INFORMATION SHEET

The U.S. Nuclear Regulatory Commission's Public Scoping Process on Environmental Issues Pertaining to Decommissioning Nuclear Power Plants

The U.S. Nuclear Regulatory Commission (NRC) is gathering information necessary to prepare a supplement to the *Final Generic Environmental Impact Statement of Nuclear Facilities*, NUREG-0586, for power reactors only. The NRC is interested in public comments on environmental issues and the proposed scope of the staff's environmental review.

Written comments can be submitted by e-mail to DGEIS@NRC.GOV or to the following address postmarked no later than July 15, 2000:

Chief, Rules and Directives Branch
Division of Administrative Services, MS T-6D 59
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NUREG-0586

Excerpted Sections Relating to Power Reactors

Final Generic Environmental Impact Statement on decommissioning of nuclear facilities

U.S. Nuclear Regulatory Commission

Office of Nuclear Regulatory Research

August 1988

FOREWORD
BY
NUCLEAR REGULATORY COMMISSION STAFF

The NRC staff is in the process of reappraising its regulatory position relative to the decommissioning of nuclear facilities. The initial part of this activity consisted of obtaining the information base to support any subsequent regulatory changes. Highly detailed studies were completed, through technical assistance contracts of the technology, safety and costs of decommissioning various nuclear facilities. (These studies are referenced in this document). These studies were, in turn, utilized along with other information, to prepare a Draft Generic Environmental Statement on Decommissioning Nuclear Facilities, draft GEIS, NUREG-0586, January 1981. On February 11, 1985, the Commission published a notice of proposed rulemaking on decommissioning criteria for nuclear facilities (50 FR 5600).

This Final Generic Environmental Impact Statement on Decommissioning Nuclear Facilities is being published based on public comment on the draft GEIS and on the proposed rule as well as on updated information in the technical information base. This statement is required because the regulatory changes that might result from the reevaluation of decommissioning policy may be a major NRC action affecting the quality of the human environment.

The information provided in this Statement, including any comments, will be included in the record for consideration by the Commission in establishing criteria and new standards for decommissioning.

ABSTRACT

This final generic environmental impact statement was prepared as part of the requirement for considering changes in regulations on decommissioning of commercial nuclear facilities. Consideration is given to the decommissioning of pressurized water reactors, boiling water reactors, research and test reactors, fuel reprocessing plants (FRPs) (currently, use of FRPs in the commercial sector is not being considered), small mixed oxide fuel fabrication plants, uranium hexafluoride conversion plants, uranium fuel fabrication plants, independent spent fuel storage installations, and non-fuel-cycle facilities for handling byproduct, source and special nuclear materials. Excluded here from consideration for regulation change, are decommissioning of low-level waste burial facilities, high-level waste repositories, and uranium mill and mill tailings piles, which are covered in separate rulemaking activities, and decommissioning of uranium mines which are not under NRC jurisdiction.

Decommissioning has many positive environmental impacts such as the return of possibly valuable land to the public domain and the elimination of potential problems associated with increased numbers of radioactively contaminated facilities with a minimal use of resources. Major adverse impacts are shown to be routine occupational radiation doses and the commitment of nominally small amounts of land to radioactive waste disposal. Other impacts, including public radiation doses, are minor. Mitigation of potential health, safety, and environmental impacts requires more specific and detailed regulatory guidance than is currently available. Recommendations are made as to regulatory decommissioning particulars including such aspects as decommissioning alternatives, appropriate preliminary planning requirements at the time of commissioning, final planning requirements prior to termination of facility operations, assurance of funding for decommissioning, environmental review requirements,

OVERVIEW

At the end of a commercial nuclear facility's useful life, termination of its license by the Nuclear Regulatory Commission (NRC) is a desired objective. Such termination requires that the facility be decommissioned. Decommissioning means the removal of a nuclear facility safely from service and reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. It is the objective of NRC regulatory activities in protecting public health and safety to provide to the applicant or licensee appropriate regulations and guidance to accomplish nuclear facility decommissioning.

Although decommissioning is not an imminent health and safety problem, the nuclear industry is maturing. Nuclear facilities have been operating for a number of years, and the number and complexity of facilities that will require decommissioning is expected to increase in the near future. Accordingly, the NRC is reevaluating its regulatory requirements concerning decommissioning. This final generic environmental impact statement is part of this reevaluation.

PAST ACTIVITIES

In support of this reevaluation, a data base on the technology, safety, and cost of decommissioning various nuclear facilities and on other matters related to decommissioning, including financial assurance, is being completed for the NRC by Battelle Pacific Northwest Laboratory (PNL), by Oak Ridge National Laboratory and by other contractors. Based on this data base and on input from other State and Federal government agencies and the public, NRC has modified and amplified its policy considerations and data base requirements in a manner responsive to comments received. Another area addressed is the generic applicability of the data base for specific facility types. This has been addressed through expansion of the PNL facility reports to include sensitivity analyses for a variety of parameters potentially affecting safety and cost considerations. A draft generic environmental impact statement was issued in January, 1981 and comments received have been considered in the development of this final statement. On February 11, 1985, the NRC published a notice of proposed rulemaking on Decommissioning Criteria for Nuclear Facilities (50 FR 5600). The proposed amendments covered a number of topics related to decommissioning that would be applicable to 10 CFR Parts 30, 40, 50, 51, 70, and 72 applicants and licensees. These topics included decommissioning alternatives, planning, assurance of funds for decommissioning, environmental review requirements, and residual radioactivity.

SCOPE OF THE EIS

Regulatory changes are being considered for both fuel cycle and non-fuel-cycle nuclear facilities. The fuel cycle facilities are pressurized (PWR) and boiling water (BWR) light water reactors (LWRs) for both single and multiple reactor sites, research and test reactors, fuel reprocessing plants (FRPs) (currently, use of FRPs in the commercial sector is not being considered), small mixed oxide (MOX) fuel fabrication plants, uranium fuel fabrication plants (U-fab), uranium hexafluoride conversion plants (UF_6), and independent spent fuel storage installations (ISFSI). Under non-fuel-cycle facilities,

consideration is given to major types such as radiopharmaceutical or industrial radioisotope supplier facilities, various research radioisotope laboratories, and rare metal ore processing plants where uranium and thorium are concentrated in the tailings.

This EIS addresses only those issues involved in the activities carried out at the end of a nuclear facility's useful life which permit the facility to be removed safely from service and the property to be released for unrestricted use. It does not address the considerations involved in extending the life of a nuclear facility. If a licensee makes an application for extending a facility license, an application for license renewal or amendment or for a new license would be submitted and reviewed according to appropriate existing regulations. This is not considered to be decommissioning and therefore is outside the scope of this EIS.

High-level waste repositories, low-level waste burial facilities, and uranium mills and their associated mill tailings piles are covered in separate rulemakings and are not included here. The first two items are covered in Title 10 of the Code of Federal Regulations (10 CFR) Parts 60 and 61. The last item is covered in amendments to 10 CFR Part 40.

REGULATORY OBJECTIVE

It is the responsibility of the NRC to ensure, through regulations and other guidance, that appropriate procedures are followed in decommissioning to protect the health and safety of the public. Present regulatory requirements and guidance cover the requirements and criteria for decommissioning in a limited way and are not adequate to regulate decommissioning actions effectively. Areas needing further criteria include decommissioning alternatives, financial assurance, planning and residual radioactivity levels as discussed below:

Decommissioning Alternatives. It is the responsibility of the NRC, in protecting public health and safety, to ensure that after a nuclear facility ceases operation its license is terminated in a timely manner. License termination requires decommissioning. Analysis of the technical data base, establishes that decommissioning can be accomplished and the facility released for unrestricted use shortly after cessation of operations or, in certain situations for certain facilities, delayed and completed after a period of storage. These situations would include considerations where the potential exists for occupational exposure and waste volume reduction, resulting from radioactive decay, or the inability to dispose of waste due to lack of disposal capacity, or other site specific factors which may affect safety. Completing decommissioning and releasing the site for unrestricted use eliminates the potential problems that may result from an increasing number of sites contaminated with radioactive material, as well as eliminating potential health, safety, regulatory, and economic problems associated with maintaining the nuclear facility.

Based on the technical data base, it appears that completing decommissioning shortly after cessation of facility operations or delaying completion of decommissioning for a 30 to 50 year period are reasonable options for decommissioning light water power reactors. Delay beyond that period may be acceptable if there is an inability to dispose of waste due to lack of disposal capacity or if there are site specific factors affecting safety such as if the safety of an adjacent reactor might be affected by dismantlement procedures.

For research and test reactors and for nuclear facilities licensed under 10 CFR Parts 30, 40, 70, and 72, occupational doses would be in most cases much less significant than power reactors. Thus, completing decommissioning shortly after cessation of operations is considered the most reasonable option. Delaying completion of decommissioning to allow short lived nuclides to decay may be justified in some cases, however, any extended delay would rarely be justifiable.

Financial Assurance. Consistent with the regulatory objective of decommissioning as described above, reasonable assurance is required from the nuclear facility licensee that adequate funds are available to decommission the facility. The funding mechanisms considered reasonable for providing the necessary assurance include prepayment of funds into a segregated account, insurance, surety bonds, letters of credit, and certain other guarantee methods, and a sinking fund deposited into a segregated account.

Planning. Planning for decommissioning is a critical item for ensuring that the decommissioning activities can be accomplished in a safe and timely manner. Development of detailed plans at the application stage is not possible because many factors (e.g., technology, regulatory requirements, economics) will change before the license period ends. Thus, most of the planning for the actual decommissioning will occur near final shutdown. However, a certain amount of preliminary planning should be done at the application stage.

Information on decommissioning funding provisions must be submitted with an application for a license for a nuclear facility. This information should include the method of assuring funds for decommissioning (as discussed above under Financial Assurance) and an indication of the amount being set aside. Provisions should also be made to adjust cost levels and associated funding levels over the life of the facility.

Facilitation of decommissioning in the design of a facility or during its operation can be beneficial in reducing operational exposures and waste volumes requiring disposal at the time of decommissioning. Although many aspects of facilitation can be covered under existing regulations, specific requirements that records of relevant operational and design information important to decommissioning be maintained should be added.

A final detailed decommissioning plan is required for review and approval by the NRC prior to cessation of facility operation or shortly thereafter. Besides the description of the decommissioning alternative which will be used, the final plan should include a description of the plans to ensure occupational and public safety and to protect the environment during decommissioning; a description of the final radiation survey to ensure that remaining residual radioactivity is within levels permitted for releasing the property for unrestricted use; an updated cost estimate; and for certain facilities as appropriate a description of quality assurance and safeguards provisions. The plan should include an estimate of the cost required to accomplish the decommissioning.

Residual Radioactivity Levels. The selection of an acceptable level is outside the scope of rulemaking supported by this EIS. The Commission is participating in an EPA organized interagency working group which is developing Federal guidance on acceptable residual radioactivity for unrestricted use. Proposed Federal guidance is anticipated to be published by EPA. NRC is planning to

implement this guidance through rulemaking as soon as possible, as well as by issuing regulatory guides and standard review plan sections. Currently, criteria for residual contamination levels do exist and research and test reactors are being decommissioned using present guidance contained in Regulatory Guide 1.86 for surface contamination plus 5 μr/hr above background measured at 1 meter from the surface for direct radiation. The cost estimate for decommissioning can be based on current criteria and guidance regarding residual radioactivity levels for unrestricted use. The information in the studies performed as part of the reevaluation on decommissioning have indicated that in any reasonable range of residual radioactivity limits, the cost of decommissioning is relatively insensitive to the radioactivity level and use of cost data based on current criteria should provide a reasonable estimate. Even in situations where the residual radioactivity level might have an effect on decommissioning cost, by use of update provisions in the rulemaking, it is expected that the decommissioning fund available at the end of facility life will approximate closely the actual cost of decommissioning.

ENVIRONMENTAL IMPACT STATEMENT

Generally, the major environmental impact from decommissioning, especially for power reactors, occurs when the decision is made to operate the reactor. Provided decommissioning rules are in place and based on the conclusions of Chapters 4 and 5 regarding impacts from reactor decommissioning alternatives, it is not expected that any significant environmental impacts will result from decommissioning. Therefore current 10 CFR Part 51 needs to be amended to delete the manditory EIS requirement for decommissioning of power reactors. An EIS may still be needed but this should be based on site specific factors. Consequently a licensee should submit a supplemental environmental report and safety analysis and, based on these submittals, the NRC should consider preparation and issuance of an environmental assessment and a finding of no environmental impact. This is expected to be reasonable for most situations.

It is imperative that decommissioning rule amendments in 10 CFR Parts 30, 40, 50, 51, 70, and 72 be issued at this time because it is important to establish financial assurance provisions, as well as other decommissioning planning provisions, as soon as possible so that funds will be available to carry out decommissioning in a manner which protects public health and safety. Based on this need for the decommissioning provisions currently existing as well as those contained in the proposed rule amendments, the Commission believes that the rule can and should be issued now.

CONCLUSIONS ON DECOMMISSIONING IMPACTS

Consideration of the decommissioning data base including comments on the Draft Generic Environmental Statement and on the proposed rule and of the need for regulatory activity has led to the following conclusions in the Final Generic Environmental Impact Statement:

(1) The technology for decommissioning nuclear facilities is well in hand and, while technical improvements in decommissioning techniques are to be expected, decommissioning at the present time can be performed safely and at reasonable cost. Radiation dose to the public due to decommissioning activities should be very small and be primarily due to transportation of

TABLE OF CONTENTS

	Page
FOREWORD	iii
ABSTRACT	v
OVERVIEW	vii
TABLE OF CONTENTS	xiii
LIST OF TABLES	xxi
LIST OF FIGURES	xxv
1.0 INTRODUCTION	1-1
1.1 Purpose of EIS	1-1
1.1.1 NEPA Requirements	1-1
1.2 Organization of the EIS	1-2
1.3 Purpose of Decommissioning	1-3
1.4 Responsibility for Decommissioning	1-3
1.4.1 Existing Criteria and Regulations for Decommissioning	1-3
1.4.2 Current Rulemaking Activities	1-3
1.5 History, Background, and Experience With Decommissioning	1-4
REFERENCES	1-7
2 GENERIC NUCLEAR FACILITY DECOMMISSIONING CONSIDERATIONS	2-1
2.1 Nuclear Facilities Operational Description	2-1
2.1.1 The Nuclear Fuel Cycle	2-1
2.1.2 Research and Test Reactors	2-4
2.1.3 Non-Fuel-Cycle Nuclear Facilities	2-5
2.2 Facilities Considered in EIS	2-5
2.3 Definition of Decommissioning	2-5
2.4 Decommissioning Alternatives	2-5
2.4.1 No Action	2-6
2.4.2 DECON	2-6
2.4.3 SAFSTOR	2-9
2.4.4 ENTOMB	2-11

TABLE OF CONTENTS (Continued)

	Page
2.5 Residual Radioactivity Levels for Unrestricted Use of a Facility	2-12
2.6 Financial Assurance	2-14
2.6.1 Present Regulatory Guidance	2-14
2.6.2 Implementation of Financial Assurance Requirements	2-14
2.7 Management of Radioactive Wastes and Interim Storage	2-20
2.8 Safeguards	2-22
REFERENCES	2-23
3 AFFECTED ENVIRONMENT - GENERIC SITE DESCRIPTION	3-1
3.1 Fuel Cycle Facility Site	3-1
REFERENCES	3-3
4 PRESSURIZED WATER REACTOR	4-1
4.1 PWR Description	4-1
4.2 Reactor Decommissioning Experience	4-2
4.3 Decommissioning Alternatives	4-4
4.3.1 DECON	4-4
4.3.2 SAFSTOR	4-7
4.3.3 ENTOMB	4-10
4.3.4 Sensitivity Analyses	4-12
4.4 Environmental Consequences	4-15
4.5 Comparison of Decommissioning Alternatives	4-17
REFERENCES	4-21
5 BOILING WATER REACTOR	5-1
5.1 Boiling Water Reactor Description	5-1
5.2 BWR Decommissioning Experience	5-3
5.3 Decommissioning Alternatives	5-3
5.3.1 DECON	5-4
5.3.2 SAFSTOR	5-9
5.3.3 ENTOMB	5-10
5.3.4 Sensitivity Analyses	5-12
5.4 Environmental Consequences	5-15
5.5 Comparison of Decommissioning Alternatives	5-17
REFERENCES	5-21

TABLE OF CONTENTS (Continued)

	Page
6 MULTIPLE REACTOR STATION	6-1
6.1 Multiple-Reactor Station Description	6-1
6.1.1 Multiple-Reactor Station Concepts	6-2
6.1.2 Multiple-Reactor Station Scenarios	6-3
6.1.3 Reference Light Water Reactors	6-5
6.2 Multiple-Reactor Station Decommissioning Experience	6-5
6.3 Multiple-Reactor Station Decommissioning Scenarios	6-5
6.3.1 DECON	6-20
6.3.2 SAFSTOR	6-21
6.3.3 ENTOMB	6-22
6.4 Environmental Consequences	6-23
6.5 Comparisons of Reactor Decommissioning at Multiple-Reactor Stations and at Single-Reactor Stations	6-24
REFERENCES	6-26
7 RESEARCH AND TEST REACTORS	7-1
7.1 Description of R&T Reactors	7-1
7.1.1 Reference Research Reactor	7-1
7.1.2 Reference Test Reactor	7-2
7.2 Research and Test Reactor Decommissioning Experience	7-2
7.3 Decommissioning Alternatives	7-2
7.3.1 DECON	7-2
7.3.2 SAFSTOR	7-4
7.3.3 ENTOMB	7-7
7.3.4 Sensitivity Analysis	7-8
7.4 Environmental Consequences	7-9
7.5 Comparison of Decommissioning Alternatives	7-10
REFERENCES	7-13
8 DECOMMISSIONING OF REACTORS THAT HAVE BEEN INVOLVED IN ACCIDENTS	8-1
8.1 Reference Facility Description and Reference Accident Scenarios	8-3
8.2 Post Accident Decommissioning Experience	8-4
8.3 Decommissioning Alternatives	8-5

TABLE OF CONTENTS (Continued)

Page

8.3.1 DECON 8-6
8.3.2 SAFSTOR 8-6
8.3.3 ENTOMB 8-9

8.4 Environmental Consequences 8-10
8.5 Comparison of Decommissioning Alternatives 8-13

REFERENCES 8-15

9 FUEL REPROCESSING PLANT 9-1

9.1 Description of Fuel Reprocessing Process and Facility .. 9-1

9.1.1 Process Description 9-1
9.1.2 Plant Description 9-1
9.1.3 Estimates of Radioactivity Levels at FRP Shutdown. 9-4

9.2 Fuel Reprocessing Plant Decommissioning Experience 9-4
9.3 Decommissioning Alternatives 9-4

9.3.1 DECON 9-5
9.3.2 SAFSTOR 9-8
9.3.3 Site Decommissioning 9-10
9.3.4 Summary of Radiation Safety 9-10
9.3.5 Missing
9.3.6 Decommissioning Costs 9-10

9.4 Environmental Consequences 9-13

9.4.1 Wastes 9-13
9.4.2 Nonradiological Safety Impacts 9-14
9.4.3 Socioconomic Impacts 9-14

9.5 Comparison of Decommissioning Alternatives 9-16

REFERENCES 9-17

10 SMALL MIXED OXIDE FUEL FABRICATION PLANT 10-1

10.1 Description of the Reference MOX Fuel Fabrication Plant. 10-1
10.2 MOX Decommissioning Experience 10-2
10.3 Decommissioning Alternatives 10-2

10.3.1 DECON 10-2
10.3.2 SAFSTOR 10-3
10.3.3 ENTOMB 10-4
10.3.4 Summary of Radiation Safety and Decommissioning Costs 10-5

TABLE OF CONTENTS (Continued)

Page

10.4 Environmental Consequences 10-12

10.4.1 Waste 10-12
10.4.2 Nonradiological Safety 10-13
10.4.3 Socioeconomic Effects 10-13
10.4.4 Noise and Aesthetics 10-14

10.5 Comparison of Decommissioning Alternatives 10-14

REFERENCE 10-16

11 URANIUM HEXAFLUORIDE CONVERSION PLANT 11-1

11.1 Uranium Hexafluoride Conversion Plant Description 11-1

11.1.1 Plant and Process Description 11-1
11.1.2 Estimates of Radioactivity Levels at UF_6 Plant Shutdown 11-2

11.2 Uranium Hexafluoride Conversion Plant Decommissioning Experience 11-4
11.3 Decommissioning Alternatives 11-4

11.3.1 DECON 11-5
11.3.2 SAFSTOR 11-6
11.3.3 ENTOMB 11-6
11.3.4 Site Decommissioning 11-6

11.4 Environmental Consequences 11-7

11.4.1 Waste Disposal 11-7
11.4.2 Additional Effects of Decommissioning 11-7

11.5 Comparison of Decommissioning Alternatives 11-7

REFERENCE 11-9

12 URANIUM FUEL FABRICATION PLANT 12-1

12.1 U-Fab Plant Description 12-1
12.2 U-Fab Plant Decommissioning Experience 12-2
12.3 Decommissioning Alternatives 12-2

12.3.1 DECON 12-3
12.3.2 SAFSTOR (Custodial) 12-4
12.3.3 ENTOMB 12-4
12.3.4 Summary of Radiation Safety and Decommissioning Costs 12-6

TABLE OF CONTENTS (Continued)

	Page
12.4 Environmental Consequences	12-10
12.4.1 Nonradiological Safety	12-10
12.4.2 Commitment of Resources	12-10
12.4.3 Socioeconomic Effects	12-10
12.5 Comparison of Decommissioning Alternatives	12-11
REFERENCES	12-12
13 INDEPENDENT SPENT FUEL STORAGE INSTALLATION	13-1
13.1 Description of an Independent Spent Fuel Storage Installation (ISFSI)	13-1
13.1.1 Wet Storage ISFSI	13-1
13.1.2 Dry Storage ISFSI	13-1
13.2 ISFSI Decommissioning Experience	13-3
13.3 Decommissioning Alternatives	13-3
13.3.1 DECON	13-3
13.3.2 SAFSTOR	13-4
13.3.3 ENTOMB	13-4
13.3.4 Summary of Radiation Safety and Decommissioning Costs	13-5
13.4 Environmental Consequences	13-7
13.4.1 Waste Disposal	13-7
13.4.2 Socioeconomic Effects	13-7
13.5 Comparison of Decommissioning Alternatives	13-7
REFERENCES	13-9
14 NON-FUEL-CYCLE NUCLEAR FACILITIES	14-1
14.1 Facilities Descriptions	14-1
14.1.1 Selected Types of Materials Facilities	14-1
14.1.2 Reference Facilities and Sites	14-5
14.2 Non-Fuel-Cycle Materials Facilities Decommissioning Experience	14-6
14.3 Decommissioning Alternatives	14-8

TABLE OF CONTENTS (Continued)

Page

14.3.1 Decommissioning Alternatives for Non-Fuel-Cycle Facilities 14-8
14.3.2 Decommissioning Alternatives for Sealed Source and Radiochemical Manufacturers 14-9
14.3.3 Decommissioning Alternatives for Broad Research and Development Program Facilities..... 14-13
14.3.4 Decommissioning Alternatives for Processors of Radioactive Ore 14-14

14.4 Environmental Consequences 14-15
14.5 Comparison of Decommissioning Alternatives 14-15

REFERENCES 14-17

15 NRC POLICY CONSIDERATIONS 15-1

15.1 Major Regulatory Particulars 15-2

15.1.1 Decommissioning Alternatives 15-2
15.1.2 Planning 15-7
15.1.3 Financial Assurance 15-9
15.1.4 Residual Radioactivity Levels for Unrestricted Use of a Facility 15-11
15.1.5 Environmental Impact Statement 15-11

15.2 Regulations 15-12

REFERENCES 15-13

GLOSSARY G-1

APPENDIX A Discussion of Comments on the Draft Generic Environmental Impact Statement A-1

APPENDIX B Comment Letters B-1

1 INTRODUCTION

Commercial nuclear facilities that come under the Nuclear Regulatory Commission's (NRC) regulatory authority include those dealing with fuel cycle and non-fuel-cycle operation. The generation of electric power from steam supplied by nuclear reactors requires a series of processes collectively known as the nuclear fuel cycle. This cycle begins with the mining and milling of uranium ore, includes the operation of power reactors, and ends with the disposition of radioactive wastes. Each step in the cycle requires the handling of radioactive materials, which are specifically designated as source materials, byproduct materials, or special nuclear materials. Non-fuel-cycle facilities can also use byproduct, source, and special nuclear materials. Non-fuel-cycle facilities include those involved in academic, pharmaceutical and industrial radioisotopic use and in rare metal ore processing. The handling of these materials and the processes involved have given rise to several issues of fundamental importance to the American public. These issues include the safe operation of all steps in the nuclear fuel cycle and of other nuclear facilities, especially the safe operation of power reactors; the safe disposition of radioactive wastes; and the safe decommissioning of all nuclear facilities. The first two issues have received much attention from Congress and from federal regulatory agencies, beginning in 1954 with the passage of the Atomic Energy Act. The third issue, decommissioning, is now receiving an increasing amount of attention because the nuclear field is maturing, in that nuclear facilities have been operating for a number of years, and the number and complexity of facilities that will require decommissioning is expected to increase in the future. It is this third issue which is the subject of this document.

1.1 Purpose of EIS

The purpose of this environmental impact statement (EIS) is to assist the Nuclear Regulatory Commission (NRC) in developing policies and in promulgating amended regulations with respect to the decommissioning of licensed nuclear facilities. It is prepared pursuant to the requirements of the National Environmental Policy Act (NEPA). The decommissioning of uranium mills and mill tailings, (this includes all facilities associated with extracting uranium from areas, such as in situs, heap leach, and milling facilities) low-level waste burial facilities and high-level waste repositories has been treated in 10 CFR Parts 40, 60 and 61. In addition, also excluded from this action are uranium mines which come under the jurisdiction of the states and other Federal agencies. The generic analyses of this EIS are applicable to specific facilities based on the decommissioning information base studies which included sensitivity analyses of such parameters as the size of the facility, contamination level, waste disposal costs, labor costs, etc. (See References of Section 1)

1.1.1 NEPA Requirements

Section 102(1) of the National Environmental Policy Act (42 U.S.C. 4321 et seq.) requires that "the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act." Section 102(2)(C) requires all agencies of the Federal

Government to "include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on:

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

1.2 Organization of the EIS

The first three sections of this EIS contain material common to all of the facilities discussed in the statement. Regulatory matters are discussed in Section 1. Section 2 discusses in a generic manner the following: nuclear facilities; decommissioning alternatives; acceptable residual radioactivity levels for permitting release of the site for unrestricted use; financial assurance that sufficient funds are available for decommissioning; the management of radioactive wastes; and safeguards. Facility sites (i.e., the affected environment) are discussed generically in Section 3. Reactor facilities are discussed in Sections 4 through 8. Fuel cycle facilities are discussed in Sections 9 through 13 and non-fuel-cycle facilities in Section 14. These sections include descriptions of each facility, discussions of decommissioning alternatives, and summaries of radiation exposures and decommissioning costs. Other environmental consequences are also discussed. Regulatory policy considerations are discussed in Section 15.

It is intended in this report to provide a document sufficient in detail to be useful to the NRC in establishing policies and in promulgating amended regulations, yet not so lengthy or detailed as to be overwhelming to the general public and to others who have a valid interest in the subject. Detailed reports have been prepared which constitute information bases on the technology, safety and costs of decommissioning of the nuclear facilities discussed in this report.[1-10] These facilities are pressurized water reactors, boiling water reactors, multiple reactor power stations, research and test reactors, fuel reprocessing plants, small mixed oxide fuel fabrication plants, uranium hexafluoride conversion plants, uranium fuel fabrication plants, independent spent fuel storage installations, and non-fuelcycle materials facilities. Many of those reports have been available for critical comment for some time, have been found to be useful as a data base, and have been used in preparation of decommissioning studies. The decommissioning of uranium mills and tailings piles is discussed in a separate EIS.[11] The decommissioning of low-level waste burial facilities is also discussed in a separate EIS.[12]

This EIS represents a compendium of what would otherwise have been many separate EIS's on the nuclear facilities considered in this report. To make the

report more useful to the user, the separate facility sections (Section 4 through 14) were kept as self-contained as possible, so that a user interested in a particular facility type need primarily read only that section, as well as the introduction, the section on generic issues and the section on policy. Such an approach causes some unavoidable redundancy in presentation of information contained in the various facility sections. In addition, an overview of this report is presented to enable a user to gain a perspective of the objectives and conclusions reached in this report.

1.3 Purpose of Decommissioning

The purpose of decommissioning nuclear facilities is to take the facility safely from service and to reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of license. Alternative methods of accomplishing this purpose, and the environmental impacts of each alternative are discussed in this EIS.

1.4 Responsibility for Decommissioning

The responsibility for decommissioning a commercial nuclear facility belongs to the licensee. Regulatory and policy guidance for decommissioning is the responsibility of the NRC and is implemented either by the NRC or Agreement State as applicable.

1.4.1 Existing Criteria and Regulations for Decommissioning

Statutory authority for the regulation of activities related to the commercial nuclear fuel cycle is contained in the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) and the Energy Reorganization Act of 1974 (42 U.S.C. 5841 et seq.) and in subsequent amendments. Pursuant to these acts, the NRC has promulgated regulations which appear in Title 10 of the Code of Federal Regulations. The NRC has also published Regulatory Guides for the purpose of assisting applicants and licensees in carrying out their regulatory obligations.

Present regulations specifically pertaining to decommissioning are contained in 10 CFR Parts 40, 61, and 72 and in Section 50.33(f), Section 50.82, and Appendix F of 10 CFR Part 50. General guidance is contained in NRC Regulatory Guides 1.86 and 3.5 (Rev. 1) and in NRC staff guidelines.

1.4.2 Current Rulemaking Activities

The NRC is currently developing an explicit overall policy for decommissioning commercial nuclear facilities and amending its regulations in 10 CFR Chapter I to include more specific decommissioning guidance for production and utilization facility licensees and byproduct, source, and special nuclear material licensees.[13] On February 11, 1985, the NRC published a notice of proposed rulemaking on Decommissioning Criteria for Nuclear Facilities (50 FR 5600). The proposed amendments covered a number of topics related to decommissioning that would be applicable to 10 CFR Parts 30, 40, 50, 70, and 72 applicants and licensees. These topics included decommissioning alternatives, planning, assurance of funds for decommissioning, environmental review requirements, and residual radioactivity.

1.5 History, Background, and Experience With Decommissioning

Facilities identified with the portion of the nuclear fuel cycle between mining and reactor operation, uranium hexafluoride conversion plants and uranium fuel fabrication plants, call for relatively routine decommissioning procedures. These facilities usually contain low-level radioactivity which is well confined to the facility. Mixed oxide fuel fabrication plants involve plutonium and thus call for special procedures. Pressurized water reactors, boiling water reactors, fuel reprocessing plants, and spent fuel storage facilities contain high levels of radioactivity that require special precautions and procedures. The differences among research and test reactors that have a variety of functions and the complexity of non-fuel-cycle facilities that handle byproduct, source, or special nuclear materials depend on the activities carried out and the materials handled. However, their problems in decommissioning these facilities are more from the great number and variety, than in any technical difficulties.

Since 1960, five licensed power reactors, four demonstration reactors, six licensed test reactors, one licensed ship reactor, and 52 licensed research reactors and critical facilities have been or are being decommissioned by the methods discussed in this EIS. Forty-two research reactors and critical facilities have been dismantled. Only one power reactor, the Elk River demonstration reactor, has been completely dismantled. Three other demonstration power reactors of small size have been entombed. The decommissioning status of the more important reactors is listed in Table 1.5-1. Some military reactors are included, while licensed research reactors and critical facilities have been omitted.

Decommissioning experience with some of the specific types of facilities is limited, but a broad base of experience with various facilities exists which is generally relevant to the decommissioning of any type of nuclear facility. A sampling of non-reactor facilities which have been decommissioned is presented in Table 1.5-2.

2 GENERIC NUCLEAR FACILITY DECOMMISSIONING CONSIDERATIONS

In this section consideration is given to generic items required for implementing a decommissioning program for the facilities considered in this EIS. First, for an overview, a brief discussion is presented of the nuclear fuel cycle for light-water-reactors. Research and test reactors and non-fuel-cycle nuclear facilities are also briefly discussed. Consideration is then given to:

(1) decommissioning alternatives and their advantages and disadvantages,

(2) acceptable residual radioactivity levels for permitting release of a decommissioned nuclear facility for unrestricted access,

(3) assurance that funds to pay for decommissioning will be available,

(4) waste management for radioactive waste needing to be disposed of during nuclear facility decommissioning, and

(5) safeguarding requirements during decommissioning.

2.1 Nuclear Facilities Operational Description

2.1.1 The Nuclear Fuel Cycle

A nuclear power plant is a facility designed to generate electricity by utilizing the heat produced by controlled nuclear fission of uranium and plutonium. This is the desired production step in the fuel cycle. It is preceded by several steps in the fuel cycle in which uranium ore is processed into fuel elements, and is followed by several steps in which fuel removed from the reactor is stored and then either reprocessed to recover usable fuel or disposed of in some manner. The basic steps in the nuclear fuel cycle are shown in Figure 2.1-1. Each box in the diagram represents a separate facility and each arrow represents the transportation of the product between facilities. Spent fuel is being stored at the reactor sites pending eventual disposal at spent fuel storage facilities or high-level waste repositories.

The steps in Figure 2.1-1 for the typical fuel cycle for power plants are described more fully below.

Milling

The uranium ores that are mined and milled in the United States are sedimentary deposits in which the uranium occurs as a coating on sand grains. Small quantities of radium and thorium are also found in the ore. The uranium content is only about 1 to 3 kg per tonne (2 to 6 lb per ton). The milling process dissolves the uranium and separates it from the sand. This involves crushing and grinding the ore, dissolving the uranium by acid or alkaline leach, and precipitating a semi-refined product, called yellowcake. The tailings from this process are mostly sand, but they also include the original quantities of radium, thorium, and other decay products that do not extract

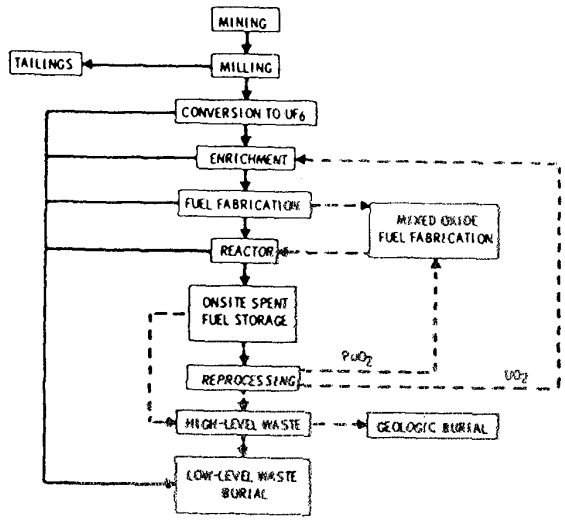

Figure 2.1-1 Diagram of the steps in the nuclear fuel cycle

with the uranium. The tailings are carried as a slurry to impoundment areas where the water is allowed to evaporate. The tailings are then stabilized to reduce future potential contamination problems.

Conversion

The yellowcake is shipped to a conversion plant where it is converted to UF_6 by one of two processes. One is the "dry" or hydrofluor process in which the yellowcake goes through a series of reduction, hydrofluorination, and fluorination steps in fluidized bed reactors. The other is a "wet" process in which the yellowcake is first processed to produce a high-purity uranium dioxide feed that undergoes reduction, hydrofluorination, and fluorination.

Enrichment

The UF_6 produced by the conversion process contains about 0.7% ^{235}U, which must be increased to 2 to 4% prior to fabrication into LWR fuel assemblies. Enrichment is accomplished by a gaseous diffusion process in which $^{235}UF_6$ molecules pass more readily through a porous membrane than do $^{238}UF_6$ molecules, thus producing a product stream that is enriched in $^{235}UF_6$. This process is repeated through many such stages until the desired degree of enrichment is attained. The enriched UF_6 is then shipped to a fuel fabrication plant.

Fuel Fabrication

In the preparation of LWR fuel, the enriched UF_6 first undergoes chemical treatment to convert it to UO_2. The UO_2 is mechanically and thermally treated to produce high-density ceramic fuel pellets that are placed in metal fuel tubes. These tubes or rods are then clustered into fuel assemblies for reactor cores.

Reactors

A light water reactor (LWR) as used in a power plant utilizes the heat produced by controlled nuclear fission within the fuel assemblies in the reactor core to heat water and generate steam which drives a turbine-generator. There are two basic LWR types: the pressurized water reactor (PWR) and the boiling water reactor (BWR). In a PWR the water in the reactor core is kept under pressure to allow heat build-up without boiling. This heated water is circulated through a heat exchanger where water in a second circulating system is converted to steam to drive the turbines. In a BWR the water in the reactor core is allowed to boil, directly producing the steam to drive the turbines.

Spent Fuel Storage Facilities

The partially depleted LWR spent fuel assemblies are removed from the reactor and stored in spent fuel pools at the reactor for a minimum of 90 days. This cooling period allows the short-lived radionuclides to decay and reduce the radioactivity and thermal heat emission of the fuel assemblies.

Spent fuel is currently being stored at reactor spent fuel pools for extended time periods as plans for further disposition of the spent fuel are being developed. Storage of spent fuel at away-from-reactor independent spent fuel storage installations (ISFSI) is being considered as an interim measure. One

ISFSI design is similar to that of the reactor storage pools except that the storage capacity is significantly greater. An alternative ISFSI design is to store the spent fuel in a dry storage environment such as an air-cooled vault.

Fuel Reprocessing

LWR spent fuel assemblies can be chemically reprocessed to separate the remaining uranium and the generated plutonium from the radioactive wastes produced during reactor operation. The chemical separation is accomplished by chopping the fuel rods into short sections, dissolving the pellets with nitric acid, extracting uranium and plutonium nitrates from the fission products, and then separating the uranium from the plutonium. The uranyl nitrate is converted to UF_6 and the plutonium nitrate is oxidized to plutonium dioxide. Both can then be inserted into the fuel cycle for reuse. At the present time no commercial spent fuel is being reprocessed in the United States.

Mixed Oxide Fuel Fabrication

A mixed oxide fuel fabrication plant produces fuel elements that contain a mixture of UO_2 and PuO_2. For example, UO_2 and PuO_2 powders are mixed and the mixture is formed into pellets by mechanical and thermal treatment. These pellets are sealed in metal cladding to form fuel elements. Only small mixed oxide plants are currently in use commercially and are used to fabricate experimental fuel elements.

Low-Level Waste Burial Facilities

Low-Level radioactive wastes which do not contain transuranic elements above certain concentrations are disposed of in shallow-land burial facilities. These kinds of materials may be generated at reactors or at any of the facilities where fuel is processed, and consist of contaminated trash, filters, and equipment. These wastes are placed in boxes or drums to facilitate handling and are buried at sites that are monitored and are restricted from public access.

High-Level Waste Repositories

High-level wastes are either intact fuel assemblies that are being discarded after serving their useful life in a reactor core (spent fuel) or certain fission product and actinide wastes generated during fuel reprocessing. High-level waste burial at deep geologic repositories is currently under consideration. There are currently no facilities of this type.

2.1.2 Research and Test Reactors

A research reactor is defined in 10 CFR 170.3(h) as a nuclear reactor licensed for operation at a thermal power level of 10 megawatts or less, and which is not a testing facility. A testing facility (i.e., a test reactor) is defined in 10 CFR 50.2 as a nuclear reactor licensed for operation at: (1) a thermal power level in excess of 10 megawatts, or (2) a thermal power level in excess of 1 megawatt if the reactor is to contain: a circulating loop through the core in which the applicant proposes to conduct fuel experiments, or a liquid fuel loading, or an experimental facility in the core in excess of 16 square inches in cross-section. There are 84 nonpower research and test (R&T) reactors in the U.S. that are licensed by the NRC. Of these 76 are research reactors, and

8 are test reactors. The level of activity of these facilities ranges from no longer operational, to occasional use, to intermittent use, to steady and scheduled use.

2.1.3 Non-Fuel-Cycle Nuclear Facilities

Non-fuel-cycle facilities are those facilities which handle by-product, source and/or special nuclear materials, but which are not involved in the production of power as outlined in Figure 2.1-1. Non-fuel-cycle facilities must be licensed by the NRC. Precise definitions and licensing requirements for the materials listed above are published in 10 CFR Parts 30, 40, and 70, respectively. Broadly speaking, source materials consist of uranium and thorium, special nuclear materials consist of plutonium or enriched uranium, and byproduct materials consist of materials made radioactive by special nuclear material. These facilities include a wide range of applications in industry, medicine and research such as manufacture of packaged products containing small sealed sources and of radiochemicals, research and development institutions, and processors of ores in which the tailings contain licensable quantities of radionuclides.

2.2 Facilities Considered in EIS

The facilities considered in this EIS are: (1) pressurized water reactors, (2) boiling water reactors, (3) multiple reactor stations, (4) research and test reactors, (5) fuel reprocessing plants, (6) small mixed oxide fuel fabrication plants, (7) uranium hexafluoride conversion plants, 8) uranium fuel fabrication plants, (9) independent spent fuel storage installations, and (10) non-fuel-cycle nuclear facilities. The facilities not considered include uranium mills and mill tailings, low-level waste burial facilities and high-level waste repositories because they are covered by separate rulemaking; and uranium mines and the existing government owned uranium enrichment plants because they are not under NRC jurisdiction.

2.3 Definition of Decommissioning

Decommissioning means to remove a nuclear facility safely from service and to reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. Decommissioning activities do not include the removal and disposal of spent fuel which is considered to be an operational activity or the removal and disposal of nonradioactive structures and materials beyond that necessary to terminate the NRC license. Disposal of nonradioactive hazardous waste not necessary for NRC license termination is not covered in detail by this EIS but would be treated by other agencies having responsibility over these wastes as appropriate.

2.4 Decommissioning Alternatives

Once a nuclear facility has reached the end of its useful life, it must be decommissioned according to the definition contained in Section 2.3. Several alternatives are possible, although not all may be satisfactory for all nuclear facilities. These alternatives are: no action, DECON, SAFSTOR, and ENTOMB. The terms DECON, SAFSTOR, and ENTOMB are relatively new in use. In the past, the nomenclature for describing these alternatives has not been consistent. Different documents have often used different terminology when referring to the same decommissioning alternative, thus causing some confusion. In the interest

of ending the confusion, this section lists the following definitions of the major decommissioning alternatives and the following pseudoacronyms to clearly delineate each alternative:

DECON is the alternative in which the equipment, structures, and portions of the facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations.

SAFSTOR is the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use.

ENTOMB is the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactivity decays to a level permitting release of the property for unrestricted use.

Table 2.4-1 presents a summary of the various activities that will be in effect during DECON, SAFSTOR and ENTOMB.

Conversion to a new or modified use is also considered. Conversion, however, is not considered to be a decommissioning alternative whether the new use involves radioactivity or not. If the intended new use involved radioactive material and, thus was under NRC licensing authority, an application for license renewal or amendment or for a new license would be submitted and reviewed according to appropriate existing regulations. If the intended new use does not involve radioactive materials, i.e., unrestricted public use, then such new use would be contingent on prior decommissioning and termination of license. As such, it would have to use one of the decommissioning alternatives indicated above, namely DECON, SAFSTOR, or ENTOMB. In this case, the new use except as it affects the decommissioning alternative chosen. For these reasons, conversion to a new or modified facility is not considered further in this EIS.

2.4.1 No action

The objective of decommissioning is to restore a radioactive facility to a condition such that there is no unreasonable risk from the decommissioned facility to the public health and safety. In order to ensure that at the end of its life the risk from a facility is within acceptable bounds, some action is required, even if it is as minimal as making a terminal radiation survey to verify the radioactivity levels and notifying the NRC of the results of the survey. Thus, independent of the type of facility and its level of contamination, No Action, implying that a licensee would simply abandon or leave a facility after ceasing operations, is not a viable decommissioning alternative. Therefore, because no action is not considered viable for any facility discussed in this EIS, this alternative is not considered further in this report.

2.4.2 DECON

DECON is the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or

Table 2.4-1 Summary of the elements of the decommissioning alternatives

Elements[a]	Facility Status	Comments, Facility/Site Use
Decontamination [to levels permitting unrestricted use of the facility]	Equipment - removed if radioactive Continuing Care Staff - none Security - none Environmental Monitoring - none Radioactivity - removed Surveillance - none Structures - removal optional	Facility - Unrestricted use reaching permissible levels Site - Unrestricted use after reaching permissible levels
Safe Storage Custodial (Layaway)	Equipment - some operating Continuing Care Staff - some required Security - continuous Environmental Monitoring - continuous Radioactivity - confined Surveillance - continuous Structures - intact	Safe storage alone is not an acceptable decommissioning mode; it must be followed by decontamination to unrestricted use. Facility - Nuclear Only Site - Nuclear Only
Passive	Equipment - none operating Continuing Care Staff - optional (onsite) - routine inspections Security - remote alarms Environmental Monitoring - routine periodic Radioactivity - immobilized/sometimes sealed Surveillance - periodic Structures - intact	Facility - Nuclear Only Site - Conditional Non-nuclear

Table 2.4-1 (Continued)

Elements[a]	Facility Status	Comments, Facility/Site Use
Hardened	Equipment - none operating Continuing Care Staff - none on site Security - hardened barriers, fencing and posting Environmental Monitoring - infrequent Radioactivity - hardened sealing Surveillance - infrequent Structures - partial removal optional	Facility - Conditional Non-nuclear Site - Conditional Non-nuclear
Entombment	Equipment - some removed, the rest encased in concrete Site - unrestricted Continuing Care Staff - none Security - hardened barriers Environmental Monitoring - infrequent Radioactivity - encased in concrete Surveillance - infrequent Structures - intact	Facility - Unusable for an extended time period Site - Unrestricted use

[a]Elements are the specific activities involved in each of the decommissioning alternatives, e.g., SAFSTOR is made up of the following elements: preparation for safe storage, safe storage and decontamination.

decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations. DECON is the only one of the decommissioning alternatives presented here which leads to termination of the facility license and release of the facility and site for unrestricted use shortly after cessation of facility operations. DECON is estimated to take from fairly short time periods for small facilities to up to approximately 6 years for a large LWR.

Because all of the DECON work is completed within a few months or years following shutdown, personnel radiation exposures are generally higher than for other decommissioning alternatives which spread the decommissioning work over longer time periods thus allowing for radioactive decay. Similarly, larger commitments of money and waste disposal site space are also required for DECON in a relatively short time frame compared to the other alternatives.

Thus, the primary advantage of DECON, which is terminating the facility license and making the facility and site available for some other beneficial use, is accomplished at the expense of larger initial commitments of money, personnel radiation exposure, and waste disposal site space than for the other alternatives. Other advantages of DECON include the availability of a work force highly knowledgeable about the facility and the elimination of the need for long-term security, maintenance and surveillance of the facility which would be required for the other decommissioning alternatives.

In DECON, nonradioactive equipment and structures need not be torn down or removed as part of a decontamination procedure for termination of the NRC license and release for unrestricted use. Once the radioactive facility structures are decontaminated to radioactivity levels permitting unrestricted use of the facility, they may either be put to some other use or demolished at the owner's option.

2.4.3 SAFSTOR

SASTOR is the alternative in which the nuclear facility is placed (preparation for safe storage) and maintained in a condition that allows the nuclear facility to be safely stored (safe storage) and subsequently decontaminated to levels that permit release for unrestricted use (deferred contamination). SAFSTOR consists of a short period of preparation for safe storage (up to 2 years after final reactor shutdown), a variable safe storage period of continuing care consisting of security, surveillance, and maintenance (up to 60 years after final shutdown depending on the type of facility), and including a short period of deferred decontamination. Several subcategories of SAFSTOR are possible:

1. Custodial SAFSTOR requires a minimum cleanup and decontamination effort initially, followed by a period of continuing care with the active protection systems (principally the ventilation system) kept in service throughout the storage period. Full-time onsite surveillance by operating and security forces is required to carry out radiation monitoring, to maintain the equipment, and to prevent accidental or deliberate intrusion into the facility and the subsequent exposure to radiation or the dispersal of radioactivity beyond the confines of the facility.

2. Passive SAFSTOR requires a more comprehensive cleanup and decontamination effort initially, sufficient to permit deactivation of the active

protective (ventilation) system during the continuing care period. The structures are strongly secured and electronic surveillance is provided to detect accidental or deliberate intrusion. Periodic monitoring and maintenance of the integrity of the structures is required.

3. Hardened SAFSTOR requires comprehensive cleanup and decontamination and the construction of barriers around areas containing significant quantities of radioactivity. These barriers are of sufficient strength to make accidental intrusion impossible and deliberate intrusion extremely difficult. Surveillance requirements are limited to detection of attack upon the barriers, to maintenance of the integrity of the structures, and to infrequent monitoring.

All categories of safe storage require some positive action at the conclusion of the period of continuing care to release the property for unrestricted use and terminate the license for radioactive materials. Depending on the nature of the nuclear facility and its operating history, the necessary action can range from a radiation survey that shows that the radioactivity has decayed and the property is releasable, to dismantlement and removal of residual radioactive materials. These latter actions, whatever their scale, are generically identified as deferred decontamination.

SAFSTOR is used as a means to satisfy the requirements for protection of the public while minimizing the initial commitments of time, money, occupational radiation exposure, and waste disposal space. In addition, SAFSTOR may have some advantage where there are other operational nuclear facilities at the same site, and may also become necessary in other situations if there is a shortage of radioactive waste disposal space offsite. Modifications to the facilities are limited to those which ensure the security of the buildings against intruders, and to those required to ensure containment of radioactive or toxic material. It is not intended that the facilities will ever be reactivated. In highly contaminated facilities and/or facilities with large amounts of activation products, there is the potential for incurring larger occupational radiation exposures if complete decontamination is performed immediately after shutdown (DECON). However, as a result of radioactive decay of this contamination, reductions in personnel exposure and simplifications in the complexity of operations can be achieved by deferring major decontamination efforts for a number of years. Also, because many of the contamination and activation products present in the facility will have decayed to background levels after a lengthy storage period, the volume of material that must be packaged for disposal will be reduced.

The reduced initial effort (and cost) of the preparation of safe storage is tempered somewhat by the need for continuing surveillance and physical security to ensure the protection of the public. Electronic surveillance devices, which are presently available, could be in service fulltime, with offshift readouts in a local law enforcement office or private security agency. These devices which monitor for intruders, increases in radiation levels, and detection of fires will require periodic checks and maintenance.

Maintenance of the facility's structures and an ongoing program of environmental surveillance are also necessary. The duration of the storage and surveillance and dismantlement period can vary from a few years to up to 60 years depending on the type of facility. If SAFSTOR is used, the decision on the length of the safe storage period will be made by the facility owner, with the

approval of the NRC, based on consideration of factors including desirability of terminating the license, radiation dose and waste volume reductions, availability of waste disposal capacity, and other site specific factors affecting safety, such as presence of other nuclear facilities at the site. Similarly, the decision on the extent of decontamination during the period of preparation for safe storage, and the resultant subcategory of SAFSTOR to be used, depends upon safety considerations and the planned length of the storage and surveillance period. If for example, ^{60}Co is the controlling source of occupational exposure, a chemical decontamination campaign achieving a decontamination factor (DF) of 10 (i.e., radioactivity levels reduced to 1/10 of original) will result in approximately the same dose reduction as a decay period of 17 years.

At the end of the period of safe storage, several things will remain to be done before the facility can be released for unrestricted use. In most cases, radioactivity in some areas within the facility will be significantly above levels acceptable for unrestricted release of the facility, necessitating the removal, packaging and disposal of selected materials at a regulated disposal site. If the safe storage period is sufficiently long, radioactive materials in the facility may have decayed to levels low enough to permit the facility to be released for unrestricted use without additional decontamination. This would not apply in the case of a reactor, if the reactor had been operated long enough to produce significant amounts of the long-lived isotopes ^{59}Ni and ^{94}Nb.

Deferred decontamination, even for a major facility such as a LWR, is a relatively straight-forward disassembly job complicated by whatever radioactivity remains. Removal and transport of the materials containing the radioactivity to a disposal site are the principal tasks that must be completed. Further action following termination of the NRC license and release for unrestricted use, such as disassembly of the various non-radioactive systems and use or demolition of the buildings, would be at the owner's discretion.

A disadvantage of SAFSTOR is the potential lack of personnel familiar with the facility at the time of deferred decontamination. More time and training would be needed. One potential solution to this problem would be the establishment of companies specializing in the decommissioning of nuclear reactor power station and other nuclear facilities. Other disadvantages include the fact that the site is tied up in a non-useful purpose for extended time period, regulatory uncertainties in the future, and the continuing need for maintenance, security and surveillance.

2.4.4 ENTOMB

ENTOMB is the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactivity decays to a level permitting release of the property for unrestricted use. ENTOMB is intended for use where the residual radioactivity will decay to levels permitting unrestricted release of the facility within reasonable time periods (i.e., within the time period of continued structural integrity of the entombing structure as well as confidence in the reliability of continued radioactivity containment and access restriction, perhaps the order of 100 years). However, a few radioactive isotopes found in fuel reprocessing plants, nuclear reactors, fuel storage facilities, and mixed oxide facilities have half-lives in excess of 100 years and the radioactivity will

not decay to levels permitting release of the facilities for unrestricted use within the foreseeable lifetime of any man-made structure. Thus, the basic requirement of continued structural integrity of the entombment cannot be ensured for these facilities, and ENTOMB would not be a viable alternative in these circumstances. On the other hand, if the entombing structure can be expected to last many half-lives of the most objectionable long-lived isotope, then ENTOMB becomes a viable alternative because of the reduced occupational and public exposure to radiation. However, even in these circumstances, one of the difficulties with ENTOMB for any complex structure such as a reactor is that the radioactive materials remaining in the entombed structure would need to be characterized well enough to be sure that they will have decayed to acceptable levels at the end of the surveillance period. If this cannot be done adequately, deferred decontamination would become necessary, which would make ENTOMB more difficult and costly than DECON or SAFSTOR. Some method would have to be provided to demonstrate that the entombed radioactivity will decay to levels permitting release of the property for unrestricted use within the order of 100 years, which would be difficult. ENTOMB does, of course, contribute to the problems associated with increased numbers of sites dedicated for very long periods to the containment of radioactive materials.

2.5 Residual Radioactivity Levels for Unrestricted Use of a Facility

Decommissioning requires reduction of the radioactivity remaining in the facility to residual levels that permit release of the facility for unrestricted use and NRC license termination.

The Commission is participating in an EPA organized interagency working group which is developing Federal guidance on acceptable residual radioactivity levels for unrestricted use. Proposed Federal guidance is anticipated to be published by EPA. NRC is planning to implement this guidance through rulemaking as soon as possible. The selection of an acceptable level is outside the scope of rulemaking supported by this EIS. Currently, criteria for residual contamination levels do exist and research and test reactors are being decommissioned using present guidance contained in Regulatory Guide 1.86[5] for surface contamination plus 5 μr/hr above background as measured at 1 meter direct radiation. The NRC provided such criteria in letters to Stanford University, dated 3/17/81 and 4/21/82 providing "Radiation criteria for release of the dismantled Stanford Research Reactor to unrestricted access." The cost estimate for decommissioning can be based on current criteria and guidance regarding residual radioactivity levels for unrestricted use. The information in the studies by Battelle Northwest Laboratory and Oak Ridge National Laboratory on decommissioning have indicated that in any reasonable range of residual radioactivity limits, the cost of decommissioning is relatively insensitive to the radioactivity level and use of cost data based on current criteria should provide a reasonable estimate.

For example, in ORNL studies[1,2] for a PWR, certification surveys at realistic dose values 10 and 25 mrem/year were considered. It was indicated that a survey for the 10 mrem/year value was considered to be well within technical capability and could be done for a cost of approximately $250,000 (i.e., less than about 0.6% of estimated PWR decommissioning costs); and a survey for the 25 mrem/year value is estimated to cost not much less than that for 10 mrem/year (about $225,000).

There should be no significant additional decontamination effort required as a result of the termination survey, perhaps only cleanup of a few hot spots indicated by the survey. This is because the extensive efforts required to decontaminate the highly contaminated facility to low radioactivity level will result in residual radioactivity levels well below the limits which permit unrestricted release of the facility. It is also the case because spot surveys will be carried out periodically during the decommissioning period so that at the time of the termination survey the licensee is confident that decontamination efforts have achieved the acceptable residual radioactivity levels in most instances. Thus, because there should not be significant additional decontamination necessary after completion of the termination survey, the major cost and effort expected for verifying the required residual radioactivity levels for unrestricted facility use should come from the certification survey. As indicated above for the PWR example, these survey costs are expected to be a small fraction of the total decommissioning cost, and thus the effort to certify that the facility is available for unrestricted use should not add significantly to the overall decommissioning cost.

In addition, cost-benefit considerations are involved in the evaluation of the extent of facility decontamination necessary to reduce radioactive contamination to levels considered acceptable for releasing the facility for unrestricted use. As is discussed by PNL in NUREG/CR-0130,[3] and in NUREG/CR-0278,[4] and as is also inherent in the reports prepared by PNL for the other nuclear facilities discussed in this EIS, the cost of decontamination of a facility and thus its decommissioning cost, is essentially independent of the level to which it must be decontaminated as long as that level is in the range of 10 to 25 mrem/yr to an exposed individual. This is because, as indicated above, it is expected that the extensive efforts required to decontaminate the highly contaminated facility to low radioactivity levels will result in residual radioactivity level well below the limits to permit release of the facility for unrestricted use. An additional cost-benefit consideration relates to decontamination of rooms which are mildly contaminated with radioactivity. Most rooms should not be mildly contaminated with radioactivity in excess of levels which are acceptable for unrestricted facility use since it is assumed that good housekeeping and ALARA practices will be used during facility operations to control the spread of contamination. In areas where there is mild contamination, techniques such as having previously painted surfaces should make decontamination easier and less costly. A source of data for the evaluation of cost for decontamination of mildly contaminated rooms is in NUREG/CR-1754[6] which evaluates decontamination of a number of specific components. As an example, for a hot cell contaminated with Cs-137, the manpower needed for decontamination would be approximately 5 man-days and the associated costs would be approximately $5,000. Costs for decontamination of other specific components would be about the same order. These costs for decontamination of specific mildly contaminated components are small in comparison to the overall decommissioning costs. Therefore, based on the above discussions, while cost-benefit is a consideration, it is not expected to have a major impact on the GEIS results concerning reactor or most nonreactor decommissionings.

Even in situations where the residual radioactivity level might have an effect on decommissioning cost, by use of update provision in the rulemaking it is expected that the decommissioning fund available at the end of facility life will approximate closely the actual cost of decommissioning.

It is imperative that these decommissioning rule amendments in 10 CFR Parts 30, 40, 50, 70, and 72 be issued at this time because it is important to establish financial assurance provisions, as well as other decommissioning planning provisions, as soon as possible so that funds will be available to carry out decommissioning in a manner which protects public health and safety. Based on this need for the decommissioning rule and provisions currently existing and those contained in the rule amendments, the Commission believes that the rule can and should be issued now.

2.6 Financial Assurance

The primary objective of the NRC with respect to decommissioning is to protect the health and safety of the public. An important aspect of this objective is to have reasonable assurance that, at the time of termination of facility operations, adequate funds are available to decommission the facility in a safe and timely manner resulting in its release for unrestricted use, and that lack of funds does not result in delays in decommissioning that may cause potential health and safety problems for the public. The need to provide this assurance arises from the fact that there are uncertainties concerning the availability of funds at the time of decommissioning. The nuclear facility licensee has the responsibility for completing decommissioning in a manner which protects public health and safety. Satisfaction of this objective requires that the licensee provide reasonable assurance that adequate funds for performing decommissioning will be available at the cessation of facility operation.

2.6.1 Present Regulatory Guidance

Present regulatory requirements concerning the degree of financial assurance required of a licensee are not specific enough. 10 CFR 50.33(f) requires that, except for an electric utility applicant for a license to operate a utilization facility, an applicant for a production or utilization facility operating license demonstrate financial capability both to operate the facility and to shut it down and maintain it safely. 10 CFR 50, Appendix F, requires the applicant for a fuel reprocessing plant operating license to demonstrate his financial qualifications "to provide for removal and disposal of radioactive wastes during operation and upon decommissioning." 10 CFR 72 requires an applicant for a license for an independent spent fuel storage installation to provide information on funding for decommissioning. These regulations do not contain sufficient criteria for assuring funds for decommissioning the facilities covered by this EIS.

2.6.2 Implementation of Financial Assurance Requirements

In providing reasonable assurance that funds will be available for decommissioning, there are several possible financing mechanisms, outlined below, which are available to applicants and licensees. The many different types of nuclear facilities present a wide diversity in the cost of decommissioning, in the risk that decommissioning funds might be unavailable, and in the licensees' financial situations. This diversity necessitates that the NRC allow latitude in the implementation of these financing mechanisms. For example, the situation for a large power reactor can be significantly different from that for a small research or testing facility or for a materials license. Generally, for a power reactor, state utility commissions regulate retail rates and the Federal Energy Regulatory Commission regulates wholesale rates, permitting utilities to

recover the cost of providing electricity from their customers. The decommissioning costs are higher than for small facilities, and the licensees are required by 50 CFR 10.54(w) to carry substantial levels of insurance for post-accident decontamination and cleanup. This is significantly different than the situation for a small non-fuel-cycle facility which is not rate regulated and has low decommissioning costs.

In analyzing funding methods, the NRC has developed the following major classification of funding alternatives.

(1) Prepayment - The deposit prior to the start of operation into an account segregated from licensee assets and outside the licensee's administrative control of cash or liquid assets such that the amount of funds would be sufficient to pay decommissioning costs. Prepayment could be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities.

(2) Surety bonds, letters of credit, lines of credit, insurance, or other guarantee methods - These mechanisms guarantee that the decommissioning costs will be paid should the licensee default. The licensee still must provide funding for decommissioning through some other method. It appears questionable that surety methods of the size necessary and for the time involved with power reactors will be available. However, they appear to be available for facilities that involve smaller costs and periods. The contractual arrangement guaranteeing the surety methods, insurance, or guarantee must include provisions for insuring that these methods will in fact result in funds being available for decommissioning. It should be kept in mind that sureties would only be called if at the time of cessation of facility operation or impending discontinuance of surety by the guarantor, licensee decommissioning funds were inadequate or unavailable.

(3) External sinking funds - A fund established and maintained by setting funds aside periodically in an account segregated from licensee assets and outside the licensee's administrative control in which the total amount of funds would be sufficient to pay decommissioning costs at the time termination of operation is expected. An external sinking fund could be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities. The weakness of the sinking fund approach is that in the event of premature closure of a facility the decommissioning fund would be insufficient. Therefore, the sinking fund would have to be supplemented by insurance or surety bonds, or letters or lines of credit or other guarantee methods of item (2).

(4) Internal reserve or unsegregated sinking fund - A fund established and maintained by the periodic deposit or crediting of a prescribed amount into an account or reserve which is not segregated from licensee assets and is within the licensee's administrative control in which the total amount of the periodic deposits or funds reserved plus accumulated earnings would be sufficient to pay for decommissioning at the time termination of operation is expected. In this mechanism, the funds are not segregated from the utility's assets, rather they may be invested in utility assets and, at the end of facility life, internal funds are used to pay for decommissioning by, for example, issuance of bonds against licensee assets and the funds raised are used to pay for decommissioning. An internal reserve may also

be in the form of an internal sinking fund which is similar to an external sinking fund except that the fund is held and invested by the licensee. Such a mechanism is generally considered to be less expensive in terms of net present value than the options listed above, although, as discussed below, whichever funding mechanism is used should not have a significant impact on the revenue requirements. The problem with the internal or unsegregated funding method is the lesser level of assurance that funds will be available to pay for decommissioning than the other mechanisms because this method depends on financing internal to the licensee, and therefore, is vulnerable to events that undermine the financial solvency of a utility.

The NRC has considered the use of all of these methods, and in particular internal reserve, in several documents. These include NUREG-0584, Revs. 1-3, "Assuring the Availability of Funds for Decommissioning Nuclear Facilities,"[7] NUREG/CR-1481, "Financing Strategies for Nuclear Power Plant Decommissioning,"[8] and NUREG/CR-3899, "Utility Financial Stability and the Availability of Funds for Decommissioning"[9]. In addition, the Commission held a meeting soliciting public and industry views of decommissioning on September 18, 1984 and the NRC staff has reviewed comments in the area of financial assurance submitted on NUREG-0586, "Draft Generic Environmental Impact Statement on Decommissioning Nuclear Facilities" and submitted in response to the proposed rule on decommissioning (50 FR 5600)[10]

These reports and meetings and public comments considered several factors regarding availability of funds for public utilities in the United States. One factor is that utilities are large, very heavily capitalized enterprises whose rates are comprehensively regulated by the State Public Utility Commissions (PUC) and the Federal Energy Regulatory Commission (FERC). This factor permits the utilities to charge reasonable rates subject to reasonable regulation and rules. In addition, the Commission has taken action recently in the promulgation of 10 CFR 50.54(w) to set requirements to establish onsite property damage insurance for use after an accident. Although these insurance proceeds would not be used directly for decommissioning, they would reduce the risk of a utility being hit by a large demand for funds after an accident. Most utilities are now carrying insurance well in excess of $1 billion. Other factors considered are the long time period before decommissioning takes place during which time reasonable assurance of funds for decommissioning must be maintained, as well as concerns regarding utility solvency and potential problems regarding availability of funds which may occur as a result of bankruptcy.

Before publication of the proposed rule, the NRC evaluated the adequacy of various funding methods in light of financial problems encountered by some utilities which, faced with lower growth in electricity demand than they projected and rapidly increasing costs of construction, had been forced to cancel nuclear plants in advanced stages of construction and the ramifications these conditions, as well as issues related to bankruptcy, could have on a utility's ultimate ability to pay for decommissioning. Details of this evaluation are contained in NUREG/CR-3899, (Ref. 9) prepared by an NRC consultant, Dr. J. Siegel of the Wharton School, University of Pennsylvania.

Based on the results of NUREG/CR-3899 in which it is indicated that internal reserve can be a valid funding method and on the considerations discussed in the Supplementary Information to the Proposed Rule, the proposed decommissioning

rule permitted a range of options, including internal reserve, for providing assurance that sufficient funds are available for decommissioning. However, the Supplementary Information to the proposed rule noted that the regulatory approach for assuring funds for decommissioning had been particularly difficult to resolve and specifically requested additional information and comments in this area. In particular, the Supplementary Information stated that:

> "More specifically, Commissioners Asselstine and Bernthal continue to be concerned about the vulnerability of the internal funding mechanism for decommissioning funds, particularly where the funds are used to purchase assets or reduce existing debt."

Based on this concern, Commissioners Asselstine and Bernthal requested "public comments on the need to consider the possibility of insolvency and its impact on the continued availability of decommissioning funds."

Although commenters did not generally refer specifically to the separate request for comment by Commissioners Asselstine and Bernthal, a number of comments, noted above, were received in this area. Those who disagreed with the inclusion of internal reserve in the rule cited problems with liquidity of the internal reserve and with the future financial viability of utilities with resultant problems in providing decommissioning funds, and stated that the level of assurance is inadequate. In contrast, other commenters agreed with the use of internal reserve citing the fact that the likelihood of instability and insolvency is remote, that utilities have investments, cash flow, and annual earnings which are large in comparison to decommissioning cost, and that the internal reserve does provide reasonable assurance.

As part of the review of the comments, NRC has had NUREG/CR-3899 updated to consider the current situation in the utility industry. This analysis is contained in NUREG/CR-3899, Supplement 1, (Ref. 9) which reviewed six utilities which have been subject to severe financial distress. Based on the analysis, NUREG/CR-3899, Supp. 1 indicates that, since NUREG/CR-3899 was published in 1984, the financial health of the nuclear utilities has improved, with the exception of Public Service of New Hampshire (PSNH), and that from a financial standpoint, use of internal reserve currently provides sufficient assurance of funds for decommissioning. The basis for this conclusion is the fact that the likelihood of future crises developing, although not impossible, is extremely remote; that the total market value of the securities of each of the six utilities studied substantially exceeds its decommissioning costs; that it is not necessarily true that bankruptcy of a utility is tantamount to default on decommissioning obligations; and the potential that the costs of decommissioning would be recognized as a prior obligation with regard to creditors.

Despite these conclusions, Supplement 1 notes that PSNH has said that, unless it undergoes financial restructuring and gets the rate increase it is seeking, it probably would become the first major utility to seek protection under the Bankruptcy Act in nearly 50 years.* In addition, Supplement 1 notes that if PSNH's Seabrook plant becomes operational, the prospects for PSNH greatly improve although bankruptcy still cannot be precluded as a possibility due to

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*Subsequent to the preparation of the analysis of NUREG/CR-3899, Supplement 1, PSNH filed a petition in bankruptcy under Chapter 11 of the U.S. Bankruptcy code.

the potential for large rate hikes and resultant defections from its electric system. Hence Supplement 1 concludes that internal reserve should not be allowed for Seabrook until the financial prospects of the utility are clarified and the viability of the corporation insured.

In addition, Supplement 1 noted that it is imperative that, in the case of the sale or other disposition of utility assets, no monies are distributed to any security holders until a fund is established to assure payment for decommissioning. Supplement 1 also recommended changes in Federal and State bankruptcy laws relating to utilities and the inclusion in the prospectus of newly issued securities of an explicit statement of the utility's financial obligations to provide adequate funds for decommissioning. Further, Supp. 1, noted that because of changing economic and financial conditions, the NRC should conduct periodic reviews of the overall financial health of utilities with ongoing and prospective nuclear facilities. If such a review indicates the financial condition of utilities taken as a whole or individually is such that internal reserve does not provide reasonable assurance of funds for decommissioning, then additional rulemaking or other steps should be taken to insure availability of these funds.

The Commission has considered the conclusions in NUREG/CR-3899, Supplement 1, as well as the public comments received on the issue. The Commission's review in this area is confined to its statutory mandate to protect the radiological health and safety of the public and promote the common defense and security which stems principally from the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended. In carrying out its licensing and related regulatory responsibilities under these acts, the NRC has determined that there is a significant radiation hazard associated with nondecommissioned nuclear reactors. The NRC has also determined that the public health and safety can best be protected if its regulations require licensees to use methods which provide reasonable assurance that, at the time of termination of operations, adequate funds are available so that decommissioning can be carried out in a safe and timely manner and that lack of funds does not result in delays that may cause potential health and safety problems. Although the Atomic Energy Act and the Energy Reorganization Act do not permit the NRC to regulate rates or to supersede the decisions of State or Federal agencies respecting the economics of nuclear power, they do authorize the NRC to take whatever regulatory actions may be necessary to protect the public health and safety, including the promulgation of rules prescribing allowable funding methods for meeting decommissioning costs. (See Pacific Gas & Electric v. State Energy Resources Conservation & Development Commission, 461 U.S. 190, 212-13, 217-19 (1983); see also United Nuclear Corporation v. Cannon, 553 F. Supp. 1220, 1230-32 (D.R.I. 1982) and cases cited therein.)

For the foregoing reasons, the Commission continues to be concerned with the use of an internal reserve. The Commission notes the concerns expressed in NUREG/CR-3899, Supp. 1 regarding bankruptcy at PSNH as well as the changing economic and financial conditions discussed in NUREG/CR-3899, Supp. 1. The Commission also notes that many utilities are engaging in diversified financial activities which involve more financial risk and believes therefore it is increasingly important to provide that decommissioning funds be provided on a more assured basis.

In addition, to the extent that a utility is having severe financial difficulties at the time of decommissioning, it may have difficulty in funding an

internal reserve when needed for decommissioning. The Commission recognizes that the market value of the stock of those utilities studied in NUREG/CR-3899 has exceeded decommissioning cost. However, although the law in this area is not fully developed, in the event of bankruptcy there is not reasonable assurance that either unsegregated or segregated internal reserves can be effectively protected from claims of creditors and therefore internal reserves cannot be made legally secure. In addition, because of the nature of the internal reserve, the funds collected are not isolated for use for decommissioning. Instead the utility may use the funds for other unrelated purposes.

For the above reasons, the Commission concludes that the internal reserve does not provide reasonable assurance that funds will be available when needed to pay the costs of decommissioning and hence does not provide reasonable assurance that decommissioning will be carried out in a manner which protects public health and safety. Accordingly, the proposed rule has been modified to eliminate the internal reserve as a possible method of providing funds for decommissioning.

In reaching its conclusion not to permit use of internal reserve for decommissioning, the Commission believes it important not to impose inordinate financial burdens on licensees. The modification to the proposed rule is not expected to impose such a burden for several reasons. First, licensees have 2 years from the effective date of the final rule before they have to submit information regarding financial assurance. Second, the external reserve is a sinking fund accumulated over a period of time. Third, a number of states (accounting for almost 50% of power reactors) already require external funding methods. Fourth, recent changes in the tax laws allowing current deductions for external reserves may reduce the cost differential between internal reserve and external reserve.

In summary, NRC has considered the analysis of NUREG/CR-3899, Supp. 1, as well as the documents discussed above. NRC has also considered pertinent factors affecting funding of decommissioning by electric utilities such as the fact that they are regulated entities providing a basic necessity of modern life, their long history of stability, and the situation which may occur in an actual bankruptcy, and the requirements that utilities maintain over one billion dollars of property insurance which reduces one of the major threats to utility solvency. Based on these considerations, it is the Commission's conclusion that the internal reserve method currently allowed by the proposed rule does not provide a reasonable level of assurance of the availability of funds and that even in the unlikely event of utility bankruptcy, there is not reasonable assurance that a reactor will not become a risk to public health and safety.

Whatever funding mechanism is used, its use requires establishing the cost required for decommissioning a facility. This cost should be included as part of financial provisions submitted by an applicant prior to facility commissioning. To minimize administrative effort while still maintaining reasonable assurance of funding, for certain facilities the financial provisions may be based on setting aside an amount which is at least equal to amounts prescribed in the NRC regulations. These amounts vary for the different facilities covered by the regulations.

As information on decommissioning costs become more definitive in time, due to technology improvements, enhanced decommissioning experience, and inflation/deflation cost factors, a licensee's funding provisions should be updated. In this way, it is expected that the decommissioning fund available at the time of

facility shutdown will not differ significantly from actual costs of decommissioning.

It is difficult to accurately estimate what the projected costs for the various funding mechanisms will be at the time of decommissioning. Based on Battelle cost analyses[3,11] presented in this EIS, for the generic PWR and BWR 1175 MWe reactors, decommissioning costs have been estimated at approximately $105 and $135 million respectively. These estimates do not include the costs of demolition of nonradioactive systems or structures beyond that necessary to terminate the NRC license or the cost of site restoration. This results in a cost of a few tenths of a mill (0.1 cent) per kilowatt-hour when averaged over the expected 30-year reactor operating life. The $105 million cost, while not insignificant, is only a small amount compared to PWR operating capital, perhaps comparable to the cost of a full core reload. Furthermore, whichever funding mechanism used should not have a significant impact on the cost to consumers. One study[8] has estimated that the difference in cost between the various funding mechanisms would result in less than a 1% difference in the total bill of a representative utility customer.

In summary, the NRC objective of protecting the public health and safety requires that there be reasonable assurance of funds for decommissioning. There should not be any significant financial burden on the applicant in providing a funding mechanism for decommissioning costs either through prepayment, surety bonds, a sinking fund, insurance, or some combination thereof.

2.7 Management of Radioactive Wastes and Interim Storage

During the decommissioning of a nuclear facility radioactive waste which was generated during the facility operating lifetime must be disposed of at waste disposal sites. These wastes include equipment and structures made radioactive both by neutron activation and by radioactive contaminants, include radioactive wastes resulting from chemical decontamination of the facility, and include miscellaneous cleaning equipment.

Disposal of these wastes is covered by existing NRC and other applied Federal and State regulations and is beyond the scope of the rulemaking action supported by the EIS. Disposal of spent fuel will be via geologic repository pursuant to requirements set forth in NRC's regulation 10 CFR Part 60. Disposal of low-level wastes is covered under NRC's regulation 10 CFR Part 61. Because low-level wastes cover a wide range in radionuclide types and activities, 10 CFR Part 61 includes a waste classification system that establishes three classes of waste generally suitable for near-surface disposal: Class A, Class B, and Class C. This classification system provides for successively stricter disposal requirements so that the potential risks from disposal of each class of waste are essentially equivalent to one another. In particular, the classification system limits to safe levels the concentrations of both short- and long-lived radionuclides of concern to low-level waste disposal. The radionuclides considered in the waste classification system of 10 CFR Part 61 include long-lived activation products such as Ni-59 or Nb-94, as well as "intense emitters" such as Co-60.

Wastes exceeding Class C limits are considered to be not generally suitable for near-surface disposal, and those small quantities currently being generated are being safely stored pending development of disposal capacity. The recently

enacted Low-Level Radioactive Waste Policy Amendments Act of 1985 (Pub. L. 99-240, approved January 15, 1986, 99 Stat. 1842) provides that disposal of wastes exceeding Class C concentrations is the responsibility of the Federal government. The Act also requires a report by DOE to Congress with recommendations for safe disposal of these wastes. DOE published this report, "Recommendations for Management of Greater than Class C Low-Level Radioactive Waste," DOE/NE-0077, in February 1987.

As far as decommissioning wastes are concerned, technical studies coupled with practical experience from decommissioning of small reactor units indicate that wastes from future decommissionings of large power reactors will have very similar physical and radiological characteristics to those currently being generated from reactor operations. Two of the studies performed by NRC include NUREG/CR-0130, Addendum 3,[3] and NUREG/CR-0672, Addendum 2,[11] which specifically address classification of wastes from decommissioning large pressurized water reactor (PWR) and large boiling water reactor (BWR) nuclear power stations.

These studies indicate that the classification of low-level decommissioning wastes from power reactors will be roughly as shown in Table 2.7-1.

Table 2.7-1 Classification of low-level decommissioning wastes from power reactors

Waste Class	PWR (Vol. %)	BWR (Vol. %)
A	98.0	97.5
B	1.2	2.0
C	0.1	0.3
Above C	0.7	0.2

As shown, the great majority of the waste volume from decommissioning will be classified as Class A waste. Only a small fraction of the wastes will exceed Class C limits.

Transportation of decommissioning wastes will involve no additional technical considerations beyond those for transportation of existing radioactive material. Existing regulations covering transportation of radioactive material are covered under NRC regulations in 10 CFR Parts 20, 71, and 73, and Department of Transportation regulations in 49 CFR Parts 170-189.

An operating 1000 MWe reactor will generate approximately 25.4 MTHM (metric tons of heavy metal) (9.4 m^3) of spent fuel each year and 1300 m^3 of low-level waste each year. When multiplied over the 40-year operating lifetime of the plant, these values can be compared to the 11 m^3 of activated material (greater than Class C) and 17,900 m^3 of low-level waste resulting from DECON of a PWR of similar size (see Section 4.4), and it can be seen that decommissioning will generate an appreciable fraction of the low-level waste generated by a PWR over its lifetime. However, in any given year, the quantity of waste from all operating reactors will considerably exceed that generated from those facilities being decommissioned. The low-level wastes generated in 1980 from commercial nuclear fuel cycle activities totaled 81,000 m^3 and low-level wastes from commercial non-fuel-cycle activities totaled 28,000 m^3. Hence, any problems in waste disposal capacity will be the result primarily of operating nuclear

facility waste inputs rather than decommissioning waste inputs. The following is a discussion of the current situation in this area.

Disposal capacity for Class A, Class B, and Class C wastes currently exists. Development of new disposal capacity under the State compacting process is covered under the Low-Level Radioactive Waste Policy Amendments Act referenced above. This Act provides for incentives for development of such capacity, as well as penalties for failure to develop such capacity. For wastes exceeding Class C concentrations, DOE has offered to accept such waste for storage pending development of disposal criteria and capacity. For spent fuel which as noted in Section 2.4 could impact the decommissioning schedule, a detailed schedule for development of monitored retrievable storage and geologic disposal capacity is provided in the Nuclear Waste Policy Act of 1982.

Hence, based on the above discussion, before decommissioning of a nuclear facility occurs, licensees should assess current waste disposal conditions and their potential impact on decommissioning. Although the DECON decommissioning alternative assumes availability of capacity to dispose of waste, alternative methods of decommissioning are available (e.g., SAFSTOR) including delay in completion of decommissioning during which time there can be temporary storage of wastes. Delay in decommissioning can result in a reduction of occupational dose and waste volume due to radioactive decay.

2.8 Safeguards

Just prior to decommissioning, the same safeguards measures may be required that are required while the facility is operating. During the actual decommissioning, levels of special nuclear material in the facility should be decreased as a result of cleanout of the facility. In the case of DECON, decreased levels of safeguards measures should be continued until the quantity of special nuclear material is reduced below safeguards levels, at which time safeguards measures can be discontinued. Regulations defining required procedures and safeguard levels are found in 10 CFR Part 70 Special Nuclear Materials and 10 CFR Part 73 Physical Protection of Plant and Materials. In the case of SAFSTOR, depending on the quantity of special nuclear material as compared to the safeguards levels, continuous manned security may be required or may be replaced by continuous remote monitoring of intrusion, fire, and radiation alarms during the continuing care period. Immediate response is, of course, required in case any alarm is activated. Engineered barriers, such as fences and high-security locks, are maintained and inspected regularly. Deferred decontamination requires similar safeguards provisions as are required during DECON depending on the quantity of special nuclear material remaining at that time. The long-term care period of ENTOMB requires remote monitoring of intrusion, fire, and radiation alarms and engineered barriers if special nuclear material quantities are above safeguard levels.

REFERENCES*

1. C. F. Holoway and Others, Monitoring for Compliance with Decommissioning Termination Survey Criteria, NUREG/CR-2082, Oak Ridge National Laboratory for U.S. Nuclear Regulatory Commission, June 1981.

2. J. P. Witherspoon, Technology and Cost of Termination Surveys Associated with Decommissioning of Nuclear Facilities, NUREG/CR-2241, Prepared by Oak Ridge National Laboratory for U.S. Nuclear Regulatory Commission, February 1982.

3. R. I. Smith, G. J. Konzek, and W. E. Kennedy, Jr., Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Station, NUREG/CR-0130, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, June 1978, Addendum 1, August 1979, Addendum 2, July 1983, and Addendum 3, September 1984.

4. K. J. Schneider and C. E. Jenkins, Technology, Safety and Costs of Decommissioning a Reference Nuclear Fuel Reprocessing Plant, NUREG-0278, Vols 1 and 2, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, October 1977.

5. Termination of Operating Licenses for Nuclear Reactors, U.S. Nuclear Regulatory Commission, Regulatory Guide 1.86, June 1974.

6. E. S. Murphy, Technology, Safety and Costs of Decommissioning Reference Non-Fuel-Cycle Nuclear Facilities, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, NUREG/CR-1754, February 1981.

7. Robert S. Wood, Assuring the Availability of Funds for Decommissioning Nuclear Facilities, Draft Report, NUREG-0584, Revision 2, U.S. Nuclear Regulatory Commission, October 1980.

8. Financing Strategies for Nuclear Power Plant Decommissioning, NUREG/CR-1481, Prepared by Now England Conference of Public Utilities Commissioners, Inc., in conjunction with Temple, Barker and Sloane, Inc. for U.S. Nuclear Regulatory Commission, July 1980.

9. J. J. Siegel, Utility Financial Stability and the Availability of Funds for Decommissioning, NUREG/CR-3899, September 1984, and Supplement 1, June 1988, Prepared by Engineering and Economics Research, Inc., for the U.S. Nuclear Regulatory Commission.

10. 50 FR 5600, February 11, 1985.

11. H. D. Oak, et al., Technology, Safety, and Costs of Decommissioning a Reference Boiling Water Reactor Power Station, NUREG/CR-0672, Prepared by Pacific Northwest Laboratory for the U.S. Nuclear Regulatory Commission, June 1980, Addendum 1, July 1983, and Addendum 2, September 1984.

*See footnote to reference in Chapter 1 for document purchasing availability.

4 PRESSURIZED WATER REACTOR

A pressurized water reactor (PWR) is a facility for converting the thermal energy of a nuclear reaction into steam to drive a turbine-generator and produce electricity. The conversion is accomplished by heating water to a high temperature and pressure in the reactor pressure vessel, using the pressurized hot water to produce steam in the steam generator, and driving the turbine-generator with the steam.

The generic site for the reference 1175-MWe PWR is described in Section 3.1. The specific site for a reactor is chosen on the basis of operational and regulatory criteria, some of which are appropriate to decommissioning as well as to reactor construction and operation. For example, transportation access, water supply, and a skilled labor supply are required for construction and operation, and are also necessary for decommissioning. Usually, however, the most suitable decommissioning alternative will not depend upon the generic site description or upon specific siting considerations. Rather it will depend on such factors as desirability of terminating the license, land use considerations at the time of decommissioning, occupational radiation exposures, and costs. The choice of decommissioning alternative may also depend upon whether or not the facility must be decommissioned before normal retirement age because of premature closure. In any event, the particular alternative chosen will depend almost entirely upon circumstances at the time of decommissioning, rather than upon earlier siting considerations.

Much of what follows is based on the NRC-sponsored Pacific Northwest Laboratory (PNL) studies on the technology, safety and cost of decommissioning a PWR.([1,2]) In the parent study,[1] PNL selected the Portland General Electric Company's 1175-MWe Trojan Nuclear Plant at Rainier, Oregon, as the reference PWR and assumed it to be located on a generic site typical of reactor locations. PNL then developed and reported information on the available technology, safety considerations, and probable costs for decommissioning the reference facility at the end of its operating life. Also, as part of an addendum[2] to this study, PNL did a sensitivity analysis to determine the effect that varying certain parameters might have on the conclusions in the original study regarding doses and costs of decommissioning. The parameters that were varied in the addendum included reactor size, degree of radioactive contamination, decommissioning alternatives, etc. The incremental costs of utilizing an external contractor for decommissioning and of additional staff needed to assure that the decommissioning staff do not exceed radiation dose limits have been evaluated in a related follow-on analysis.[3] In another related follow-on study,[4] the estimated decommissioning cost and dose impacts of post-TMI backfit requirements on the reference PWR have been examined and assessed. The results of all of these recent studies are included in the estimated decommissioning cost and dose estimates presented in this chapter for the reference PWR.

4.1 PWR Description

The major components of a PWR are a reactor core and pressure vessel, steam generators, steam turbines, an electric generator, and a steam condenser system

(Figure 4.1-1). Water is heated to a high temperature under-pressure inside the reactor and is then pumped in the primary circulation loop to the steam generator. Within the steam generator, water in the secondary circulation loop is converted to steam that drives the turbines. The turbines turn the generator to produce electricity. The steam leaving the turbines is condensed by water in the tertiary loop and returned to the steam generator. The tertiary loop water then flows to cooling towers where it is, in turn, cooled by evaporation. The tertiary loop is open to the atmosphere, but the primary and secondary cooling loops are not.

Buildings or structures associated with the reference PWR include (1) the heavily reinforced concrete containment building, which houses the pressure vessel, the steam generators, and the pressurizer system, (2) the turbine building, which contains the turbines and the generator, (3) the cooling towers, (4) the fuel building, which contains fresh and spent fuel handling facilities, the spent fuel storage pool and its cooling system, and the solid radioactive waste system, (5) the auxiliary building, which contains the liquid radioactive waste treatment systems, the filter and ion exchanger vaults, the gaseous radioactive waste treatment system, and the ventilation systems for the containment, fuel, and auxiliary buildings, (6) the control building, which houses the reactor control room and personnel facilities, (7) water intake structures, (8) the administration building, and (9) perhaps other structures such as warehouses and nonradioactive shops.

In a PWR, the reactor core and its pressure vessel are highly radioactive. So are the steam generators and the piping between the reactor and steam generators. Because the turbines are not directly connected to the primary loop, they are usually not radioactive unless there has been tube leakage in the steam generators. The cooling towers and associated piping are normally not radioactive. Much equipment in the auxiliary building is radioactive, as is the spent fuel storage pool and its associated equipment.

The major radiation problems in decommissioning are associated with the reactor itself, the primary loop, the steam generators, the radioactive waste handling systems, and the concrete biological shield that surrounds the pressure vessel.

4.2 Reactor Decommissioning Experience

At the present time, the Elk River, Minnesota, demonstration reactor is the only power reactor that has been completely dismantled. This was a 58.2-MWt BWR that was dismantled between 1971 and 1974. Though this reactor was quite small compared to present day commercial power reactors, one lesson stands out: reactors can be decontaminated with reasonable occupational radiation exposure and with virtually no public radiation exposure. At Elk River the containment building was kept intact until the pressure vessel and the biological shield were removed. Only after all of the radioactive metal components and concrete areas were removed, was the concrete containment building demolished. Of particular interest was the development of a remotely operated plasma arc torch that was used for cutting 1½-inch-thick stainless steel under water and 3½-inch-thick carbon steel in air.[5] For large reactors, 1,000-MWe, the cutting of $2^3/_4$-inch-thick stainless steel under water and 9-inch-thick carbon steel in air will be required.[6] Based on current technology, this should easily be accomplished.[7,8]

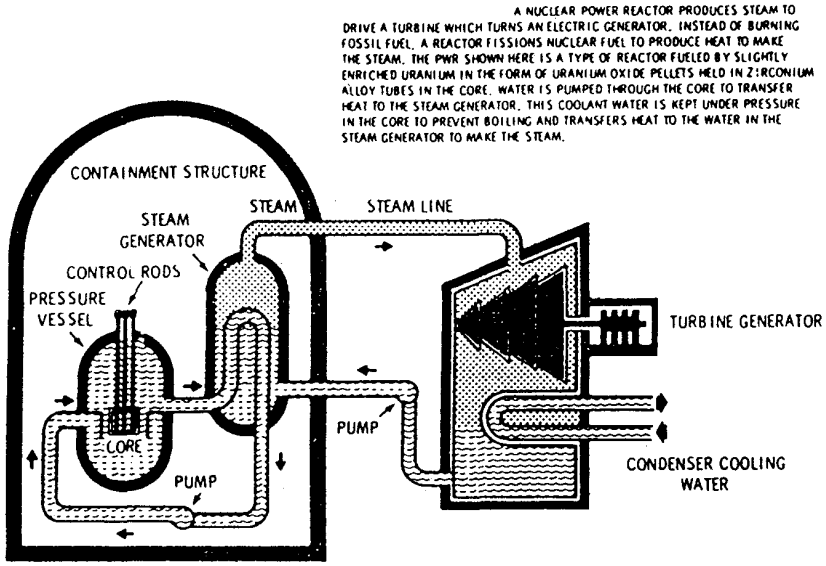

Figure 4.1-1 Pressurized water reactor

Other power reactors, all of them relatively small, have been placed in safe storage or entombed (see Table 1.5-1). These methods of decommissioning require some sort of surveillance as mentioned in Section 2.3, and also require retention of a possession-only license. In the case of the Elk River reactor, its licenses were terminated.

4.3 Decommissioning Alternatives

The decommissioning alternatives considered in this section are DECON, SAFSTOR, and ENTOMB.

4.3.1 DECON

DECON is defined as the immediate removal and disposal of all radioactivity in excess of levels which would permit release of the facility for unrestricted use. Nonradioactive equipment and structures need not be torn down or removed as part of a DECON procedure. The end result is the release of the site and any remaining structures for unrestricted use as early as the 6 years estimated for decommissioning after the end of reactor operation.

DECON is advantageous because it allows termination of the NRC license shortly after cessation of facility operations and eliminates a radioactive site. DECON is advantageous if the site is required for other purposes, if the site is extremely valuable, or, if for some reason the site must be immediately released for unrestricted use. It is also advantageous in that the reactor operating staff is available to assist with decommissioning and that continued surveillance and maintenance is not required. A disadvantage is the higher occupational radiation dose which occurs during DECON compared to the other alternatives.

The basic estimates in the original PNL studies have been adjusted by PNL analysts to reflect January 1986 costs. The revised estimate for the reference PWR shows that DECON would require 6 years to complete, including 2 years of planning prior to reactor shutdown, and would cost $88.7 million in 1986 dollars (Table 4.3-1). In addition to the values escalated from the PNL reports (NUREG/CR-0130 and NUREG/CR-0130, Addendum 1), the table also includes the cost additions--for pre-decommissioning engineering, additional staff to assure meeting the 5 rem/year dose limit for personnel, extra supplies for the additional staff, and the additional costs associated with the option of utilizing an external contractor to conduct the decommissioning effort--which were developed in the PNL cost update done for the Electric Power Research Institute.[3] The estimated decommissioning cost impacts of post-TMI-2 requirements on the reference PWR[4] are included in the table as well. It can be seen from the table that the total cost of DECON is about $103.5 million under the utility-plus-contractor option. For comparison purposes, the time required to plan and build a large power reactor is presently about 12 years and the cost is well over two billion dollars.

Three important radiation exposure pathways need to be considered in the evaluation of the radiation safety of normal reactor decommissioning operations: inhalation, ingestion, and external exposure to radioactive materials. For decommissioning workers, external exposure to radioactive materials is the dominant exposure pathway during decommissioning since inhalation and ingestion can be minimized or eliminated as pathways by protective techniques, clothing and breathing apparatus. Inhalation is considered to be the dominant pathway of

Table 4.3-1 Summary of estimated costs for decommissioning the reference PWR in $ Millions [a,b]

Decommissioning Element	DECON[c]	Prep. for Safe Storage[d]	SAFSTOR[e] 10 Years	SAFSTOR[e] 30 Years	SAFSTOR[e] 100 Years	ENTOMB[f] Internals Included (g)	ENTOMB[f] Internals Removed	100 years of Surveillance (h)
Base Case Estimated Decommissioning Costs:								
(1978 dollars)	(31.0)	(9.5)	(39.2)	(40.8)	(39.9)	(21.0)	(24.7)	(3.9)
1986 dollars	73.5					38.2	46.6	6.4
Safe Storage Preparation[d]	NA[1]	17.1	21.8	21.8	21.8	NA	NA	
Continuing Care	NA	NA	1.1[d]	3.7[d]	12.6[d]	(h)	(h)	
Deferred Decontamination[d]	NA	NA	69.4	69.4	40.4	NA	NA	
Possible Additional Costs[j]								
• Additional Staff Needed to Reduce Average Annual Radiation Dose to: 5 rem per year	7.5	1.1				3.1	3.9	
• Use of External Decommissioning Contractor[j]	12.9	4.6				10.5	11.4	
• Pre-Decommissioning Engineering: Internal (utility)[j]	5.6	3.4	4.5	4.5	4.5	5.6	5.6	
or External (contractor)	7.4	4.5				7.4	7.5	
• Supplies for Extra Staff (5 rem/yr average dose)[j]	1.2	0.1				0.6	0.7	
• NRC Licensing Activities[j]	>0.1	~0.1	~0.1[k]	~0.3[k]	~1.0[k]	~0.1	>0.1	~1.0
• Post-TMI-2 Impacts: Internal (utility)[l]	~0.8	negligible[n]	~0.8	~0.8	negligible	~0.3	~0.3	~0.3
or								

Table 4.3-1 (Continued)

Decommissioning Element	DECON[c]	Prep. for Safe Storage[d]	SAFSTOR[e] 10 Years	SAFSTOR[e] 30 Years	SAFSTOR[e] 100 Years	ENTOMB[f] Internals Included (g)	ENTOMB[f] Internals Removed	100 years of Surveillance (h)
External (contractor)[m]	~0.9	negligible				~0.3	~0.3	
Subtotal (<5 rem/yr):								
Utility (Internal) Staffing	88.7	21.8	97.7	100.5	80.3	47.9	57.2	7.4
or								
Contractor (external) Staffing	103.5	27.5				60.2	70.5	7.4
TOTAL Estimated Cost:								
Utility Staffing	88.7		97.7	100.5	80.3			64.6
or								
Contractor Staffing	103.5							77.9

(a) Values include a 25% contingency and are in constant 1986 dollars.

(b) Values exclude cost of disposal of last core, exclude cost of demolition of nonradioactive structures, and exclude cost of deep geologic disposal of dismantled, highly activated components.

(c) Adapted from Reference 1, Table 10.1-1 and Table H.5-2, unless otherwise indicated.

(d) Adapted from Reference 1, Table 2.9-3 and Table H.5-2, unless otherwise indicated.

(e) The values shown for SAFSTOR include the costs of the preparations for safe storage, continuing care, and deferred decontamination.

(f) Adapted from Reference 2, 4.5-1, unless otherwise indicated.

(g) Dose not include the eventual costs associated with the removal, packaging, and disposal of the entombed radioactive materials, the demolition of the entombment structure, or demolition of the Reactor Building.

(h) The annual cost of surveillance and maintenance for the entombed structure is estimated to be about $0.064 million.

(i) NA-not applicable.

(j) Adapted from Reference 3, Table 1.1, unless otherwise indicated.

(k) The values shown include the estimated costs of NRC licensing activities as well as the costs associated with inspections anticipated to be required by other Federal and state agencies.

(l) Adapted from Reference 4, Table 2.5-4.

(m) Adapted from Reference 4, Table 2.5-4 and from Reference 2, Section 6.3.

(n) Negligible means less than $0.025 million.

public radiation exposure, since exposure to radioactive surfaces and ingestion can be minimized or eliminated as radiation pathways to the public during decommissioning. During the transport of radioactive wastes, inhalation and ingestion can be minimized or eliminated as radiation pathways to workers and to the public by techniques similar to those used during decommissioning. Therefore, exposure to radioactive materials is considered to be the dominant mode of radiation exposure to the public and to workers during waste transport. PNL calculated radiation doses for only the dominant pathways, and assumed the radiation doses from other pathways to be essentially zero. A summary of these doses is presented in Table 4.3-2.

The aggregate occupational radiation dose from external exposure to surface contamination and activated material, not including transportation of radioactive waste, is estimated to be about 1115 man-rem over 4 years (Table 4.3-2) or an average of about 279 man-rem per year. The aggregate occupational radiation dose from the transportation of radioactive wastes is estimated to be about 100.2 man-rem to truck transportation workers from DECON waste shipments. For comparison purposes, the average aggregate annual occupational radiation dose from operation, maintenance, and refueling of PWRs from 1974 through 1978 was 550 man-rem per reactor.[9] In 1979 it was 924 man-rems,[10] and in 1980 it was 1,101 man-rems.

This increase is considered to be due to build-up of radioactive contaminants with increasing reactor age[11] and to increasing reactor size[12] and special man-rem intensive maintenance tasks.

The inhalation radiation dose to the public from airborne radionuclide releases during DECON is estimated to be negligible. The radiation dose to the public is calculated to be about 20.6 man-rem from the truck transport of radioactive wastes from DECON.

4.3.2 SAFSTOR

Generally, the purpose of SAFSTOR is to permit ^{60}Co to decay to levels that will reduce occupational radiation exposure during decontamination. As indicated in Table 4.3-2, most of the occupational dose reduction due to decay occurs during the first 30 years after shutdown with considerably less dose reduction thereafter. The public dose, which will always be small, will also experience most of its reduction during the first 30 years. Nonradioactive equipment and structures need not be removed, but eventually all radioactivity in excess of that allowed for unrestricted use of the facility must be removed. Hence, in contrast to DECON, to take advantage of the dose reduction, SAFSTOR could be as long as 60 years including final decontamination. The end result is the same: release of the site and any remaining structures for unrestricted use.

SAFSTOR is advantageous in that it results in reduced occupational radiation exposure in situations where urgent land use considerations do not exist. Disadvantages are that the licensee is required to maintain a possession-only license under 10 CFR Part 50 and to meet its requirements at all times, thus contributing to the number of sites dedicated to radioactive confinement for an extended time period. Other disadvantages are that surveillance is required, the dollar costs are higher than for DECON, and the experienced operating staff may not be available at the end of the safe storage period to assist in the decontamination.

Table 4.3-2 Summary of radiation dose analyses for decommissioning the reference PWR (values are in man-rem)[a,b]

	DECON	SAFSTOR			ENTOMB	
		10 Years	30 Years	100 Years	Internals Included	Internals Removed
Occupational Exposure						
Safe Storage Preparation[c]	NA[j]	282.4[k]	282.4[k]	282.4[k]	NA	NA
Continuing Care[d]	NA	10	14	14	neg.	neg.
Decontamination[e,f]	1,114.5[k]	337.5[k]	24.6[k]	1	NA	NA
Entombment[g]	NA	NA	NA	NA	900	1,000
Safe Stor. Prep. Truck Shipments[h]	NA	10.2	10.2	10.2	NA	NA
Decontamination Truck Shipments[h]	100.2[k]	24.2	1.7	neg.	NA	NA
Entombment Truck Shipments[g]	NA	NA	NA	NA	16	21
Total	1,215[k]	664[k]	333[k]	308[k]	916	1,021
Public Exposure						
Safe Storage Preparation[i]	NA	neg.	neg.	neg.	NA	NA
Continuing Care[i]	NA	neg.	neg.	neg.	neg.	neg.
Decontamination[i]	neg.	neg.	neg.	neg.	NA	NA
Entombment[g]	NA	NA	NA	NA	neg.	neg.
Safe Stor. Prep. Truck Shipments[h]	NA	2.1	2.1	2.1	NA	NA
Decontamination Truck Shipments[h]	20.6[k]	5[k]	0.4	neg.	NA	NA
Entombment Truck Shipments[g]	NA	NA	NA	NA	4	4
Total	21[k]	7[k]	3	2	4	4

Table 4.3-2 (Continued)

[a] All references are from Reference 1, unless otherwise indicated.

[b] Values exclude radiation dose from disposal of the last core.

[c] Table 11.3-2.

[d] Table 11.3-4.

[e] Table 11.3-1.

[f] Table H.6-1.

[g] Tables 3.5-1 and 4.6-1 from Reference 2, with no allowances for radioactive decay (see text for discussion).

[h] Table 11.4-2, with allowances for radioactive decay.

[i] Table 11.2.2.

[j] NA-not applicable.

[k] Values affected by the estimated additional radiation doses due to post-TMI-2 impacts on decommissioning operations. For a detailed explanation of the minor contributions from post-TMI-2 impacts to the total estimates given, consult Table 2.4-1 of Reference 4.

The PNL study shows that the costs of SAFSTOR for a 30-year period are greater than those of DECON and vary with the number of years of safe storage. For example, the total cost of 30-year SAFSTOR is estimated to be $100.5 million in 1986 dollars compared with the total cost of $82.7 million for DECON. However, the total cost of 100-year SAFSTOR is estimated to $80.3 million in 1986 dollars. The lower cost for 100-year SAFSTOR compared to 30-year SAFSTOR is the result of lower costs for deferred decontamination due to the radioactivity having decayed. PNL's cost estimates for the decommissioning alternatives are presented in Table 4.3-1.

SAFSTOR results in lower radiation doses to both the work force and to the public than DECON. The PNL study (Table 4.3-2) shows the aggregate occupational radiation dose to be approximately 321 man-rem for a 30-year SAFSTOR (282.4 man-rem from safe storage preparation, 14 man-rem for continuing care and surveillance, and 24.6 man-rem from deferred decontamination), not including transportation. The occupational radiation dose from the truck transport of radioactive wastes is calculated to be about 12 man-rem. 100-year SAFSTOR results in little additional reduction in the aggregate occupational radiation dose compared to 30-year SAFSTOR.

Radiation doses to the public from airborne radionuclide releases during preparation for safe storage are estimated to be negligible. The radiation dose to the public from the truck transport of radioactive wastes during preparation for safe storage is estimated to be about 2.1 man-rem, and that from the truck transport of radioactive wastes during deferred decontamination after 30 years of safe storage is estimated to be about 0.4 man-rem.

4.3.3 ENTOMB

ENTOMB means the complete isolation of radioactivity from the environment by means of massive concrete and metal barriers until the radioactivity has decayed to levels which permit unrestricted release of the facility. These barriers must prevent the escape of radioactivity and prevent deliberate or inadvertent intrusion. The length of time the integrity of the entombing structure must be maintained depends on the inventory of radioactive nuclides present. A PWR that has been operated only a short time will contain ^{60}Co as the largest contributor to radiation dose and smaller amounts of dominant fission products such as ^{137}Cs with about 30-year half-life. In this case, the integrity of the entombing structure need only be maintained for a few hundred years, as the disappearance of radioactivity is initially controlled by the 5.27-year half-life of ^{60}Co and later by 30-year half-life fission products. If, on the other hand, the reactor has been operated for 30 or 40 years, substantial amounts of ^{59}Ni and ^{94}Nb (80,000-year and 20,000-year half-lives, respectively,) will have been accumulated as activation products in the reactor vessel internals. The dose rate from the ^{94}Nb present in the reactor vessel internals has been estimated to be approximately 2 rem/hour while the dose from the ^{59}Ni in the internals is 0.1 rem/hour. These dose levels are substantially above acceptable residual radioactivity levels and, because of the long half-lifes of ^{94}Nb and ^{59}Ni, would not decrease by an appreciable amount, due to radioactive decay, for thousands of years. In addition, there are an estimated 1,300 curies of ^{59}Ni in the reactor vessel internals which could result in potential internal exposures in the event of a breach of the entombed structure and subsequent introduction of the ^{59}Ni in an exposure pathway during the long half-life of ^{59}Ni. Thus, the long-lived isotopes will have to be removed or the integrity

of the entombing structure will have to be maintained for many thousands of years.

ENTOMB of a PWR is limited to the containment building because its unique structure lends itself to entombment and because it contains most of the radioactivity in the facility. The other radioactive buildings associated with a reactor must be decommissioned by another method such as DECON. It is possible, however, to move some radioactive components from the fuel building or auxiliary building to the containment building and entomb them there, rather than ship them offsite.

ENTOMB is advantageous because of reduced occupational and public exposure to radiation compared to DECON, because little surveillance is required, and because little land is required. It is disadvantageous because the integrity of the entombing structure must be assured in some cases for hundreds of thousands of years, because a possession-only license under 10 CFR Part 50 would be required, and because entombing contributes to the number of sites permanently dedicated to radioactive materials containment.

PNL considered two approaches to entombment in an addendum[2] to its earlier PWR study.[1] In both approaches, as much solid radioactive material from the entire facility as can be accommodated is sealed in the containment building beneath the operating floor by means of a continuous concrete slab. All openings to the exterior beneath the operating floor are sealed. Above the operating floor, radioactive materials are removed to sufficiently permit release of that portion of the facility for unrestricted use.

In the first approach, the pressure vessel internals and their long-lived ^{59}Ni and ^{94}Nb isotopes are entombed, along with other radioactive material. This results in less cost and radiation exposure because the pressure vessel and its internals will not have to be removed, dismantled, and transported to a deep geologic waste repository. It will also, however, result in the requirement for a possession-only license and surveillance in perpetuity because of the presence of the long-lived isotopes. Because of the many variables involved, PNL made no firm estimate of the costs for possible deferred dismantlement of the entombment structure. However, these costs are anticipated to be at least of the same order of magnitude as those for deferred dismantlement of the reference PWR after a period of safe storage (see Table 4.3-1).

In the second approach, the pressure vessel internals and their long-lived ^{59}Ni and ^{94}Nb isotopes are removed, dismantled, and transported to a radioactive waste repository (a careful inventory of radioactivity would need to be made to ensure that only relatively short-lived isotopes remained). This approach results in more cost and radiation dose, but offers the possibility that surveillance and the possession-only license could be terminated at some time within several hundred years, thereby releasing the entire facility for unrestricted use.

Radioactive materials not entombed would have to be packaged and transported to a disposal site. Costs and radiation doses for this portion of the entombment procedure would be the same as for DECON. Cost savings and radiation dose reductions result from a lesser volume of radioactive equipment and material having to be dismantled, packaged, and transported. In all cases, spent fuel would be removed.

ENTOMB for the reference PWR, including the pressure vessel and its internals, is estimated to cost $47.9 million, with an annual maintenance cost of $64,000. It results in an aggregate radiation dose of 900 man-rem to decommissioning workers, 16 man-rem to transportation workers, and 4 man-rem to the general public. ENTOMB for the reference PWR, with the pressure vessel internals removed, is estimated to cost $57.2 million with an annual maintenance cost of $64,000, and to result in an aggregate radiation dose of 1000 man-rem to decommissioning workers, 21 man-rem to transportation workers, and 4 man-rem to the general public. These estimates are listed in Tables 4.3-1 and 4.3-2.

Although task-wise schedules were developed for DECON,[1] no comparable schedules were developed for the ENTOMB analysis.[2] As a result, the estimated occupational exposures shown in Table 4.3-2 are not decay-corrected; thus, they represent conservative, upper-bound estimates.

4.3.4 Sensitivity Analyses

An addendum to the initial PNL study was developed[2] to analyze a variety of realistic decommissioning situations that might significantly impact on the original conclusions regarding doses and costs for the various decommissioning alternatives. While there were some differences in results, the conclusion of the sensitivity analysis is that these differences do not substantially affect the original cost and dose conclusions. Of the various situations analyzed by PNL in the addendum, the most important with regard to their potential effect on dose and cost estimates are reactor size and degree of contamination.

Based on an analysis[11] similar to that for the reference PWR (NUREG/CR-0130 Addendum 1) and incorporating selected cost adders (described in References 3 and 4 and escalated to constant 1986 dollars as shown in Table 4.3-1), upper-bound estimates were made of the costs for immediate dismantlement of reactor plants smaller than the reference plant. The analysis was limited to plants with thermal power ratings greater than 1200 MWt and was based on the assumption that all costs (staff labor, equipment, supplies, etc.) except radioactive waste disposal are independent of plant size. The results are shown in Table 4.3-3.

Table 4.3-3 Estimated immediate dismantlement costs for plants smaller than the reference PWR, based on previously-derived overall scaling factors[a,b] (millions of dollars)

Reactor	MWt.	Waste Disposal	Scaling Factor	Remaining Costs	Escalated Adders	Total Costs[c]
Trojan	3500	40.223	1.000	34.174	14.385	88.782
Turkey Pt.	2550	40.223	0.789	34.174	14.385	80.295
R. E. Ginna	1300	40.223	0.518	34.174	14.385	69.395

[a] All costs are in constant 1986 dollars and include a 25% contingency.

[b] Derivation of previously-derived overall scaling factors can be found in Reference 2.

[c] Total costs shown above are for the utility-only cost option.

Using the results from Table 4.3-3, a linear equation can be derived for the scaling of the immediate dismantlement costs for plants in the 1200 to 3500 MWt range:

$$\text{Cost} = 57.911 + (8.808 \times 10^{-3})(\text{MWt})$$

Revised overall scaling factors for the Turkey Point and Ginna plants were obtained by dividing the results of the linear equation by the cost of the reference plant. Based on this formula, a list of variations in dose and cost for these PWRs is presented in Table 4.3-4.

The addendum[2] also analyzed the sensitivity of decommissioning costs and radiation doses related to a postulated tripling of radiation dose rates from radionuclides deposited in PWR coolant system piping during reactor operation over a period of 30 to 40 years. This tripling of dose rate is postulated as an upper limit on the basis of recent trends for operating reactors. If no corrective action is taken to reduce the radiation dose rates, the accumulated radiation dose to decommissioning workers for DECON would be increased about 1,250 man-rem[(a)], and the total decommissioning costs could be increased by about $5.2 million for DECON. For ENTOMB the radiation dose would be nearly doubled and the total cost could be increased about $3.6 million. For preparations for safe storage, the radiation dose would be increased about 130 man-rem, and there would be no significant change in the cost. If corrective action is taken, such as an extended chemical decontamination cycle, the total additional cost could be about $170,000.

In order to handle these postulated higher initial radiation levels, it appears that additional chemical decontamination during decommissioning would be the most cost-effective approach. For example, it is estimated that increasing the circulation time of the chemical solution about 50% would reduce the postulated increased radiation levels by a factor of 3, thus reducing these levels to approximately the same dose rate conditions assumed in the reference case analysis. This approach would also be more consistent with the principles of ALARA, since the occupational radiation dose associated with a chemical decontamination cycle is relatively small, compared with the radiation dose associated with installing temporary shielding, or with attempting to perform the dismantlement without additional shielding. In addition, it appears likely that the large buildups of radionuclides prevalent today on piping systems will be prevented as periodic decontamination during normal operation of the reactor coolant system and related fluid-handling systems become standard procedures when the present technology development for decontamination solutions has been completed.

One of the circumstances that has changed since the original PWR decommissioning reports[1,2] were prepared which could influence the development of the cost and dose estimates presented in this GEIS is an assessment of post-TMI-2 requirements on the decommissioning of the reference PWR. Actions judged necessary by the NRC to correct or improve the regulation and operation of nuclear power plants based on the experience from the accident at TMI-2 resulted in a number of recommendations that were subsequently issued to the utilities as requirements. Some of those requirements resulted in equipment and hardware changes and/or additions to the reference PWR that could eventually expand the

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[(a)] This number excludes removal of last core and allows for radioactive decay.

Table 4.3-4 Estimated costs and occupational radiation doses for decommissioning different-sized PWR plants[a,b]

		Station		
		R. E. Ginna	Turkey Point	Trojan
Power Rating	(thermal			
Overall Scaling	megawatts)	1.300	2.550	3.500
Factor	(OSF[MWt])	0.781	0.905	1.000
DECON	($ millions)	69.3	80.3	88.7
	(man-rem)	1097.	1.271	1.404
ENTOMB[d]				
w/internals	($ millions)[d]	37.4	43.3	47.9
	(man-rem)	703	815	900
w/o internals	($ millions)	44.7	51.8	57.2
	(man-rem)	781	905	1.000
SAFSTOR				
Preparations for Safe Storage	($ millions)	17.0	19.7	21.8
	(man-rem)	333	386	426
Safe Storage				
for 30 years	($ millions)	3.7	3.7	3.7
	(man-rem)	14	14	14
for 50 years	($ millions)	6.2	6.2	6.2
	(man-rem)	14	14	14
for 100 years	($ millions)	12.6	12.6	12.6
	(man-rem)	14	14	14
Deferred Dismantlement:				
after 30 years	($ million)	54.2	62.8	69.4
	(man-rem)	23.4	27.2	30
after 50 years	($ million)	31.6	36.7	40.5
	(man-rem)	1.9	2.2	2.4
after 100 years	($ million)	31.6	36.6	40.4
	(man-rem)	0.9	1.1	1.2

[a] Values include a 25% contingency and are in 1986 dollars.

[b] Costs do not include spent-fuel disposal or demolition of nonradioactive structures.

[c] Doses are taken from Ref. 2 and do not include transportation doses and do not take credit for radioactive decay during decommissioning.

[d] Entombment costs do not include continuing care cost ($0.064 M/yr.).

scope of decommissioning activities, since those materials could reasonably be expected to become contaminated or radioactive during the remaining operational lifetime of the plant. For the reference PWR, it was concluded by PNL in a recent study[4] that the original immediate dismantlement decommissioning cost estimates could be expected to increase only slightly overall (less than 1% in constant 1986 dollars), due to a slightly expanded scope of decommissioning activities associated with changes in the reference plants characteristics. The radiation dose would be increased by about 32 man-rem, due largely to the dismantling operations associated with the removal of a significantly greater mass of spent fuel pool storage racks.

There are many areas where various planned design and operational features could facilitate decommissioning. Exploration of such areas was considered by PNL[1] in their initial decommissioning study. It was concluded that appropriate measures could not only significantly reduce decommissioning occupational dose and radioactively contaminated waste volume but could also reduce occupational dose during reactor operation. Preliminary considerations of various design and operational features that could further facilitate decommissioning and their impacts on doses and costs are discussed in NUREG/CR-0569.[14]

4.4 Environmental Consequences

Radiation doses and costs associated with possible decommissioning alternatives are discussed in Section 4.3. It is noted for perspective that in the cases of DECON and SAFSTOR, the environmental effects of greatest concern (i.e., radiation dose and radioactivity released to the environment) are substantially less than the same effects resulting from reactor operation and maintenance. It should also be noted that while the dollar costs of ENTOMB are less than those of DECON, the environmental impacts could be quite high should large amounts of radioactivity escape from a breached structure during the entombment period.

Other environmental consequences are rather different from the environmental consequences usually discussed in environmental impact statements. This is because, usually, an environmental impact statement is addressed to the consequences of building a facility that will require land, labor, capital investment, materials, continuing use of air, water, and fuel; a socio-economic infrastructure; and so on. Decommissioning, on the other hand, is an attempt to restore things to their original condition, which requires a much smaller commitment of resources than did building and operating the facility.

A major environmental consequence of decommissioning, other than radiation dose and dollar cost, is the commitment of land area to the disposal of radioactive waste. PNL made estimates (shown in Table 4.4-1) of the low-level waste disposal volume required to accommodate radioactive waste and rubble removed from the facility and transported to a licensed site for disposal. Reduction in waste volume for SAFSTOR occurs as many of the contamination and activation products present in the facility will have decayed to background levels. The volume for ENTOMB does not include the volume of the entombing structure or of the wastes entombed within it, only the wastes shipped off-site. The entombing structure is, in effect, a new radioactive waste burial ground, separate and distinct from the ones in which the wastes listed in Table 4.4-1 are buried, and may necessitate licensing considerations such as for a low-level waste burial ground under (10 CFR 61).

Table 4.4-1 Estimated burial volume of low-level radioactive waste and rubble for the reference PWR

Decommissioning Alternative		Volume (m^3)
DECON		18,340
SAFSTOR		
Deferred Decontamination[b] following Safe Storage for:	10 Years	18,340[a]
	30 Years	18,340[a,c]
	50 Years	1,830
	100 Years	1,780
ENTOMB[d]		1,740

[a] Includes about 440 m^3 of radioactive waste attributable to removal of back-fitted material adapted from Table 5.1-9, Reference 4).

[b] Radioactive wastes from preparation for safe storage and during safe storage are small in comparison to those of deferred decontamination.

[c] Although, in actuality, there is a gradual decrease in waste volume over time, it is not indicated here for clarity of presentation.

[d] Does not include the volume of the entombing structure or of the wastes within.

If shallow-land burial of radioactive wastes in standard trenches is assumed, then a burial volume of 18,340 m^3 of radioactive waste can be accommodated in less than 2 acres. The two acres is small in comparison with the 1,160 acres used as the site of the reference PWR.

Certain highly activated components of the reactor and its internals may require disposal in a deep geologic disposal facility rather than in a shallow-land burial ground because of the large initial level of radioactivity and the very long half-lives of ^{59}Ni and ^{94}Nb. Only about 11 m^3 of material would be involved and would required approximately 88 m^3 of waste disposal space. The cost for disposing of these materials in deep geologic disposal was estimated by PNL to be about $2.8 million (in 1978 dollars).[1] Based on recent estimates of deep geologic disposal costs,[13] it is currently estimated by PNL that deep geologic disposal of the highly activated materials would cost about $6 million (in 1986 dollars). This latter estimate is based on recent estimates of deep

geologic disposal costs conducted by Pacific Northwest Laboratory for the Department of Energy.[12] This cost has not been included in the costs of decommissioning shown in Table 4.3-1.

PNL considered accidental releases of radioactivity both during decommissioning and during transport of wastes. Radiation doses to the maximum-exposed individual from accidental airborne radioactivity releases during decommissioning operations were calculated to be quite low (Table 4.4-2). Radiation doses to the maximally-exposed individual from accidental radioactivity releases resulting from truck accidents were calculated to be moderate for the most severe accident (Table 4.4-3).

Other environmental consequences of decommissioning are minor compared to the environmental consequences of building and operating a PWR. Water use and evaporation at the rate of as much as 27×10^6 m^3/yr ceased when the reactor ceased operation. The total water use for decommissioning is estimated to be about 18×10^3 m^3. The number of workers on site at any time will be no greater than when the PWR was in operation and will be much less than when the PWR was under construction. The transportation network is already in place, but will require some maintenance if the SAFSTOR alternative is selected.

Disturbance of the ground cover need not take place to any appreciable extent except for filling holes and leveling the ground following removal of underground structures, unless extended operation of the plant has resulted in contamination of the ground around the plant. Plowing of the ground would generally result in lowering average soil contamination levels to those acceptable for releasing the site for unrestricted use, except for a few more highly contaminated areas where material would have to be removed. In this case, soil to a depth of several centimeters and some paving may have to be removed, packaged, and shipped to a disposal facility before the site can be released for unrestricted use.

The biggest socioeconomic impact will have occurred before decommissioning started, at the time the plant ceased operation and the tax income created by the plant was reduced. No additional public services will be required because the decommissioning staff will be somewhat smaller than the operating staff. In the case of deferred decontamination, the decontamination staff will be larger than the surveillance staff.

4.5 Comparison of Decommissioning Alternatives

From careful examination of Tables 4.3-1 and 4.3-2 it appears that DECON or 30-year SAFSTOR are reasonable options for decommissioning a PWR. 100-year SAFSTOR is not considered a reasonable option since it results in the continued presence of a site dedicated to radioactivity containment for an extended time period with little benefit in aggregate dose reduction compared to 30-year SAFSTOR. DECON costs less than SAFSTOR and its larger annual occupational radiation dose, which is similar to the routine annual dose from plant operations is considered of marginal significance to health and safety.

Either ENTOMB option requires indefinite dedication of the site as a radioactive waste burial ground. In the ENTOMB option with the reactor internals and its long-lived activation products entombed, the security of the site could not be assured for thousands of years necessary for radioactive decay, so this option

Table 4.4-2 Summary of radiation doses to the maximally-exposed individual from accidental airborne radionuclide releases during decommissioning operations

Incident	DECON					Preparations for Safe Storage				
	Airborne Release (μCi)	First-Year Dose (mrem)		Fifty-Year Dose Commitment (mrem)		Airborne Release (mCi)	First-Year Dose (mrem)		Fifty-Year Dose Commitment (mrem)	
		Total Body(a)	Lung	Total Body	Lung		Total Body(a)	Lung	Total Body	Lung
Explosion of LPG Leased from a Front End Loader	3.6×10^{3}	3.6×10^{-2}	4.7×10^{-2}	4.4×10^{-2}	5.4×10^{-2}	---(c)				
Explosion of Oxyacetylene During Segmenting of the Reactor Vessel Shell	3.6×10^{2}	4.3×10^{-5}	6.1×10^{-3}	6.9×10^{-3}	6.9×10^{-3}	---				
Explosion and/or Fire in the Ion Exchange Resin	3.8×10^{1}	3.8×10^{-4}	5.0×10^{-4}	4.6×10^{-4}	5.7×10^{-4}	---				
Gross Leak during In Situ Decontamination	2.1×10^{1}	2.1×10^{-4}	2.8×10^{-4}	2.5×10^{-4}	3.2×10^{-4}	2.1×10^{1}	2.1×10^{-4}	2.8×10^{-4}	2.5×10^{-4}	
Segmentation of RCS Piping With Unremoved Contamination	1.1×10^{1}	4.6×10^{-6}	7.3×10^{-4}	4.8×10^{-6}	7.9×10^{-4}	---				
Loss of Contamination Control Envelope During Oxyacetylene Cutting of the Reactor Vessel Shell	2.3×10^{0}	---	---	---	4.4×10^{-4}	---				
Vacuum Bag Rupture	---					1.0×10^{0}	1.1×10^{-8}	1.3×10^{-5}	1.2×10^{-8}	
Accidental Cutting of Contaminated Piping	---					1.8×10^{-1}	---	1.2×10^{-5}	---	
Accidental Spraying of Concentrated Contamination With the High Pressure Spray	---					1.2×10^{-1}	---	1.6×10^{-6}	1.5×10^{-6}	

(a) The average annual total body dose to an individual in the U.S. from natural sources ranges from 80 to 170 mrem. United Nations Scientific Committee on the Effects of Atomic Radiation, Ionizing Radiation: Levels and Effects. Volume 1, United Nations, pp. 29-63, 1972.

(b) Frequency of occurrence: high $>1.0 \times 10^{-2}$; medium 1.0×10^{-2} to 1.0×10^{-5}; low $<1.0 \times 10^{-5}$ per year.

(c) A dash indicates a dose less than 1.0×10^{-6} mrem or that this action does not apply to the decommissioning mode shown.

Table 4.4-3 Estimated frequencies and radioactivity releases for selected truck transport accidents

Accident Description	Frequency of Accidents per DECON	Frequency of Accidents per SAFSTOR	Release, Curies	Radiation Dose for Maximally Exposed Individual, (rem)(a)			
				1st Year Dose		50 Yr Dose Commitment	
				Bone	Lung	Bone	Lung
Truck Transport of Decommissioning Wastes[b],[c]							
Minor Accident with Closed Van	8.8×10^{-1}	9.0×10^{-2}	No Release	--	--	--	--
Moderate Accidents with Closed Van	2.1×10^{-1}	2.1×10^{-2}	1×10^{-4}	0.01	0.2	0.01	0.2
Severe Accieent with Closed Van	5.6×10^{-3}	5.7×10^{-4}	1×10^{-2}	1.1	21	1.1	24

(a) Maximally-Exposed individual is assumed at 100 m from the site of the accident.

(b) Based on an inventory of 100 Ci per truck shipment.

(c) Release fractions for respirable material for moderate and severe accidents are assumed to be 10^{-6} and 10^{-4} respectively.

is not considered viable. In the ENTOMB option with the reactor internals removed, it may be possible to release the site for unrestricted use at some time within the order of a hundred years if calculations demonstrate that the radioactive inventory has decayed to acceptable residual levels. However, even this ENTOMB alternative appears to be less desirable than either DECON or SAFSTOR based on consideration of the fact that ENTOMB results in higher radiation exposure and higher initial costs than 30-year SAFSTOR, that the overall cost of ENTOMB over the entombment period is approximately the same as DECON, and the fact that regulatory changes occurring during the long entombment period might result in additional costly decommissioning activity in order to release the facility for unrestricted use.

Consideration was given to the situation where, at the end of the reactor operational life, it is not possible to dispose of waste offsite for a limited period of time, but not exceeding 100 years (see Section 2.7). Such a constraint needs to be accounted for in the decommissioning alternatives. Based on an analysis by PNL of the technology, safety and cost considerations on selection of decommissioning alternatives,[14] it was concluded that SAFSTOR is an acceptably viable alternative. While DECON and conversion of the spent fuel pool to an independent spent fuel storage pool is certainly a possibility for the case where all other radioactive wastes can be removed offsite, there does not appear to be any significant safety difference between this alternative and SAFSTOR and the choice should be a licensee decision. The active phase of maintaining the spent fuel in the pool is not considered to be part of the regulatory requirements for decommissioning, but would be considered under the usual operating licensing aspects regarding health and safety with consideration given to facilitation for decommissioning. Aside from the expenses incurred from storing spent fuel, other costs for keeping radioactive wastes onsite for the reactor in a safe storage mode were estimated to have minimal effect on the SAFSTOR alternative compared to this alternative for radioactive wastes being sent offsite. Site security for storage of spent fuel (which is considered as an operational rather than a decommissioning consideration) was estimated at about $0.94 million per year (in 1986 dollars)[a]. In a multireactor site, such security could result in less cost because of a sharing of required overheads.

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[a] Adapted from Reference 14.

REFERENCES*

1. R. I. Smith, G. J. Konzek, and W. E. Kennedy, Jr., Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station, NUREG/CR-0130, Vols. 1 and 2, Prepared by Pacific Northwest Laboratory for the U.S. Nuclear Regulatory Commission, June 1978.

2. R. I. Smith and L. M. Polentz, Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station. Addendum to NUREG/CR-0130, Prepared by Pacific Northwest Laboratory for the U.S. Nuclear Regulatory Commission, August 1979.

3. R. I. Smith et al., Updated Costs for Decommissioning Nuclear Power Facilities, EPRI NP-4012, Prepared by Battelle, Pacific Northwest Laboratories for the Electric Power Research Institute, Final Report, May 1985.

4. G. J. Konzek and R. I. Smith, Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station, Prepared by Pacific Northwest Laboratory for the U.S. Nuclear Regulatory Commission, July 1988.

5. AEC-Elk River Reactor Final Program Report, CDO-651-93, United Power Association, Elk River, MN, Revised November 1974.

6. W. J. Manion and T. S. LaGuardia, An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives, Atomic Industrial Forum, November 1976.

7. Ninth Annual Occupational Radiation Exposure Report, 1976, U.S. Nuclear Regulatory Commission, NUREG-0322, p. 10, October 1977.

8. B. G. Brooks, Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1980, U.S. Nuclear Regulatory Commission, NUREG-0713, Vol. 2, December 1981.

9. R. O. Pohl, "Radiation Exposure in LWRs Higher than Predicted," Nuclear Engineering International, p. 36, January 1977.

10. A. Martin, "Occupational Radiation Exposure in LWRs Increasing," Nuclear Engineering International, p. 32, January 1977.

11. Letter from R. I. Smith, Pacific Northwest Laboratories, to Carl Feldman, U.S. Regulatory Commission, Subject: Updated Costs for Decommissioning the Reference PWR and BWR as Developed for the GEIS, November 12, 1986 (available in USNRC Public Document Room).

12. E. B. Moore, Jr., Facilitation of Decommissioning Light Water Reactors, NUREG/CR-0569, Prepared by Pacific Northwest Laboratory for the U.S. Nuclear Regulatory Commission, December 1979.

*See footnote to reference in Chapter 1 for document purchasing availability.

13. R. L. Engel et al., 1986. 1986 Annual Review of the Adequacy of the 1.0 mill per kWh Waste Disposal Fee, PNL-5877, Pacific Northwest Laboratory. Richland, Washington.

14. G. M. Holter, Technology Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station, Addendum 2 to NUREG/CR-0130, Effects on Decommissioning of an Interim Inability to Dispose of Wastes Offsite, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, July 1983.

5 BOILING WATER REACTOR

A boiling water reactor (BWR), like a pressurized water reactor (PWR), is a facility for converting the thermal energy of a nuclear reaction into the kinetic energy of steam to drive a turbine-generator and produce electricity. In a BWR, the conversion is accomplished by heating water to boiling in the reactor pressure vessel and using the resulting steam to drive the turbines. The intermediate step, present in a PWR, of converting pressurized hot water into steam through a heat exchanger in a steam generator is not used in a BWR. Elimination of this step also eliminates one cooling loop.

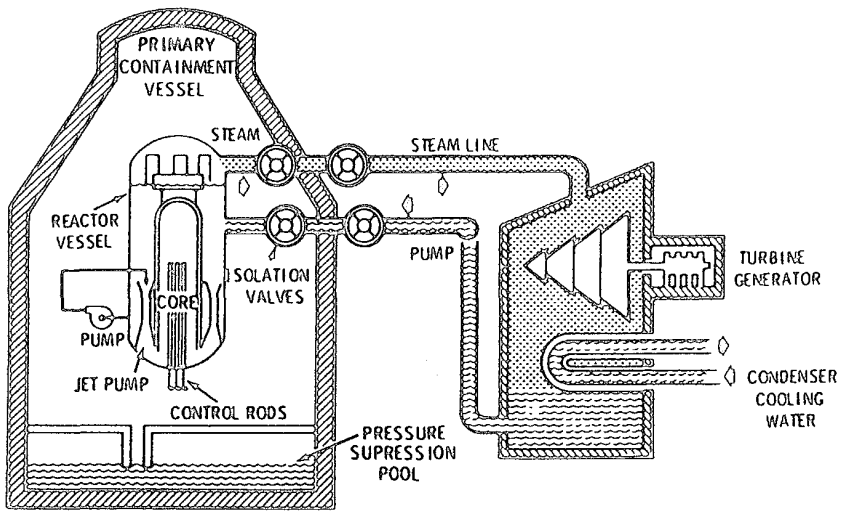
The generic site for the reference 1155-MWe BWR is assumed to be typical of reactor locations and is described in Section 3.1. As in the case of a PWR, the specific site for a BWR is chosen on the basis of operational and regulatory criteria, usually with little regard for decommissioning. Fortunately, factors that are appropriate for siting, such as transportation access, water supply, and skilled labor supply, are also appropriate for decommissioning. Thus, the decommissioning alternative chosen will not usually depend on siting considerations, but rather on safety, costs, and land use options at the time of decommissioning. These considerations are discussed in Section 4 for a PWR, and apply equally to a BWR.

In this section, we have used information prepared for the study on the technology, safety and costs of decommissioning a reference BWR, which was conducted by Pacific Northwest Laboratory (PNL) for the NRC.[1] In the BWR study, PNL selected the Washington Public Power Supply System's WNP-2 1155-MWe reactor at Hanford, Washington, as the reference BWR and assumed it to be located on the generic site. PNL then developed and reported information on the available technology, safety considerations, and probable costs for decommissioning the reference facility at the end of its operating life. As part of this study, PNL did a sensitivity study to analyze the effect that variation of certain parameters might have on radiation doses and costs associated with decommissioning. The parameters which were varied included reactor size, degree of radioactive contamination, different contract arrangements, type of containment structure, etc.

The incremental costs of utilizing an external contractor for decommissioning were updated in a related follow-on analysis.[2] In another related follow-on study,[3] the estimated decommissioning cost and dose impacts of post-TMI-2 requirements on the reference BWR have been examined and assessed. The results of these two recent studies are included in the estimated decommissioning cost and dose estimates presented in this chapter for the reference BWR.

5.1 Boiling Water Reactor Description

The major components of a BWR are a reactor core and pressure vessel, steam turbines, an electric generator, and a steam condenser system (Figure 5.1-1). Water is boiled in the reactor pressure vessel to create steam at high temperature and pressure, which then passes through the primary circulation loop to drive the turbines. The turbines turn the generator, which produces electricity.



A NUCLEAR POWER REACTOR PRODUCES STEAM TO DRIVE A TURBINE WHICH TURNS AN ELECTRIC GENERATOR. THE BWR SHOWN HERE IS A TYPE OF REACTOR FUELED BY SLIGHTLY ENRICHED URANIUM IN THE FORM OF URANIUM OXIDE PELLETS HELD IN ZIRCONIUM ALLOY TUBES IN THE CORE. WATER IS PUMPED THROUGH THE CORE, BOILS, AND PRODUCES STEAM THAT IS PIPED TO THE TURBINE.

Figure 5.1-1 Boiling water reactor

The steam leaving the turbines is condensed by water in the secondary loop and flows back to the reactor. The water in the secondary loop flows to the cooling towers where it is in turn cooled by evaporation. The secondary cooling loop is open to the atmosphere, but the primary loop is not.

Buildings or structures associated with the reference BWR include 1) the reactor building which houses the reactor pressure vessel, the containment structure, the biological shield, new and spent fuel pools, and fuel handling equipment; 2) the turbine generator building which houses the turbines and electric generator; 3) the radwaste and control building which houses the solid, liquid, and gaseous radioactive waste treatment systems, and the main control room; 4) the cooling towers; 5) the diesel generator building which houses auxiliary diesel generators; 6) water intake structures and pump houses; 7) the service building which houses the makeup water treatment system, machine shops, and offices; and 8) other minor structures.

In reference BWR, the reactor building, the turbine generator building, and the radwaste building are the only buildings containing radioactive materials. The reactor core and its pressure vessel are highly radioactive, as is the piping to the turbines. The turbines are also radioactive, but the cooling towers and associated piping are not, since the design of the system is such that any leakage would be from the nonradioactive secondary loop to the primary loop. Much equipment in the radwaste building is radioactively contaminated, as is the spent fuel pool in the reactor building.

The major sources of radiation in decommissioning a BWR are associated with the reactor itself, the containment structure, the concrete biological shield, the primary loop, the turbines, and the radwaste handling systems.

5.2 BWR Decommissioning Experience

At the present time, the Elk River, Minnesota, demonstration reactor is the only power reactor that has been completely dismantled.[4] This was a 58.2-MWt BWR that was dismantled between 1971 and 1974. While this reactor was quite small compared to present-day power reactors, its decommissioning served to demonstrate that reactors can be decontaminated safely with little occupational or public risk. At Elk River, the containment building was kept intact until the pressure vessel and biological shield were removed. Only after all of the radioactive metal components and concrete areas were removed was the concrete containment structure demolished.

Other reactors, all of them relatively small, have been placed in safe storage or entombed (Table 1.5-1). Safe storage and entombment require surveillance and retention of a possession-only license. At Elk River, the license was terminated.

5.3 Decommissioning Alternatives

The decommissioning alternatives considered in this section are DECON, SAFSTOR, and ENTOMB.

5.3.1 DECON

DECON means the prompt removal and disposal of all radioactivity in excess of levels which would permit release of the facility for unrestricted use. Non-radioactive equipment and structures need not be torn down or removed as part of a DECON procedure. The end result is the release of the site and any remaining structures for unrestricted use as early as 6 years after the end of reactor operation.

DECON is advantageous because it allows termination of the NRC license shortly after cessation of facility operations and eliminates a radioactive site. DECON is advantageous if the site is required for other purposes, if the site has become extremely valuable, or if the site for some reason must be immediately released for unrestricted use. It is also advantageous in that the reactor operating staff is available to assist with decommissioning and that continued surveillance and maintenance is not required. A disadvantage is the higher occupational radiation dose which occurs during DECON compared to the other alternatives.

The basic estimates in the original PNL studies have been adjusted by PNL analysts to reflect January 1986 costs. The revised estimate for the reference BWR shows that DECON would require 6 years to complete, including 2 years of planning prior to reactor shutdown, and would cost $108.9 million in 1986 dollars (Table 5.3-1). In addition to the values escalated from the PNL report (NUREG/CR-0672),[1] the table also includes the cost additions--for pre-decommissioning engineering, additional staff to assure meeting the 5 rem/year dose limit for personnel, extra supplies for the additional staff, and the additional costs associated with the option of utilizing an external contractor to conduct the decommissioning effort--which were developed in the PNL cost update done for the Electric Power Research Institute.[2] The estimated decommissioning cost impacts of post-TMI-2 requirements on the reference BWR[3] are included in the table as well. It can be seen from the table that the total cost of DECON is about $131.8 million under the utility-plus-contractor option. For comparison purposes, the time required to plan and build a large power reactor is presently about 12 years and the cost is well over two billion dollars.

Three important radiation exposure pathways need to be considered in the evaluation of the radiation safety of normal reactor decommissioning operations: inhalation, ingestion, and external exposure to radioactive materials. For reasons similar to that discussed for PWRs in Section 4.3.1, during decommissioning the dominant exposure pathway to workers is external exposure while for the public the dominant exposure pathway is inhalation. During the transport of radioactive waste, the dominant exposure pathway is external exposure for both transportation workers and the public. A summary of the radiation doses resulting from these pathways is presented in Table 5.3-2.

The aggregate occupational radiation dose from external exposure to surface contamination and activated material, not including transportation of radioactive waste, is estimated to be about 1764 man-rem over 4 years, or an average of 440 man-rem per year. (Table 5.3-2). The occupational radiation dose to truck transportation workers from DECON waste shipments is estimated to be

Table 5.3-1 Summary of reevaluated decommissioning costs for the reference BWR in $ Millions [a,b]

Decommissioning Element	DECON[c]	Prep. for Safe Storage[d]	SAFSTOR[e] 10 Years	SAFSTOR[e] 30 Years	SAFSTOR[e] 100 Years	ENTOMB[f] Internals Included (g)	ENTOMB[f] Internals Removed	100 years of Surveillance (h)
Base Case Estimated Decommissioning Costs:								
(1978 dollars)	(43.6)	(21.3)	(57.4)	(58.9)	(55.0)	(35.0)	(40.6)	(3.9)
1986 dollars	98.5					68.7	81.4	6.4
Safe Storage Preparation[d]	NA[1]	37.5	41.0	41.0	41.0	NA	NA	
Continuing Care	NA	NA	0.9[j]	3.3[j]	11.6[j]	(h)	(h)	
Deferred Decontamination[d]	NA	NA	82.2	82.2	48.0	NA	NA	
Possible Additional Costs[j]								
• Additional Staff Needed to Reduce Average Annual Radiation Dose to: 5 rem per year	4.4	1.1				2.7	2.3	
• Use of External Decommissioning Contractor[l]	21.1	8.8				17.8	21.3	
• Pre-Decommissioning Engineering: Internal (utility)[l]	5.6	3.4	4.5	4.5	4.5	5.6	5.6	
or External (contractor)	7.4	4.5				7.4	7.5	
• Supplies for Extra Staff (5 rem/yr average dose)[j]	.02	0.1				~0.1	~0.1	
• NRC Licensing Activities[m]	>0.1	~0.1	~0.1[k]	~0.3[k]	~1.0[k]	~0.1	~0.1	~1.0
• Post-TMI-2 Impacts: Internal (utility)[n]	~0.1	negligible[p]	~0.1	~0.1	negligible	~0.1	~0.1	~0.3
or								

Table 5.3-1 (Continued)

Decommissioning Element	DECON[c]	Prep. for Safe Storage[d]	SAFSTOR[e]			ENTOMB[f]		100 years of Surveillance (h)
			10 Years	30 Years	100 Years	Internals Included (g)	Internals Removed	
External (contractor)[o]	<0.1	negligible			.	<0.1	<0.1	
Subtotal (<5 rem/yr):								
Utility (Internal)	108.9	41.0	128.3	130.4	106.1	77.3	89.6	7.4
or								
Contractor (external) Staffing	131.8					96.2	112.8	7.4
TOTAL Estimated Cost:								
Utility Staffing	108.9		128.3	131.4	106.1	84.7	97.0	
or								
Contractor Staffing	131.8					104.3	120.2	

TABLE 5.3-1 Footnotes

(a) Values include a 25% contingency and are in constant 1986 dollars.

(b) Values exclude cost of disposal of last core, exclude cost of demolition of nonradioactive structures, and exclude cost of deep geologic disposal of dismantled, highly activated components.

(c) Adapted from Reference 1, Table 10.1-1, unless otherwise indicated.

(d) Adapted from Reference 1, Table 10.2-1, unless otherwise indicated.

(e) The values shown for SAFSTOR include the costs of the preparations for safe storage, continuing care, and deferred decontamination.

(f) Adapted from Reference 1, Table 10.3-1 and Appendix K.

(g) Does not include the eventual costs associated with the removal, packaging, and disposal of the entombed radioactive materials, the demolition of the entombment structure, or demolition of the Reactor Building.

(h) The annual cost of surveillance and maintenance for the entombed structure is estimated to be about $0.064 million.

(i) NA-not applicable.

(j) Adapted from Reference 1, Table 2.10-4.

(k) Adapted from Reference 1, Table J.7-2.

(l) Adapted from Reference 2, Table 1.1, unless otherwise indicated.

(m) The values shown include the estimated costs of NRC licensing activities as well as the costs associated with inspections anticipated to be required by other Federal and state agencies.

(n) Adapted from Reference 3, Table 2.5-7.

(o) Adapted from Reference 3, Table 2.5-7 and from Reference 1, Appendix O.

(p) Negligible means less than $0.025 million.

Table 5.3-2 Summary of radiation dose analyses for decommissioning the reference BWR (values are in man-rem)[a]

	DECON	SAFSTOR After			ENTOMB with	
		10 Years	30 Years	100 Years	Internals Included	Internals Removed
Occupational Exposure						
Safe Storage Preparation	NA[b]	294	294	294	NA	NA
Continuing Care	NA	1	7	10	neg	neg
Decontamination	1764	495	36	neg	NA	NA
Entombment	NA	NA	NA	NA	1492	1603
Safe Stor. Prep. Truck Shipments	NA	22	22	22	NA	NA
Decontamination Truck Shipments	110	22	2	neg	NA	NA
Entombment Truck Shipments	NA	NA	NA	NA	51	69
Total	1874	834	361	326	1543	1672
Public Exposure						
Safe Storage Preparation	NA	neg	neg	neg	NA	NA
Continuing Care	NA	neg	neg	neg	neg	neg
Decontamination	neg	neg	neg	neg	NA	NA
Entombment	NA	NA	NA	NA	neg	neg
Safe Stor. Prep. Truck Shipments	NA	2	2	2	NA	NA
Decontamination Truck Shipments	10	2	neg	neg	NA	NA
Entombment Truck Shipments	NA	NA	NA	NA	5	7
Total	10	4	2	2	5	7

[a] All entries are from Reference 1. Values exclude radiation dose from disposal of last core.

[b] NA means not applicable and neg means negligible.

about 110 man-rem.[a] In comparison, the average annual occupational radiation dose from operation, maintenance, and refueling of BWRs from 1974 through 1979 was approximately 670 man-rem per reactor[5] and 1,136 man-rem in 1980.

The inhalation radiation dose to the public from airborne radionuclide releases during DECON is estimated to be negligible. The radiation dose to the public from the truck transportation of radioactive wastes from DECON is estimated to be about 10 man-rem.

A major reason for the difference in cost and radiation dose between DECON of a BWR and a PWR is the requirement to dismantle, remove, and dispose of the radioactive turbine, condenser, and main steam piping of a BWR. A PWR turbine is not significantly contaminated with radioactivity since the major portion of the radioactivity is confined to the primary coolant systems.

5.3.2 SAFSTOR

Generally, the purpose of SAFSTOR is to permit residual radioactivity to decay to levels that will reduce occupational radiation exposure during subsequent, final decontamination. As indicated in Table 5.3-2, most of the occupational dose reduction due to decay occurs during the first 30 years after shutdown with considerably less dose reduction thereafter. The public dose will always be small and will also experiences most of its reduction during decommissioning within the first 30 years. Nonradioactive equipment and structures need not be removed, but eventually all radioactivity in excess of that allowed for unrestricted use of the facility must be removed. Hence, in contrast to DECON, to take advantage of the dose reduction, the safe storage period could be as long as 60 years including final decontamination. The end result is the same: release of the site and any remaining structures for unrestricted use.

SAFSTOR is advantageous in that it can result in reduced occupational radiation exposure in situations where urgent land use considerations do not exist. Disadvantages are that the owner is required to maintain a possession-only license under 10 CFR Part 50 during the safe storage phase and to meet its requirements at all times, thus contributing to the number of sites dedicated to radioactive materials storage for an extended time period. Other disadvantages are that surveillance and monitoring are required, the cumulative dollar costs are higher than for DECON, and the original operating staff will not be available at the end of the safe storage period to assist in the decontamination.

The PNL study shows that the costs of SAFSTOR for a 30-year period are greater than those of DECON and vary with the number of years of safe storage. For example, the total cost of 30-year SAFSTOR is estimated to be $131.4 million in 1986 dollars compared with the total cost of $108.9 million for DECON.

However, the total cost of 100-year SAFSTOR is estimated to $106.1 million in 1986 dollars. The lower cost of 100-year SAFSTOR compared to 30-year SAFSTOR is the result of lower costs for deferred decontamination due to the radio-

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[a] For a detailed explanation of the minor contributions (e.g., less than 0.08 man-rem for DECON) from post-TMI-2 impacts to the total estimates shown in Table 5.3-2, consult Table 2.4-2 of Reference 3.

activity having decayed. PNL's cost estimates for the decommissioning alternatives are presented in Table 5.3-1.

SAFSTOR results in lower radiation doses to both the work force and the public than DECON or ENTOMB. The aggregate occupational radiation dose is estimated to be approximately 337 man-rem for 30-year SAFSTOR (294 man-rem from safe storage preparation, 7 man-rem from continuing care, and 36 man-rem from deferred decontamination), not including transportation (Table 5.3-2). The occupational radiation dose from the truck transport of radioactive wastes is estimated to be about 24 man-rem. For 100-year SAFSTOR the estimated occupational radiation dose is estimated to be approximately 326 man-rem (294 man-rem from safe storage preparation, 10 man-rem from continuing care, and a negligible dose from deferred decontamination). The occupational radiation dose from the truck transport of radioactive wastes is estimated to be about 22 man-rem. Thus, 100-year SAFSTOR results in little additional reduction in the aggregate occupational radiation dose compared to 30-year SAFSTOR.

Radiation doses to the public from airborne radionuclide releases resulting from SAFSTOR are estimated to be negligible. The radiation dose to the public from the truck transport of radioactive wastes during the preparation for safe storage is estimated to be about 2 man-rem, and that from the truck transport of radioactive wastes during deferred decontamination after 30 and 100 years of safe storage is estimated to be negligible.

5.3.3 ENTOMB

ENTOMB means the complete isolation of radioactivity from the environment by means of massive concrete and metal barriers until the radioactivity has decayed to levels which permit unrestricted release of the facility. These barriers must prevent the escape of radioactivity and prevent deliberate or inadvertent intrusion. The length of time the integrity of the entombing structure must be maintained depends on the inventory of radioactive nuclides present. A BWR will contain ^{60}Co as the largest contributor to radiation dose. If it has been operated only a short time the integrity of the entombing structure need only be maintained for a few hundred years, as the disappearance of radioactivity is controlled by the 5.27-year half-life of ^{60}Co and the 30 year half-life fission products such as ^{137}Cs. If, on the other hand, the reactor has been operated for 30 or 40 years, substantial amounts of ^{59}Ni and ^{94}Nb (80,000-year and 20,000-year half-lives, respectively) will have been accumulated as activation products in the reactor vessel internals. The dose rate from the ^{94}Nb present in the reactor vessel internals has been estimated to be approximately 0.7 rem/hour while the dose from the ^{59}Ni in the internals is 0.07 rem/hour. These dose levels are substantially above acceptable residual radioactivity levels and, because of the long half-lives of ^{94}Nb and ^{59}Ni, would not decrease by an appreciable amount, due to radioactive decay, for thousands of years. In addition, there are an estimated 1,000 curies of ^{59}Ni in the reactor vessel internals which could result in potential internal exposures in the event of a breach of the entombed structure and subsequent introduction of the ^{59}Ni in an exposure pathway during the long half-life of ^{59}Ni. Thus, the long-lived isotopes will have to be removed or the integrity of the entombing structure will have to be maintained for many thousands of years.

ENTOMB for a BWR is limited to the containment vessel because its unique structure lends itself to entombment and because it contains most of the radioactivity in the facility. Other buildings associated with a reactor must be decommissioned by another method such as DECON. It is possible, however, to move some radioactive components from other buildings to the containment vessel and ENTOMB them there, rather than shipping them offsite.

ENTOMB is advantageous because of reduced occupational and public exposure to radiation compared to DECON, because little surveillance is required, and because little land is required. It is disadvantageous because the integrity of the entombing structure must be assured in some cases for hundreds of thousands of years, because a possession-only license under 10 CFR Part 50 would be required which in turn requires some surveillance, monitoring, and maintenance, and because entombing contributes to the number of sites dedicated to radioactive materials containment for very long time periods.

Two approaches to the ENTOMB alternative for a BWR are possible. In the first approach, the pressure vessel internals and their long-lived ^{59}Ni and ^{94}Nb isotopes are entombed, along with other radioactive material. This results in less cost and radiation dose because the pressure vessel and its internals will not have to be removed, dismantled, and transported to a deep geologic waste repository. It will also, however, result in the requirement for a possession-only license and indefinite surveillance because of the presence of the long-lived isotopes.

In the second approach, the pressure vessel internals, with their long-lived ^{59}Ni and ^{94}Nb isotopes, are removed, dismantled, and transported to a radioactive waste repository. This results in more cost and radiation dose, but offers the possibility that surveillance and the possession-only license could be terminated at some time within several hundred years, thereby releasing the entire facility for unrestricted use. At the outset, a careful inventory of radioactivity would need to be made to ensure that only relatively short-lived isotopes were present.

In both approaches, as much solid radioactive material from the entire facility as can be accommodated is sealed within the containment vessel. All openings to the exterior of the containment vessel are sealed. Radioactive material outside the containment vessel is removed down to levels which permit release of the remainder of the facility for unrestricted use.

Radioactive materials not entombed would have to be packaged and transported to a disposal site. Cost savings and radiation dose reductions would result from the lesser volume of radioactive equipment and material having to be dismantled, packaged, and transported. In any case, all spent fuel would be removed.

ENTOMB for the reference BWR, including the pressure vessel and its internals, is estimated to cost $77.3 million, with an annual surveillance and maintenance cost of $64,000. It results in an aggregate radiation dose of 1492 man-rem to decommissioning workers, 51 man-rem to transportation workers, and 5 man-rem to the general public. ENTOMB for the reference BWR, with the pressure vessel internals removed, is estimated to cost $89.6 million, with an annual surveillance and maintenance cost of $64,000, and to result in an aggregate radiation dose of 1603 man-rem to decommissioning workers, 69 man-rem to transportation

workers, and 7 man-rem to the general public. These estimates are listed in Tables 5.3-1 and 5.3-2.

5.3.4 Sensitivity Analyses

In addition to the reference BWR, PNL also analyzed a variety of realistic decommissioning situations.[1] These variations were studied to determine if they might have significant impact on the conclusions reached for the reference BWR regarding doses and costs for the decommissioning alternatives. While there were some differences in results, the conclusion of the sensitivity analysis is that these differences do not substantially affect the original cost and radiation dose conclusions. Of the various situations analyzed by PNL, the most important with regard to their potential effect on dose and cost estimates are reactor size, degree of contamination and type of containment structure.

Based on an analysis[6] similar to that for the reference BWR (NUREG/CR-0672) and incorporating selected cost adders (described in References 2 and 3 and escalated to constant 1986 dollars as shown in Table 5.3-1), upper-bound estimates were made of the costs for immediate dismantlement of reactor plants smaller than the reference plant. The analysis was limited to plants with thermal power ratings greater than 1200 MWt and was based on the assumption that all costs (staff labor, equipment, supplies, etc.) except radioactive waste disposal are independent of plant size. The results are shown in Table 5.3-3.

Table 5.3-3 Estimated immediate dismantlement costs (in millions) for plants smaller than the reference BWR, based on previously-derived overall scaling factors[a,b]

Reactor	MWt	Waste Disposal	Scaling Factor	Remaining Costs	Escalated Adders	Total Costs[c]
WNP-2	3320	44.201	1.000	54.464	10.230	108.894
Cooper	2381	44.201	0.809	54.464	10.230	100.453
Vermont Yankee	1593	44.201	0.648	54.465	10.230	93.336

[a] All costs are in constant 1986 dollars and include a 25% contingency.

[b] Derivation of previously-derived overall scaling factors can be found in Reference 1.

[c] Total costs shown above are for the utility-only cost option.

Using the results from Table 5.3-3, a linear equation can be derived for the scaling of the immediate dismantlement costs of plants in the 1200 to 3500 MWt range:

$$\text{Cost} = 78.993 + (9.008 \times 10^{-3})\ (\text{MWt})$$

Revised overall scaling factors for the Cooper and Vermont Yankee plants were obtained by dividing the results of the linear equation by the cost of the

reference plant. Based on this formula, a list of variations in dose and cost of these BWRs is presented in Table 5.3-4.

Also analyzed was the sensitivity of decommissioning costs and radiation doses to a postulated tripling of radiation dose rates from radionuclides deposited in BWR coolant system piping during reactor operation over a period of 30 to 40 years. This tripling of dose rate is postulated as an upper limit on the basis of recent trends for operating reactors. If no corrective action is taken to reduce the radiation dose rates, the accumulated radiation dose to decommissioning workers for DECON would be increased from 1764 man-rem to 4573 man-rem,[1] and the total decommissioning costs could be increased by about 12 million for DECON. For ENTOMB the radiation dose would be increased from 1604 man-rem to 4154 man-rem and the total cost could be increased about 12 million. For preparation for safe storage, the radiation dose would be increased from 294 man-rem to 759 man-rem, and there would be no significant change in the cost.

In order to handle these postulated higher initial radiation levels, it appears that additional chemical decontamination during decommissioning would be the most cost-effective approach. For example, it is estimated that increasing the circulation time of the chemical solution about 50% would reduce the postulated increased radiation levels by a factor of 3, thus reducing these levels to approximately the same dose rate conditions assumed in the reference case analysis. This approach would also be more consistent with the principles of ALARA, since the occupational radiation dose associated with a chemical decontamination cycle is relatively small, compared with the radiation dose associated with installing temporary shielding, or with attempting to perform the dismantlement without additional shielding. In addition, it appears likely that the large buildups of radionuclides prevalent today on piping systems will be prevented as periodic decontamination during normal operation of the reactor coolant system and related fluid-handling systems becomes standard procedure.

Analysis was also done to determine if variation in design of the BWR containment structure would have significant impact on doses or costs of decommissioning. There are three principal designs of BWR containments and pressure suppression systems, namely Mark 1, Mark II, and Mark III and these were analyzed by PNL. The conclusion reached by this analysis was that for BWR plants of equivalent power rating, differences in containment design have very little effect on the total cost of decommissioning of a BWR.

One of the circumstances that has changed since the original BWR decommissioning report[1] was prepared which could influence the development of the cost of dose estimates presented in this GEIS is an assessment of post-TMI-2 requirements on the decommissioning of the reference BWR. Actions judged necessary by the NRC to correct or improve the regulation and operation of nuclear power plants based on the experience from the accident at TMI-2 resulted in a number of recommendations that were subsequently issued to the utilities as requirements. Some of those requirements resulted in equipment and hardware changes and/or additions to the reference BWR that could eventually expand the scope of decommissioning activities, since those materials could reasonably be expected to become contaminated or radioactive during the remaining operational lifetime of the plant. For the reference BWR, it was concluded by PNL in a recent study[3] that the original immediate dismantlement decommissioning cost estimates could be expected to increase very slightly overall (considerably less than 1% in

Table 5.3-4 Estimated costs and occupational radiation doses for decommissioning different-sized BWR plants (a, b, c)

		Station		
		Vermont Yankee	Cooper	WNP-2
Power Rating	(thermal megawatts)	1,593	2,381	3,320
Overall Scaling Factor	(OSF)	0.857	0.922	1.000
DECON	($millions)	93.3	100.4	108.9
	(man-rem)	1,581	1,701	1,845(c)
ENTOMB[d]				
w/internals	($ millions)[c]	66.2	71.3	77.3
	(man-rem)	1,348	1,450	1,573
w/o internals	($ millions)	76.8	82.6	89.6
	(man-rem)	1,443	1,553	1,684
SAFSTOR				
Preparations for Safe Storage	($ millions)	35.1	37.8	41.0
	(man-rem)	321	346	375
Safe Storage:				
for 30 years	($ millions)	3.3	3.3	3.3
	(man-rem)	6.5	6.5	6.5
for 50 years	($ millions)	5.6	5.6	5.6
	(man-rem)	10	10	10
for 100 years	($ millions)	11.7	11.7	11.7
	(man-rem)	10	10	10
Deferred Dismantlement:				
after 30 years	($ millions)	70.4	75.8	82.2
	(man-rem)	31	33	36
after 50 years	($ millions)	41.4	44.5	48.3
	(man-rem)	2.6	2.8	3
after 100 years	($ millions)	41.1	44.3	48
	(man-rem)	>1	>1	>1
Facility Demolition	($ millions)	16.4	18.0	19.9

(a) Values include a 25% contingency and are in 1986 dollars.

(b) Costs do not include spent-fuel disposal or demolition of nonradioactive structures.

(c) Doses are taken from Reference 1 and do not include those due to transportation of wastes.

(d) ENTOMB costs do not include continuing care costs (0.064 M/yr).

constant 1986 dollars), due to a slightly expanded scope of decommissioning activities associated with changes in the reference plant's characteristics. The radiation dose would be increased by about 3 man-rem, due entirely to decommissioning operations associated with the removal and packaging of a small additional quantity of contaminated materials.

Other methods of facilitating decommissioning, in addition to additional chemical decontamination, are discussed in NUREG/CR-0569.[7] These include improved documentation, reduction of radwaste volume by incineration, electropolishing of piping and components as a decontamination technique, remote maintenance and decommissioning equipment (robots), improved access to piping and components, and improved concrete protection.

5.4 Environmental Consequences

Radiation doses and costs associated with possible decommissioning alternatives are discussed in Section 5.3. It is to be emphasized for perspective that for any viable decommissioning alternative, the environmental effects of greatest concern, i.e., radiation dose and radioactivity released to the environment, are substantially less than the same effects resulting from reactor operation and maintenance. It should also be noted that while the dollar costs of ENTOMB are less than those of DECON, the environmental impacts could be quite high should large amounts of radioactivity escape from a breached structure during the entombment period.

Other environmental consequences are rather different from the environmental consequences usually discussed in environmental impact statements. This is because, usually, an environmental impact statement is addressed to the consequences of building a facility that will require land, labor, capital investment, materials, continuing use of air, water and fuel, a socioeconomic infrastructure, etc. Decommissioning, on the other hand, is an attempt to restore things to their original condition, which requires a much smaller commitment of resources than did building and operating the facility.

A major environmental consequence of decommissioning, other than radiation dose and dollar cost, is the commitment of land area to the disposal of radioactive waste. Estimates are shown in Table 5.4-1 of the low-level waste disposal volume required to accommodate radioactive waste and rubble removed from the facility and transported to a licensed site for disposal. The volume for ENTOMB does not include the volume of the entombing structure or of the wastes entombed within it, only the wastes shipped off-site. The entombing structure is, in effect, a new radioactive waste burial ground, separate and distinct from the ones in which the wastes in Table 5.4-1 are buried, and may necessitate licensing consideration such as those for a low-level waste burial ground under (10 CFR 61).

If shallow-land burial of radioactive wastes in standard trenches is assumed, then a burial volume of about 18,975 m^3 of radioactive waste can be accommodated in less than 2 acres. The two acres is small in comparison with the 1,160 acres used as the site of the reference BWR.

Certain highly activated components of the reactor and its internals may require disposal in a deep geologic disposal facility rather than in a shallow-land burial ground because of the large initial level of radioactivity and the very

Table 5.4-1 Estimated burial volume of low-level radioactive waste and rubble for the reference BWR

Decommissioning Alternative		Volume (m^3)
DECON		18,975[a]
SAFSTOR		
Deferred Decontamination[b] following Safe Storage for:	10 Years	18,975
	30 Years	18,975[a,c]
	50 Years	1,783
	100 Years	1,673
ENTOMB[d]		
Internals Included		8,042
Internals Removed		8,420

[a] Includes about 36m^3 of radioactive waste attributable to removal of backfitted material (adapted from Table 5.2-8, Reference 3).

[b] Radioactive wastes from preparations for safe storage are small in comparison to those from deferred decontamination.

[c] Although, in actuality, there is a gradual decrease in waste volume over time, it is not indicated here for clarity of presentation.

[d] Volume of entombing structure and the wastes within are not included.

long half-lives of ^{59}Ni and ^{94}Nb. Only about 11.5 m^3 of material would be involved and would require approximately 89 m^3 of waste disposal space.

The cost for disposing of these materials in deep geologic disposals was estimated by PNL to be about $2.9 million (in 1978 dollars).[1] Based on recent estimates of deep geologic disposal costs,[8] it is currently estimated by PNL that deep geologic disposal of the highly activated materials would cost about 16.2 million (in 1986 dollars). This cost has not been included in the costs of decommissioning shown in Table 5.3-1.

PNL considered accidental releases of radioactivity both during decommissioning during transport of wastes and the results are presented in Table 5.4-2. Radiation doses to the maximally-exposed individual from accidental airborne radioactivity releases during decommissioning operations were calculated to be quite low. Radiation doses to the maximally-exposed individual from accidental radioactivity releases resulting from transportation accidents were calculated to be low for the most severe accident.

Other environmental consequences of decommissioning are minor compared to the environmental consequences of building and operating a BWR. Water use and evaporation at the rate of as much as 27 x 10^6 m^3/yr ceased when the reactor ceased operation. The total water use for decommissioning is estimated to be about 18 x 10^3 m^3. The number of workers on site at any time will be no greater than when the BWR was in operation and will be much less than when the BWR was under construction. The transportation network is already in place, but will require some maintenance if the SAFSTOR mode is selected.

Disturbance of the ground cover need not take place to any appreciable extent except for filling holes and leveling the ground following removal of underground structures, unless operation of the plant has resulted in contamination of the ground around the plant. Plowing of the ground would generally result in lowering average soil contamination levels to those acceptable for releasing the site for unrestricted use, except for a few more highly contaminated areas where materials would have to be removed. In this case, soil to depth of several centimeters and some paving may have to be removed, packaged, and shipped to a disposal facility before the site can be released for unrestricted use.

The biggest socioeconomic impact will have occurred before decommissioning started, at the time the plant ceased operation and the tax income created by the plant was reduced. No additional public services will be required because the decommissioning staff will be somewhat smaller than the operating staff. In the case of deferred decontamination, the decontamination staff will be larger than the surveillance staff.

5.5 Comparison of Decommissioning Alternatives

From careful examination of Tables 5.3-1 and 5.3-2 it appears that DECON or 30-year SAFSTOR are reasonable options for decommissioning a BWR. 100-year SAFSTOR is not considered a reasonable option since it results in the continued presence of a site dedicated to radioactivity containment for an extended time period with little benefit in aggregate dose reduction compared to 30-year SAFSTOR. DECON costs less than SAFSTOR and its larger on an annual basis occupational radiation dose, which is consistent with routine annual operational

Table 5.4-2. Summary of radiation doses to the maximally-exposed individual from accidental airborne radionuclide releases during BWR decommissioning and transportation of wastes

Incident	Total Atmospheric Release (Ci/hr)(b)	Radiation Dose to Lung (in rem) from: DECON First-Year	DECON Fifty-Year	SAFSTOR First-Year	SAFSTOR Fifty-Year	ENTOMB First-Year	ENTOMB Fifty-Year	Occurrence(a)
Severe Transportation Accident	2.0×10^{-2}	9.0×10^{-2}	2.0×10^{-1}	9.0×10^{-2}	2.0×10^{-1}	9.0×10^{-2}	2.0×10^{-1}	Low
Explosion of LPG Leaked from a Front-end Loader	8.6×10^{-3}	7.9×10^{-5}	1.5×10^{-4}	N/Ac	N/A	N/A	N/A	Low
Vacuum Filter-Bag Rupture	8.5×10^{-4}	8.3×10^{-5}	1.8×10^{-4}	8.3×10^{-5}	1.8×10^{-4}	8.3×10^{-5}	1.8×10^{-4}	Medium
Minor Transportation Accident	5.0×10^{-4}	2.2×10^{-3}	4.5×10^{-3}	2.2×10^{-3}	4.5×10^{-3}	2.2×10^{-3}	4.5×10^{-3}	Low
Contamination Control Envelope Rupture	1.4×10^{-4}	1.0×10^{-6}	1.9×10^{-6}	N/A	N/A	N/A	N/A	High
Oxyacetylene Explosion	1.2×10^{-4}	8.7×10^{-7}	1.6×10^{-6}	N/A	N/A	N/A	N/A	Medium
Contaminated Sweeping Compound Fire	1.1×10^{-6}	1.1×10^{-7}	2.3×10^{-7}	1.1×10^{-7}	2.3×10^{-7}	1.1×10^{-7}	2.3×10^{-7}	Medium
Gross Leak During Loop Chemical Decontamination	1.0×10^{-6}	9.8×10^{-8}	2.1×10^{-7}	9.8×10^{-7}	2.1×10^{-7}	9.8×10^{-8}	2.1×10^{-7}	Low
Filter Damage from Blasting Surges	1.3×10^{-7}	1.2×10^{-9}	N/A	N/A	N/A	N/A	N/A	Medium

Table 5.4-2 (Continued)

Incident	Total Atmospheric Release (Ci/hr)(b)	Radiation Dose to Lung (in rem) from: DECON First-Year	DECON Fifty-Year	SAFSTOR First-Year	SAFSTOR Fifty-Year	ENTOMB First-Year	ENTOMB Fifty-Year	Occurrence(a)
Combustible Waste Fire	6.0×10^{-9}	5.9×10^{-10}	1.2×10^{-9}	5.9×10^{-10}	1.2×10^{-9}	5.9×10^{-10}	1.2×10^{-9}	High
Detonation of Unused Explosives	4.8×10^{-10}	4.4×10^{-12}	8.6×10^{-12}	N/A	N/A	N/A	N/A	Medium

(a) The frequency of occurrence considers not only the probability of the accident, but also the probability of an atmospheric release of the calculated magnitude. The frequency of occurrence is listed as "high" if the occurrence of a release of similar or greater magnitude per year is $>10^{-2}$, as "medium" if between 10^{-2} and 10^{-5}, and as "low" if $<10^{-5}$.

(b) All atmospheric releases are assumed to occur during a 1-hr period, for comparison purposes.

(c) N/A = Not applicable.

dose for plant operations is considered of marginal significance to health and safety.

Either ENTOMB option requires indefinite dedication of the site as a radioactive waste burial ground. In the ENTOMB option with the reactor internals and its long-lived activation products entombed, the security of the site could not be assured for thousands of years necessary for radioactive decay, so this option is not considered viable. In the ENTOMB option with the reactor internals removed, it may be possible to release the site for unrestricted use at some time within the order of a hundred years if calculations demonstrate that the radioactive inventory has decayed to acceptable residual levels. However, even this ENTOMB alternative appears to be less desirable than either DECON or SAFSTOR based on consideration of the fact that ENTOMB results in higher radiation exposure and higher initial costs than 30-year SAFSTOR, that the overall cost of ENTOMB over the entombment period is approximately the same as DECON, and the fact that regulatory changes occurring during the long entombment period might result in additional costly decommissioning activity in order to release the facility for unrestricted use.

Consideration was given to the situation where, at the end of the reactor operational life, it is not possible to dispose of waste offsite for a limited period of time, but not exceeding 100 years (see Section 2.7). Such a constraint needs to be accounted for in selecting the decommissioning alternative. Based on an analysis by PNL of the technology, safety and cost considerations on selection of decommissioning alternatives,[9] it was concluded that SAFSTOR is an acceptably viable alternative. Unlike the PWR case, DECON and conversion of the spent fuel pool to an independent spent fuel storage pool for a BWR is an unlikely possibility for the case where all other radioactive wastes can be removed offsite. The active phase of maintaining the spent fuel in the pool is not considered to be part of the regulatory requirements for decommissioning, but would be considered under the usual operating licensing aspects regarding health and safety with consideration given to facilitation for decommissioning. Aside from the expenses incurred from storing spent fuel, other costs for keeping radioactive wastes onsite for the reactor in a safe storage mode were estimated to have minimal effect on the SAFSTOR alternative compared to this alternative for radioactive wastes being sent offsite. Site security for storage of spent fuel (which is considered as an operational rather than a decommissioning consideration) was estimated at about $0.94 million per year (in 1986 dollars)[a]. For a multi-reactor site, such security could result in a lesser cost because of a sharing of required overheads.

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[a] Adapted from Reference 9.

REFERENCES*

1. H. D. Oak et al., Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station, NUREG/CR-0672, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, June 1980.

2. R. I. Smith et al., Updated Costs for Decommissioning Nuclear Power Facilities, EPRI NP-4012, Prepared by Battelle, Pacific Northwest Laboratories for the Electric Power Research Institute, Final Report, May 1985.

3. G. J. Konzek and R. I. Smith, Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, July 1988.

4. AEC-Elk River Reactor Final Program Report, COO-651-93. United Power Association, Elk River, Minnesota, revised November 1974.

5. B. G. Brooks, Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1982, U.S. Nuclear Regulatory Commission, NUREG-0713, Vol. 4, December 1983.

6. Letter from R.I. Smith, Pacific Northwest Laboratories, to Carl Feldman, U.S. Nuclear Regulatory Commission, Subject: Updated Costs for Decommissioning the Reference PWR and BWR as Developed for the GEIS, November 12, 1986 (available in USNRC Public Document Room).

7. E. B. Moore, Jr., Facilitation of Decommissioning Light Water Reactors, NUREG/CR-0569, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, December 1979.

8. R. L. Engel et al., 1986. 1986 Annual Review of the Adequacy of the 1.0 mill per kWh Waste Disposal Fee, PNL-5877 Pacific Northwest Laboratory. Richland, Washington.

9. G. M. Holter, Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station, Addendum 1 to NUREG/CR-0672, Effects on Decommissioning of Interim Inability to Dispose of Wastes Offsite, Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, July 1983.

See footnote to reference in Chapter 1 for document purchasing availability.

NUREG-0586, Supplement 1
Volume 1

Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities

Supplement 1

Regarding the Decommissioning of Nuclear Power Reactors

Main Report, Appendices A through M

Final Report

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555-0001

NUREG-0586, Supplement 1
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Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities

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Abstract

This document is a supplement to the U.S. Nuclear Regulatory Commission (NRC) document *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* issued in 1988 (NUREG-0586, referred to here as the 1988 Generic Environmental Impact Statement [GEIS]). This Supplement was prepared because of technological advances in decommissioning operations, experience gained by licensees, and changes made to NRC regulations since the 1988 GEIS.

This Supplement updates the information provided in the 1988 GEIS. It is intended to be used to evaluate environmental impacts during the decommissioning of nuclear power reactors as residual radioactivity at the site is reduced to levels that allow for termination of the NRC license. This Supplement addresses only the decommissioning of nuclear power reactors licensed by the NRC. It updates the sections of the 1988 GEIS relating to pressurized water reactors, boiling water reactors, and multiple reactor stations. It goes beyond the 1988 GEIS to explicitly consider high-temperature gas-cooled reactors and fast breeder reactors. This document can be considered a stand-alone document for power reactor facilities such that readers should not need to refer back to the 1988 GEIS. The environmental impacts described in this Supplement supercede those described for power reactor facilities in the 1988 GEIS.

The scope of this Supplement is based on the decommissioning activities performed to remove radioactive materials from structures, systems, and components from the time that the licensee certifies that it has permanently ceased power operations until the license is terminated. The scope of the document was determined through public scoping meetings and meetings with other Federal agencies and the nuclear industry. An evaluation process was then developed to determine environmental impacts from nuclear power reactor facilities that are being decommissioned. The evaluation process involved determining the specific activities that occur during reactor decommissioning and obtaining data from site visits and from licensees at reactor facilities currently being decommissioned. The data obtained from the sites were analyzed and then evaluated against a list of variables that defined the parameters for facilities that are currently operating but which will one day be decommissioned. This evaluation resulted in a range of impacts for each environmental issue that may be used for comparison by licensees that are or will be decommissioning their facilities.

Abstract

Contents

Volume 1
Main Report, Appendices A-M

Abstract iii

Executive Summary xi

Abbreviations/Acronyms xix

1.0 Introduction 1-1
- 1.1 Purpose and Need for This Supplement 1-1
- 1.2 Process Used to Determine Scope of This Supplement 1-2
- 1.3 Scope of This Supplement 1-3
- 1.4 Categories for Environmental Impacts and Extent of Issues 1-9
  - 1.4.1 Levels of Significance of Environmental Impacts 1-9
  - 1.4.2 Regulatory Distinction of Generic and Site-Specific Approaches 1-10
- 1.5 Uses of This Supplement 1-10
- 1.6 Development of This Supplement 1-12
- 1.7 Parts of This Supplement 1-12
- 1.8 References 1-12

2.0 Background Information Related to Decommissioning Regulations 2-1
- 2.1 Basis for Current Regulations 2-1
- 2.2 Summary of Current Regulations 2-1
  - 2.2.1 Regulations for Decommissioning Activities 2-1
  - 2.2.2 Regulations for License Termination 2-4
- 2.3 References 2-8

3.0 Description of NRC Licensed Reactor Facilities and the Decommissioning Process . 3-1
- 3.1 Plants, Sites, and Reactor Systems 3-1
  - 3.1.1 Types of Nuclear Power Reactor Facilities 3-2
    - 3.1.1.1 Pressurized Water Reactors 3-3
    - 3.1.1.2 Boiling Water Reactors 3-3
    - 3.1.1.3 Fast Breeder Reactors 3-4
    - 3.1.1.4 High-Temperature Gas-Cooled Reactors 3-5
  - 3.1.2 Types of Structures Located at a Nuclear Power Facility 3-5
  - 3.1.3 Description of Systems 3-8

3.1.4 Formation and Location of Radioactive Contamination and Activation in an Operating Plant . . . 3-15
3.2 Decommissioning Options . . . 3-16
3.2.1 DECON . . . 3-18
3.2.2 SAFSTOR . . . 3-19
3.2.3 ENTOMB . . . 3-21
3.3 Summary of Plants That Have Permanently Ceased Operations . . . 3-27
3.3.1 Plant Sites . . . 3-27
3.3.2 Description of Decommissioning Options Selected . . . 3-28
3.3.3 Decommissioning Process . . . 3-29
3.4 References . . . 3-36

4.0 Environmental Impacts of Decommissioning Permanently Shutdown Nuclear Power Reactors . . . 4-1
4.1 Definition of Environmental Impact Standards . . . 4-1
4.1.1 Terms of Significance of Impacts . . . 4-1
4.1.2 Terms of Applicability of Impacts . . . 4-2
4.2 Evaluation Process . . . 4-3
4.3 Environmental Impacts from Nuclear Power Facility Decommissioning . . . 4-5
4.3.1 Onsite/Offsite Land Use . . . 4-6
4.3.1.1 Regulations . . . 4-6
4.3.1.2 Potential Impacts of Decommissioning Activities on Land Use 4-6
4.3.1.3 Evaluation . . . 4-7
4.3.1.4 Conclusions . . . 4-8
4.3.2 Water Use . . . 4-9
4.3.2.1 Regulations . . . 4-9
4.3.2.2 Potential Impacts of Decommissioning Activities on Water Use . . . 4-9
4.3.2.3 Evaluation . . . 4-10
4.3.2.4 Conclusions . . . 4-11
4.3.3 Water Quality . . . 4-11
4.3.3.1 Regulations . . . 4-12
4.3.3.2 Potential Impacts of Decommissioning Activities on Water Quality . . . 4-12
4.3.3.3 Evaluation . . . 4-13
4.3.3.4 Conclusions . . . 4-14
4.3.4 Air Quality . . . 4-15
4.3.4.1 Regulations . . . 4-15
4.3.4.2 Potential Impacts of Decommissioning Activities on Air Quality 4-16
4.3.4.3 Evaluation . . . 4-16
4.3.4.4 Conclusions . . . 4-20

4.3.5 Aquatic Ecology 4-20
4.3.5.1 Regulations 4-21
4.3.5.2 Potential Impacts of Decommissioning Activities on Aquatic Ecological Resources 4-21
4.3.5.3 Evaluation 4-22
4.3.5.4 Conclusions 4-23
4.3.6 Terrestrial Ecology 4-24
4.3.6.1 Regulations 4-24
4.3.6.2 Potential Impacts of Decommissioning Activities on Terrestrial Ecological Resources 4-25
4.3.6.3 Evaluation 4-25
4.3.6.4 Conclusions 4-27
4.3.7 Threatened and Endangered Species 4-27
4.3.7.1 Regulations 4-28
4.3.7.2 Potential Impacts of Decommissioning Activities on Threatened and Endangered Species 4-28
4.3.7.3 Evaluation 4-29
4.3.7.4 Conclusions 4-30
4.3.8 Radiological 4-31
4.3.8.1 Regulations 4-31
4.3.8.2 Potential Radiological Impacts of Decommissioning Activities . 4-33
4.3.8.3 Evaluation 4-33
4.3.8.4 Conclusions 4-38
4.3.9 Radiological Accidents 4-38
4.3.9.1 Regulations 4-39
4.3.9.2 Potential for Radiological Accidents as a Result of Decommissioning Activities 4-40
4.3.9.3 Evaluation 4-41
4.3.9.4 Conclusions 4-43
4.3.10 Occupational Issues 4-44
4.3.10.1 Regulations 4-44
4.3.10.2 Potential Impacts of Decommissioning Activities on Occupational Issues 4-44
4.3.10.3 Evaluation 4-45
4.3.10.4 Conclusions 4-49
4.3.11 Cost 4-49
4.3.11.1 Regulations 4-50
4.3.11.2 Potential Impacts of Decommissioning Activities on Cost 4-51
4.3.11.3 Evaluation 4-51
4.3.11.4 Conclusions 4-53

4.3.12 Socioeconomics 4-53
4.3.12.1 Regulations 4-53
4.3.12.2 Potential Impacts of Decommissioning Activities on Socioeconomics 4-53
4.3.12.3 Evaluation 4-55
4.3.12.4 Conclusions 4-61
4.3.13 Environmental Justice 4-62
4.3.13.1 Regulations 4-62
4.3.13.2 Potential Impacts of Decommissioning Activities on Environmental Justice 4-64
4.3.13.3 Evaluation 4-64
4.3.13.4 Conclusions 4-65
4.3.14 Cultural, Historic, and Archeological Resources 4-66
4.3.14.1 Regulations 4-66
4.3.14.2 Potential Impacts of Decommissioning Activities on Cultural, Historic, and Archeological Resources 4-67
4.3.14.3 Evaluation 4-68
4.3.14.4 Conclusions 4-68
4.3.15 Aesthetic Issues 4-69
4.3.15.1 Regulations 4-69
4.3.15.2 Potential Impacts of Decommissioning Activities on Aesthetics 4-70
4.3.15.3 Evaluation 4-70
4.3.15.4 Conclusions 4-72
4.3.16 Noise 4-72
4.3.16.1 Regulations 4-73
4.3.16.2 Potential Impacts from Noise of Decommissioning Activities . . 4-74
4.3.16.3 Evaluation 4-75
4.3.16.4 Conclusions 4-76
4.3.17 Transportation 4-76
4.3.17.1 Regulations 4-76
4.3.17.2 Potential Decommissioning Impacts from Transportation 4-77
4.3.17.3 Evaluation 4-77
4.3.17.4 Conclusions 4-81
4.3.18 Irreversible and Irretrievable Commitment of Resources 4-81
4.3.18.1 Regulations 4-81
4.3.18.2 Potential Impacts of Decommissioning Activities on Irretrievable Resources 4-82
4.3.18.3 Evaluation 4-82
4.3.18.4 Conclusions 4-83

4.4 References 4-83
4.5 Related Documents 4-88

5.0 No-Action Decommissioning Alternative 5-1
5.1 Reference 5-1

6.0 Summary of Findings and Conclusions 6-1
6.1 Summary of Findings 6-1
6.2 Conclusions 6-4
6.3 References 6-5

Appendix A - Supplement to the Generic Environmental Impact Statement Scoping Summary Report: Comments in Scope A-1

Appendix B - Reserved for Comments on the Draft Supplement to the Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586 . . B-1

Appendix C - Contributors C-1

Appendix D - Further Discussion of Out-of-Scope Activities D-1

Appendix E - Evaluation Process for Identifying the Environmental Impacts of Decommissioning Activities E-1

Appendix F - Summary Table of Permanently Shutdown and Currently Operating Commercial Nuclear Reactors F-1

Appendix G - Radiation Protection Considerations for Nuclear Power Facility Decommissioning G-1

Appendix H - Summary of Environmental Impacts from Decommissioning Activities H-1

Appendix I - Radiological Accidents I-1

Appendix J - Additional Supporting Data Related to Socioeconomics and Environmental Justice J-1

Appendix K - Transportation Impacts K-1

Appendix L - Relevant Regulations and Federal Permits L-1

Appendix M - Glossary M-1

Figures

1-1 Decommissioning Timeline 1-4

3-1 Pressurized Water Reactor 3-3
3-2 Boiling Water Reactor 3-4
3-3 Reactor Decommissioning Process - DECON or SAFSTOR 3-34
3-4 Reactor Decommissioning Process - ENTOMB 3-35

4-1 Environmental Impact Evaluation Process 4-4

Tables

ES-1 Summary of the Environmental Impacts from Decommissioning Nuclear Power Facilities xvii

1-1 Activities and Impacts Within or Outside the Scope of This Supplement 1-6

3-1 Summary of Shutdown Plant Information 3-28
3-2 Permanently Shutdown Plants 3-31

4-1 Comparison of Occupational Dose Estimates from NUREG-0586 to those for Decommissioning Reactors 4-37
4-2 Predicted Noise Ranges from Significant Construction Equipment 4-46
4-3 Cost Impacts of Decommissioning 4-54
4-4 Summary of Cost Impacts by Decommissioning Option and Reactor Type and Size 4-55
4-5 Predicted Noise Ranges from Significant Decontamination and Dismantlement Sources 4-74
| 4-6 Impacts of Transportation of LLW from Decommissioning 4-80
| 4-7 Volumes of Land Required for LLW Disposal 4-83

6-1 Summary of the Environmental Impacts from Decommissioning Nuclear Power Facilities 6-2

Executive Summary

This document is a supplement to the U.S. Nuclear Regulatory Commission (NRC) document *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities,* issued in 1988 (NUREG-0586, referred to hereafter as the 1988 Generic Environmental Impact Statement [GEIS]).[(a)] As a supplement, this document considers the technological advances in decommissioning, the experience gained by licensees, and changes made to NRC regulations since the 1988 GEIS. The information from the 1988 GEIS that is still current and applicable to permanently shut down and currently operating commercial nuclear power reactors is included here. This Supplement is intended to be used to evaluate environmental impacts during the decommissioning of nuclear power reactors as residual radioactivity at the site is reduced to levels that allow for termination of the NRC license.

The NRC elected to supplement the GEIS:

(1) to further the purposes of the National Environmental Policy Act (NEPA)

(2) to update the information in the GEIS

(3) to provide additional information to the public on decommissioning activities

(2) to establish an envelope of environmental impacts that could be associated with decommissioning activities.

Unlike the 1988 GEIS, which took a broad look at decommissioning of a variety of sites and activities, this Supplement addresses only nuclear power reactors licensed by the NRC. It updates the sections of the 1988 GEIS relating to pressurized water reactors, boiling water reactors, and multiple reactor stations. It goes beyond the 1988 GEIS and considers the existing permanently shut down high-temperature gas-cooled reactor and fast breeder reactor. It does not include research and test reactors or the power reactor facilities that have been involved in a significant accident resulting in large-scale contamination of structures, systems, and components (SSCs). It also does not include other types of fuel-cycle facilities, such as fuel-reprocessing plants or small mixed oxide fuel-fabrication plants.

The intent of this Supplement is to consider in a comprehensive manner all aspects related to the radiological decommissioning of nuclear reactor facilities by incorporating updated information, regulations, and analyses. Since the 1988 GEIS was written, the NRC and the industry have gained substantially more nuclear power facility decommissioning experience. Based on the number of reactors shut down and the date that they permanently ceased

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(a) The GEIS is considered “generic” in that it evaluates environmental impacts from decommissioning activities common to a number of nuclear power facilities.

operations, over 200 facility-years' worth of decommissioning experience have accumulated since the NRC published the 1988 GEIS. Currently, there are 19 commercial power reactor facilities in the decommissioning process. This includes nine that permanently ceased operations after the NRC published the 1988 GEIS. Since the 1988 GEIS, there are three facilities that have completed decommissioning and terminated their licenses. There are also new technologies and approaches applicable to decommissioning that the 1988 GEIS does not address. The regulations for decommissioning reactors have also undergone significant changes since the 1988 GEIS.

Scope of the Supplement

The content of this Supplement was initially defined by the scope of the 1988 GEIS and was modified based on current decommissioning regulations, input received during four public scoping meetings, letters and comments received during the scoping period, and meetings between the NRC and the U.S. Environmental Protection Agency (EPA) and the Council on Environmental Quality (CEQ). The public comments received during the scoping process that were considered to be with the scope of the environmental review are provided in Volume 2 Appendix N. The NRC staff published for comment Supplement 1 to the GEIS in October 2001. Public meetings in San Francisco, California, Boston Massachusetts, Chicago, Illinois and Atlanta, Georgia were held in December, 2001 to describe the preliminary results of the NRC environmental review, to answer questions, and to provide members of the public with information to assist them in formatting comments on the draft Supplement. All comments received on the draft Supplement were considered by the staff in developing the final document and are presented in Appendices O and P.

The scope of this Supplement is based on the decommissioning activities performed to remove radioactive materials from SSCs from the time that the licensee certifies that it has permanently ceased power operations until the license is terminated. As a result, the activities performed before permanent cessation of operations (except for decommissioning planning) or impacts that are related to the decision to permanently cease operations (for example, the impact from the loss of generation capacity) are outside the scope of this document.

The Commission defines decommissioning as "to remove a facility or site safely from service and reduce residual radioactivity to a level that permits (1) Release of the property for unrestricted use and termination of the license; or (2) Release of the property under restricted conditions and termination of the license." The staff has included activities that are directly related to the removal of radioactive material from the facility or that must be performed in order to facilitate the removal of contaminated SSCs, as well as the activities and impacts related to the removal of uncontaminated SSCs (such as the intake structure or cooling towers) that were required for the operation of the reactor.

The decommissioning process continues until the licensee requests termination of the license and demonstrates that radioactive material has been removed to the levels that permit

termination of the NRC license. At that point, the NRC no longer has jurisdiction over the site and the owner of the site is no longer subject to NRC regulations. As a result, activities performed after license termination and the resulting impacts are outside the scope of this Supplement. These activities may include any non-NRC required monitoring, site restoration (grading, planting of vegetation, etc.), continued dismantlement (removal of uncontaminated structures or those that have been radiologically decontaminated), or continued use of the site for activities such as power production using natural gas, oil, or coal.

Any potential radiological impacts following license termination that are related to activities performed during the decommissioning period are not considered in this Supplement. Those impacts are covered by the *Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities* (NUREG-1496). Nonradiological impacts following license termination that are related to activities performed during the decommissioning period are considered in this Supplement.

Levels of Significance and Applicability of Environmental Impacts

This Supplement provides a measure of (a) the significance and severity of potential environmental impacts and (b) the applicability of these impacts to a variety of plants both permanently shut down and operating. The significance of the environmental impacts is described as either SMALL, MODERATE or LARGE. The applicability of these impacts to a variety of plants is categorized as either generic or site-specific.

Levels of Significance: For decommissioning, the staff is using a standard of significance derived from the CEQ terminology for “significantly” (40 CFR 1508.27, which considers “context” and “intensity”). The NRC has defined three significance levels: SMALL, MODERATE, and LARGE.

SMALL - Environmental impacts are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts in this Supplement, the NRC has concluded that those impacts that do not exceed permissible levels in the Commission’s regulations are considered small.

MODERATE - Environmental impacts are sufficient to alter noticeably but not to destabilize important attributes of the resource.

LARGE - Environmental impacts are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The discussion of each environmental issue in this Supplement includes an explanation of how the significance level was determined. In determining the significance level, the NRC staff assumed that ongoing mitigation measures would continue (including those mitigation

measures implemented during plant construction and/or operation) during decommissioning, as appropriate. Benefits of additional mitigation measures during or after decommissioning are not considered in determining significance levels.

Applicability: In addition to determining the significance of environmental impacts, this Supplement includes a determination of whether the analysis of the environmental issues could be applied to all plants, and whether additional mitigation measures would be warranted. An environmental issue may be assigned to one of two categories:

- Generic - For each environmental issue, the analysis reported in this Supplement shows the following:

  (1) Environmental impacts associated with the issue have been determined to apply either to all plants, or for some issues to plants of a specific size, specific location or having a specific type of cooling system or site characteristics, and

  (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts, and

  (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

- Site-specific - For each environmental issue that was determined to be site-specific, the analysis reported in this Supplement has shown that one or more of the generic criteria was not met. Therefore, additional plant-specific review is required. An example of a site-specific issue is threatened and endangered species.

Use and Development of this Supplement

This Supplement can be used by the public to understand the decommissioning process, the activities performed during decommissioning, and the potential environmental impacts resulting from these activities. It identifies activities that can be bounded by a generic evaluation. Licensees can rely on the information in this Supplement as a basis for meeting the requirements in 10 CFR 50.82(a)(6)(ii). This requirement states that the licensee must not perform any decommissioning activity that causes any significant environmental impact not previously reviewed. The NRC staff will also rely on this Supplement as a basis for determining if anticipated decommissioning impacts require an additional review.

The staff first created an initial list of environmental issues and activities that this Supplement should address. The initial list of environmental issues was developed from issues (such as air

quality, aquatic ecology, and radiological impacts) identified in the 1988 GEIS and in the list specified in 10 CFR Part 51, Subpart A, Appendix B, for license renewal. This list was used because it represents the potential impacts associated with nuclear power facilities. The initial list of decommissioning activities was modified based on experience, public participation in the scoping process, site visits to six facilities currently being decommissioned, and meetings with EPA and CEQ. After compiling the issue and activity lists, the staff assessed which activities might have environmental impacts for each of the issues. The next step was to identify the variables that might affect the decommissioning impact for a specific issue and activity. For example, the proximity of the plant to a barge slip or railroad might affect the licensee's decision to remove the steam generator or other large components intact and ship them to a waste site. If the barge slip needs additional dredging, or an additional railroad line needs to be installed, then the environmental impacts may change.

The analyses in this Supplement include data from both operating and decommissioning facilities in order to appropriately span the range of impacts that could be expected. Data from decommissioning facilities was used to determine whether the potential impacts from decommissioning activities for the various issues are generic or site-specific. Data from operating facilities were used to ensure that this Supplement will be valid for all commercial nuclear power reactors.

Alternatives

The alternative to the action of decommissioning is not to decommission the facility. The option to restart the reactor is not considered to be an alternative to decommissioning because the decision to permanently cease operation prevents the licensee from operating the reactor without a significant safety and environmental review by the NRC staff.

The alternative to decommissioning at the end of the licensing period is a "no action" alternative, implying that a licensee would simply abandon or leave a facility after ceasing operations. NRC regulations do not allow the option of not decommissioning. Once the facility permanently ceases operation, if the licensee does not conduct decommissioning activities to an extent that meets the license termination criteria in 10 CFR Part 20, Subpart E, then the license will not be terminated (although the licensee will not be authorized to operate the reactor). The licensee will be required to comply with the necessary requirements for the operating license. As a result, the environmental impacts for maintaining the nuclear reactor facility will be considered to be in the bounds of the appropriate, previously issued Environmental Impact Statements. Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for periods of up to 20 years if NRC requirements are met. However, at the end of the licensing period (whether it has been extended or not), the regulations require that the facility be decommissioned.

Conclusions

Table ES-1 presents each evaluated environmental issue and identifies whether the issue is considered generic or site-specific. If the issue is considered generic, then it is assigned a significance level of either SMALL, MODERATE or LARGE. Of the environmental issues assessed, most of the impacts are generic and SMALL for all plants regardless of the activities and identified variables (see Appendix E for a list of the variables). The two issues determined to be site-specific are threatened and endangered species and environmental justice. Four issues are considered to be conditionally site-specific.

- land use involving offsite areas to support decommissioning activities
- aquatic ecology for activities beyond the operational area
- terrestrial ecology for activities beyond the operational area
- cultural and historic resources for activities beyond the operational area with no current cultural and historic resource survey.

The operational area is defined as the portion of the plant site where most or all of the site activities occur, such as reactor operation, materials and equipment storage, parking, substation operation, facility service, and maintenance. This includes areas within the protected area fences, the intake, discharge, cooling, and associated structures as well as surrounding paved, graveled, maintained landscape, or other maintained areas.

Licensees undergoing or planning decommissioning of a commercial nuclear power reactor can use this Supplement in support of their evaluation of the environmental consequences from decommissioning. The impacts identified in this Supplement are designed to span the range of impacts from all plants that are currently permanently shut down as well as the plants that are currently operating, including the plants that have or may renew their licenses beyond the original 40-year license; a renewed license can be issued for a period not to exceed 20 years beyond the expiration of the operating license. When planning a specific decommissioning activity, licensees that fall within the bounds of the impacts, as described in Chapter 4, may proceed with the activity with no further analysis. However, if the planned activity could result in environmental impacts greater than those predicted by this supplement, then the activity cannot be performed until the licensee performs a site-specific analysis of the activity. Depending on the results of the site-specific evaluation, the staff may determine that it is appropriate to consult with another agency (such as the U.S. Fish and Wildlife Service or a State Historic Preservation Office). If the activity would result in an impact that is outside the bounds of the GEIS or other environmental assessments, the licensee would be required to submit a license-amendment request.

Table ES-1. Summary of the Environmental Impacts from Decommissioning Nuclear Power Facilities

Issue	Generic	Impact
Onsite/Offsite Land Use		
- Onsite land use activities	Yes	SMALL
- Offsite land use activities	No	Site-specific
Water Use	Yes	SMALL
Water Quality		
- Surface water	Yes	SMALL
- Groundwater	Yes	SMALL
Air Quality	Yes	SMALL
Aquatic Ecology		
- Activities within the operational area	Yes	SMALL
- Activities beyond the operational area	No	Site-specific
Terrestrial Ecology		
- Activities within the operational area	Yes	SMALL
- Activities beyond the operational area	No	Site-specific
Threatened and Endangered Species	No	Site-specific
Radiological		
- Activities resulting in occupational dose to workers	Yes	SMALL
- Activities resulting in dose to the public	Yes	SMALL
Radiological Accidents	Yes	SMALL
Occupational Issues	Yes	SMALL
Cost	NA[(a)]	NA
Socioeconomic	Yes	SMALL
Environmental Justice	No	Site-specific
Cultural and Historic Resource Impacts		
- Activities within the operational areas	Yes	SMALL
- Activities beyond the operational areas	No	Site-specific
Aesthetics	Yes	SMALL
Noise	Yes	SMALL
Transportation	Yes	SMALL
Irretrievable Resources	Yes	SMALL

(a)A decommissioning cost assessment is not a specific National Environmental Policy Act (NEPA) requirement. However, an accurate decommissioning cost estimate is necessary for a safe and timely plant decommissioning. Therefore, this Supplement includes a decommissioning cost evaluation, but the cost is not evaluated using the environmental significance levels nor identified as a generic or site-specific issue.

Abbreviations/Acronyms

µGy	microGray(s)
µSv	microSieverts
ac	acre(s)
AEA	Atomic Energy Act of 1954
AEC	U.S. Atomic Energy Commission
ALI	annual limits on intake
ALARA	as low as reasonably achievable
ANPR	advance notice of proposed rulemaking
BLM	Bureau of Land Management
BMP	best management practice
Bq	Bequerel(s)
BWR	boiling water reactor
C	Celsius
CAA	Clean Air Act
CDE	committed dose equivalent
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Ci	Curie
CWA	Clean Water Act
DAC	derived air concentration
dB	decibel
dBA	A-weighted sound levels
dBC	C-weighted sound levels
DBA	design basis accident
DDREF	dose or dose rate effectiveness factor
DE	dose equivalent
DNL	day-night average sound level
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation

EA	environmental assessment
EDE	effective dose equivalent
EIS	environmental impact statement
EJ	environmental justice
EPA	U.S. Environmental Protection Agency
ER	environmental report
ESA	Endangered Species Act of 1973
ES&H	environment, safety and health
F	Fahrenheit
FAA	Federal Aviation Administration
FBR	fast breeder reactor
FES	final environmental statement
FHA	Federal Housing Administration
FR	Federal Register
FSAR	Final Safety Analysis Report
ft	foot/feet
FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
FWS	U.S. Fish and Wildlife Service
gal.	gallon(s)
GEIS	Generic Environmental Impact Statement
gpd	gallons per day
gpm	gallons per minute
GTCC	Greater-than-Class-C (waste)
Gy	gray(s)
ha	hectare(s)
HDA	high decommissioning activity
HEPA	high-efficiency particulate air (filter)
HLW	high-level waste
h	hour
HTGR	high-temperature gas-cooled reactor
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilation, and air conditioning
IAEA	International Atomic Energy Agency
in.	inch(es)
I&C	instrumentation and control

ICRP	International Commission on Radiological Protection
ISFSI	independent spent fuel storage installation
kg	kilogram(s)
km	kilometer(s)
kV	kilovolt(s)
kWh	kilowatt hour(s)
L	liter(s)
LDA	low-decommissioning activity
LER	licensee event report
LET	linear energy transfer
LLW	low-level waste
LOS	level of service
LRA	license renewal application
LTP	license termination plan
LWR	light water reactor
m	meter(s)
m^3/d	cubic meters per day
m^3/s	cubic meters per second
MARSSIM	Multi-agency Radiation Survey and Site Investigation Manual, NUREG-1575
MBTA	Migratory Bird Treaty Act of 1918
mi	mile(s)
mGy	milliGray(s)
MPC	maximum permissible concentrations
mrad	millirad(s)
mrem	millirem(s)
MRS	monitored retrievable storage
mSv	milliSievert(s)
MTHM	metric tonnes of heavy metal
MT	metric ton(s) (or tonne[s])
MTU	metric ton(s)-uranium
MW	megawatt(s)
MWd/MTU	megawatt-days per metric ton of uranium
MW(e)	megawatt(s) electric
MW(t)	megawatt(s) thermal
MWh	megawatt hour(s)

NA	not applicable
NAS	National Academy of Sciences
NBS	National Bureau of Standards

NCRP	National Council on Radiation Protection and Measurements
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966
NIST	National Institute of Standards and Technology
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxide(s)
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NWPA	Nuclear Waste Policy Act of 1982
ODCM	Offsite Dose Calculation Manual
OSHA	Occupational Safety and Health Administration
PAG	protective action guide
PCBs	polychlorobiphenyls
PEL	permissible exposure limit
POL	possession-only license
PPE	personal protective equipment
PSDAR	post-shutdown decommissioning activities report
PV	pressure vessel
PWR	pressurized water reactor
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act of 1976
RCS	reactor coolant system
ROW	right-of-way/rights-of-way
RPV	reactor pressure vessel
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Officer
SI	Systeme Internationale (international system of units)
SO_2	sulfur dioxide
SO_x	sulfur oxide(s)
SSCs	structures, systems, and components
Sv	sievert(s)

TEDE	total effective dose equivalent
THPO	Tribal Historic Preservation Officer
UNSCEAR	United Nations Scientific Committee on The Effects of Atomic Radiation
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
VRM	Visual Resource Management (system)
wk	week(s)
YNPS	Yankee Nuclear Power Station
yr	year(s)

1.0 Introduction

1.1 Purpose and Need for This Supplement

This document supplements the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (NRC 1988), issued in 1988 (NUREG-0586, referred to hereafter as the 1988 GEIS) for power reactor facilities. This Supplement updates information provided in the 1988 GEIS by considering technological advances in decommissioning activities gained since 1988 and changes in U.S. Nuclear Regulatory Commission (NRC) regulations and, where appropriate, other agency regulations. The NRC has adopted the following definition of the purpose and need of this Supplement:

> The purpose and need are to provide an analysis of environmental impacts from decommissioning activities that can be treated generically so that decommissioning activities for commercial nuclear power reactors conducted at specific sites will be bounded, to the extent practicable, by this and appropriate previously issued environmental impact statements.

This Supplement is intended to be used to evaluate environmental impacts during the decommissioning of nuclear power facilities as residual radioactivity at the site is reduced to levels that allow for termination of the NRC license. This Supplement can be considered a stand-alone document for power reactor facilities such that readers should not need to refer back to the 1988 GEIS. The environmental impacts described in this Supplement supercede those described in the 1988 GEIS for power reactor facilities.

The NRC elected to supplement the 1988 GEIS:

(1) to further the purposes of the National Environmental Policy Act (NEPA)

(2) to update the information in the 1988 GEIS

(3) to provide additional information to the public on decommissioning activities

(4) to establish an envelope of environmental impacts associated with decommissioning activities.

Unlike the 1988 GEIS, this Supplement covers only reactor facilities licensed by the NRC for commercial power production. It updates the sections of the 1988 GEIS relating to pressurized water reactors, boiling water reactors, and multiple reactor stations. It goes beyond the 1988 GEIS and considers the permanently shut down high-temperature gas-cooled reactors and fast

breeder reactors. It does not cover research and test reactors or power reactor facilities that have been involved in a significant accident resulting in large-scale contamination of structures, systems, and components (SSCs). It also does not cover other types of fuel-cycle facilities, such as fuel-reprocessing plants or small mixed oxide fuel-fabrication plants.

This Supplement incorporates updated information, regulations, and analyses. Since the 1988 GEIS was written, the NRC and the industry have gained over 200 facility-years' worth of additional decommissioning experience. Currently, there are 19 nuclear power reactor facilities in the decommissioning process. This includes nine that permanently ceased operations after the NRC published the 1988 GEIS. Since the 1988 GEIS, three facilities have completed decommissioning and terminated their licenses: Pathfinder, Shoreham, and Fort St. Vrain. This Supplement addresses new decommissioning technologies and approaches that the 1988 GEIS did not address. Also, the decommissioning regulations have changed since the 1988 GEIS.

1.2 Process Used to Determine Scope of This Supplement

The content of this Supplement was initially defined by the scope of the 1988 GEIS and was modified based on current decommissioning regulations, inputs from the scoping process and the outcome of meetings between the NRC, the U.S. Environmental Protection Agency (EPA), and the Council on Environmental Quality (CEQ).

Four public scoping meetings were held between April and June 2000 as part of the scoping process. During the meetings, the NRC outlined the GEIS revision process and accepted comments regarding the scope of this Supplement. In addition to comments obtained during the scoping meetings, the NRC received 12 letters from industry groups, other interested organizations, and private citizens. A total of 397 comments were provided during the scoping process. The staff reviewed the comments and categorized them as either relevant to this Supplement or outside of its intended scope. The staff prepared and issued a scoping summary report on April 17, 2001 (NRC 2001), that summarized the comments and NRC responses to the comments. Appendix N is an extraction of comments from the scoping summary report that were considered to be within the scope of the environmental review. The NRC staff published for comment draft Supplement 1 to the GEIS in October 2001. Public meetings in San Francisco, California, Boston, Massachusetts, Chicago, Illinois and Atlanta, Georgia, were held in December 2001, to describe the preliminary results of the NRC environmental review, to answer questions, and to provide members of the public with information to assist them in formatting comments on the draft Supplement. All comments received on the draft Supplement were considered by the staff in developing the final document. Appendix O provides a compilation of comments received on the draft Supplement and staff responses to the comments. Originally, the staff planned to publish the scoping

summary and the response to comments in Appendices A and B of this report. However, due to the length of these two appendices, the staff decided to publish these two appendices and the appendix containing the transcripts and comment letters in a second volume. In addition to the scoping meetings, meetings were held with EPA and CEQ between February and November 2000 to obtain input on the scope of the environmental review.

Site visits were conducted by the NRC staff and its contractor at six nuclear reactor facilities that are in various stages of decommissioning. The site visits were conducted to obtain information and to familiarize the NRC team with the current types of activities conducted and the resulting impacts during decommissioning. In addition to the site visits, the Nuclear Energy Institute arranged access to additional site-specific decommissioning data. In addition to the six sites visited, data was received for three other nuclear power reactor facilities.

Information used in this report was also obtained from docketed material, such as post-shutdown decommissioning activity reports (PSDARs), effluent release reports, license termination plans (LTPs), and decommissioning funding plans.

1.3 Scope of This Supplement

Except for decommissioning planning activities, this Supplement considers only activities that occur following certification that fuel has been removed from the reactor. Figure 1-1 illustrates the decommissioning process. Licensee decommissioning activities are listed in the top part of the timeline. Regulatory activities are summarized by the lower part of the timeline. This section discusses licensee decommissioning activities that are within scope and also explains why some activities and impacts are not in scope for this Supplement. Table 1-1 briefly lists decommissioning activities that are within and outside the scope of this Supplement. Additional discussion of the out-of-scope activities is provided in Appendix D.

Impacts related to the decision to permanently cease operations are outside the scope of this Supplement. This includes impacts that result directly and immediately from the act of permanently ceasing operations, regardless of when or why the decision was made. For example, when a reactor ceases operation, the flow of warmer water into the canal, lake, or river that receives the plant's thermal discharges is stopped, and this may impact the organisms in the vicinity of the thermal outfall. However, this impact is not within the scope of this Supplement because it is essentially a restoration of the existing conditions.

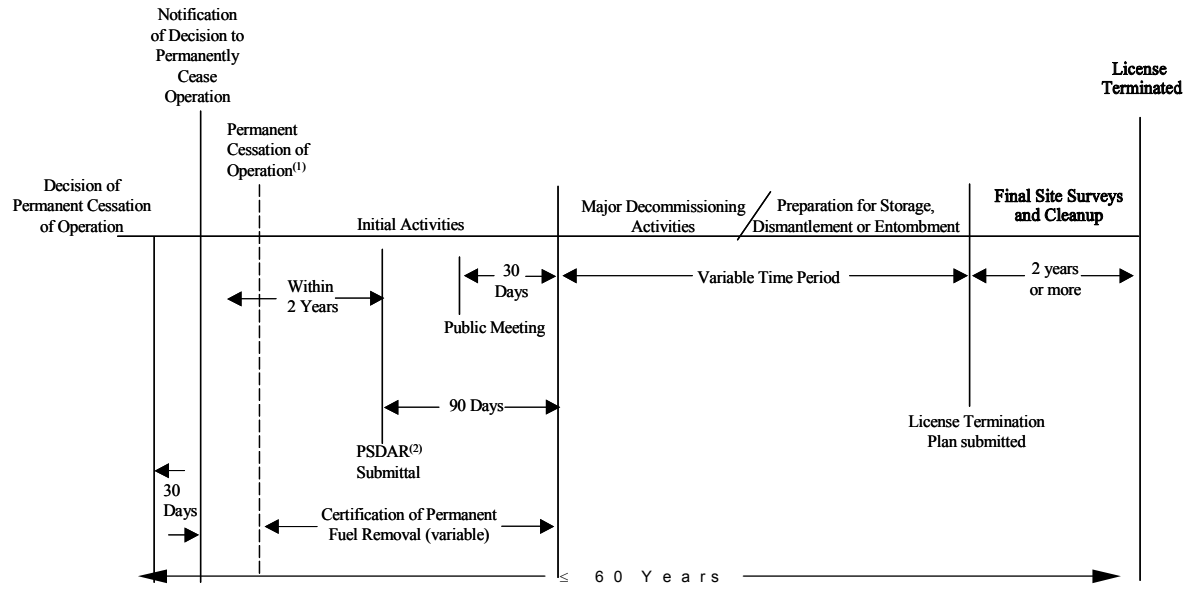

Figure 1-1.
Decommissioning Timeline

(1) The cessation of operations may occur before, concurrent with, or following the certification to permanently cease operations.
(2) The PSDAR may be submitted before permanent cessation of operations.

The licensee may declare or certify the date for permanent cessation of operations prior to the end of the license term and while still operating. In such cases, the decommissioning planning activities prior to shutdown and activities and impacts that occur following the actual shutdown of the facility are within the scope of this Supplement. In some circumstances, the licensee may not operate the facility for a period of many years without certifying that they have permanently ceased power operations. In these cases, the activities occurring before the certification is completed would be considered part of the operational phase of the facility and would be within the scope of the site-specific environmental impact statement (EIS) that covers reactor operations but are outside the scope of this Supplement.

The NRC definition for *decommission* in 10 CFR 50.2 is “to remove a facility or site safely from service and reduce residual radioactivity to a level that permits (1) Release of the property for unrestricted use and termination of the license; or (2) Release of the property under restricted conditions and termination of the license.” This Supplement is not limited only to activities directly related to the removal of radioactive material from facilities or that must be performed to facilitate removal of contaminated SSCs. The staff has included activities and impacts related

to removing uncontaminated SSCs that were required for reactor operation, such as the intake structure or cooling towers. Including uncontaminated SSCs in this Supplement is consistent with an expectation under NEPA that all impacts associated with an activity and that public concerns about the scope of the review be considered.

Various activities that are performed in conjunction with decommissioning are not considered within the scope of this Supplement, but are reviewed and regulated by the NRC under other licenses. These activities include

- independent spent fuel storage installation (ISFSI) construction, maintenance, and decommissioning – An ISFSI can be operated and decommissioned either under the same license that is used for the operating or decommissioning facility called a general license under 10 CFR Part 50, or under a specific license under 10 CFR Part 72. If a licensee chose to operate the ISFSI under a Part 50 license, it could choose to continue to maintain their Part 50 license, or seek a site -specific 10 CFR Part 72 license for the ISFSI, thus allowing termination of the Part 50 license and the end of the reactor decommissioning process. The NRC staff would also be required to conduct an environmental assessment of the licensee's request for a site-specific 10 CFR Part 72 license.

- spent fuel storage and maintenance – The Commission has independently, in a separate proceeding (the Waste Confidence Proceeding), made a finding that there is

  > reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised license) of that reactor at its spent fuel storage basin, or at either onsite or offsite independent spent fuel storage installations. (54 FR 39767)

The Commission has committed to review this finding at least every 10 years. In its most recent review, the Commission concluded that experience and developments since 1990 were not such that a comprehensive review of the Waste Confidence Decision was necessary at that time (64 FR 68005). Accordingly, the Commission reaffirmed its findings of insignificant environmental impacts cited above. This finding is codified in the Commission's regulations at 10 CFR 51.23(a). The staff relies on the Waste Confidence Rule, but has elected to include in this Supplement information related to the storage and maintenance of fuel in a spent fuel pool for completeness.

Table 1-1. Activities and Impacts Within or Outside the Scope of This Supplement

In Scope
• Activities performed to remove the facility from service from the time that the licensee certifies that the facility has permanently ceased operations
• Activities (and the resulting impacts) performed in support of radiological decommissioning, including decontamination and dismantlement of radioactive structures and any activities required to support the decontamination and dismantlement process
• Activities performed in support of dismantlement of nonradiological structures, systems, and components (SSCs) required for the operation of the reactor, such as diesel generator buildings and cooling towers
• Activities performed up to license termination and their resulting impacts as provided in the definition of decommissioning. Nonradiological impacts occurring after license termination from activities conducted during decommissioning
• Activities related to release of the facility
• Human health impacts from radiological and nonradiological decommissioning activities
• Activities related to preparing the facility for entombment
Out of Scope[(a)]
• Activities and the resulting impacts (other than planning activities) that are performed before permanent cessation of operation is certified
• Radiological impacts following license termination
• Activities (and the resulting impacts) performed to dismantle structures on the site that are not radiologically contaminated and were not required for operation of the reactor (e.g., training building and administration building)
• Activities performed to support installation of alternate energy-generating facilities during or following the decommissioning process
• Site restoration activities performed during or after the decommissioning process
• Activities (and their impacts) performed after license termination, such as - any additional non-NRC required monitoring to evaluate radiological impacts - site restoration - continued use of site for power production or other activities
• Activities performed at facilities that are separately licensed or regulated - independent spent fuel storage installation (ISFSI) construction, maintenance, or decommissioning - interim storage of Greater-than-Class-C Waste - spent fuel storage,[(b)] maintenance, and disposal on or away from a reactor location - low-level waste (LLW) disposal at a licensed LLW site or treatment at compactor facilities
• Activities to install engineered barriers and institutional controls for restricted release
• Public perceptions and psychological impacts
• Activities at facilities that have been permanently shut down by a major accident
• Issues related to the ENTOMB option after the facility begins the entombment period

(a) A detailed discussion of the reasons for determining that activities are out of scope can be found in Appendix D.

(b) As discussed in the text, the staff relies on the Waste Confidence Decision Review (54 FR 39767 and 64 FR 68005) but has chosen to include information related to the storage and maintenance of fuel in a spent fuel pool for completeness in this Supplement.

- spent fuel transport and disposal away from the reactor location – Transportation of spent fuel and other high-level nuclear wastes is governed by regulations in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material." Disposal of spent fuel and high-level wastes are governed by the Nuclear Waste Policy Act (NWPA) of 1982, as amended, which defined the goals and structure of a program for permanent, deep geologic repositories for the disposal of high-level radioactive waste and nonreprocessed spent fuel. Under this Act, the U.S. Department of Energy (DOE) is responsible for developing permanent disposal capacity for spent fuel and other high-level nuclear wastes. Title 10 CFR Part 60 contains rules governing the licensing to receive and possess source, special nuclear, and by-product material at a geological repository operations area that is sited, constructed, or operated in accordance with the NWPA. However, the Commission issued the final rule to supercede the generic criteria in 10 CFR Part 60 for disposal at a geological repository with specific criteria in 10 CFR Part 63, issued on November 2, 2001 (66 FR 55732).

- LLW disposal at a licensed LLW site or treatment of LLW at compactor facilities – Regulations related to LLW disposal are in 10 CFR Part 61 and 10 CFR Part 20, Subpart K. A final GEIS supporting the regulations in 10 CFR Part 61, "Final Generic Environmental Impact Statement for 10 CFR Part 61" was published as NUREG-0945 (NRC 1982).

A further description of these activities and the basis for not including them in the scope of this supplement is in Appendix D.

The decommissioning process continues until the licensee requests termination of the license and demonstrates that radioactive material has been removed to levels that permit termination of the NRC license. Once the NRC determines that the decommissioning is completed, the license is terminated. At that point, the NRC no longer has regulatory authority over the site, and the owner of the site is no longer subject to NRC regulations. As a result, activities performed after license termination and the resulting impacts are outside the scope of this Supplement. These activities may include any non-NRC required monitoring, site restoration (grading, planting of vegetation, etc.), continued dismantlement or continued use of the site for activities such as power production using natural gas, oil, or coal.

Any potential radiological impacts following license termination that are related to activities performed during decommissioning are not considered in this Supplement. Such impacts are covered by the Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities, NUREG-1496 (NRC 1997).

Any potential nonradiological impacts resulting from decommissioning and occurring after termination of the license are considered within the scope of this Supplement. Onsite disposal has been proposed by the industry as a method to dispose of slightly radiologically contaminated building rubble provided that the waste is buried onsite below grade, for example, in existing underground portions of the dismantled plant in such a manner as to meet the site release criteria of 10 CFR Part 20, Subpart E. This concept has been referred to as "Rubblization" (the disposal onsite of slightly contaminated material in a manner to meet the 10 CFR Part 20 release criteria).[(a)] On February 14, 2000, the staff informed the Commission of licensee interest in this method and the staff's intent to address Rubblization in this Supplement (NRC 2000). The staff has determined that the long-term radiological aspects of Rubblization, or onsite disposal of slightly contaminated material, would require a site-specific analysis and would be addressed at the time the LTP is submitted. The nonradiological impacts, occurring both during the decommissioning period (e.g., noise, dust, land disturbance), and the long-term impacts occurring after the decommissioning activities are completed (e.g., concrete leaching into the groundwater) can be evaluated generically and are included in the evaluation of each of the applicable environmental issues in Chapter 4 of this document.

Public perceptions and psychological impacts related to the risk of a radiological accident during decommissioning are not addressed in the 1988 GEIS and are not addressed in this Supplement. The U.S. Supreme Court stated in *Metropolitan Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766, at 774-775, that such psychological effects or impacts raised policy questions that fell outside of NEPA. This court case involved an organization of residents living in the area of Three Mile Island, People Against Nuclear Energy (PANE), that claimed the NRC should consider, as part of an EIS, the severe psychological stress caused to its members by the restart of Three Mile Island, Unit 1, after the accident at Three Mile Island, Unit 2. However, in *Metropolitan Edison Co., et al. v. People Against Nuclear Energy* (1983), the Supreme Court read NEPA to require

> a reasonably close causal relationship between a change in the physical environment and the effect at issue .... a risk of an accident is not an effect on the physical environment .... We believe that the element of risk lengthens the causal chain beyond the reach of NEPA.

(a) The term "rubblization" is frequently used to describe the crushing of structural material (e.g., concrete) to facilitate disposal. The material may be concrete that is uncontaminated or contaminated with radiological material. The staff used the term Rubblization to describe the process of onsite disposal of slightly contaminated material in a manner to meet the site release criteria. For this report, in order to avoid confusion, the staff chose to use the term "demolition" instead of rubblization as the verb to describe the process of crushing structural material to allow for easy burial or disposal.

The decommissioning activities following shutdown of a facility after a major accident resulting in significant contamination of the site are outside the scope of this Supplement. For most types of accidents, decommissioning would be treated on a site-specific basis and, therefore, cannot be considered in a generic sense.

1.4 Categories for Environmental Impacts and Extent of Issues

In the analysis of potential issues in decommissioning activities, two areas in particular were found to benefit from categorization: (a) ranking the significance and severity of potential environmental impacts for proposed decommissioning activities and (b) sorting potential issues as either generic or site-specific.

1.4.1 Levels of Significance of Environmental Impacts

For decommissioning, the staff is using a standard of significance derived from the CEQ terminology for "significantly" (40 CFR 1508.27, which considers "context" and "intensity"). The NRC has defined three significance levels: SMALL, MODERATE, and LARGE.

SMALL – Environmental impacts are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts in this Supplement, the NRC has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

MODERATE – Environmental impacts are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE – Environmental impacts are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The discussion of each environmental issue in this Supplement includes an explanation of how the significance level was determined. In determining the significance level, the NRC staff assumed that ongoing mitigation measures would continue (including those mitigation measures implemented during plant construction and/or operation) during decommissioning, as appropriate. Benefits of additional mitigation measures during or after decommissioning are not considered in determining significance levels.

1.4.2 Regulatory Distinction of Generic and Site-Specific Approaches

In addition to determining the significance of environmental impacts, this Supplement includes a determination of whether the analysis of the environmental issue could be applied to all plants, and whether additional mitigation measures would be warranted. An environmental issue may be assigned to one of two categories (generic or site-specific) described below.

- Generic – For each environmental issue, the analysis reported in this Supplement shows the following:

  (1) Environmental impacts associated with the issue have been determined to apply either to all plants, or for some issues to plants having a specific size, specific location, or having a specific type of cooling system or other site characteristics, and

  (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts, and

  (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

- Site-specific – For each environmental issue that was determined to be site-specific, the analysis reported in this Supplement has shown that one or more of the generic criteria was not met. Therefore, additional plant-specific review is required.

1.5 Uses of This Supplement

This Supplement can be used by the public to understand the decommissioning process, the activities performed during decommissioning, and the potential environmental impacts resulting from these activities. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process.

This Supplement identifies activities that can be bounded by a generic evaluation. It also identifies the decommissioning activities and associated environmental issues that will likely require site-specific analysis before performing a decommissioning activity.

Licensees can rely on the information in this Supplement as a basis for meeting the requirements in 10 CFR 50.82(a)(6)(ii). This requirement states that the licensee must not perform any decommissioning activity that causes any significant environmental impact not previously

reviewed. Prior to conducting a decommissioning activity, the licensee must make a determination that the resulting environmental impacts fall within the bounds of this Supplement or of another EIS related to its facility. When finalized, licensees are expected to reflect the environmental impacts described in this Supplement rather than those in the 1988 GEIS. For any decommissioning activity that does not meet these conditions, the regulations prohibit the licensee from undertaking the activity until it performs a site-specific analysis of the activity. Depending on the results of the site-specific evaluation, the staff may determine that it is appropriate to consult with another agency about the potential impacts. Such agencies could include the U.S. Fish and Wildlife Service or a State Historic Preservation Office. If the activity would result in an impact that is outside the bounds of the GEIS or other environmental assessments, the licensee would be required to submit a license-amendment request. The NRC staff periodically inspects the licensee's procedures and documentation to ensure that a proper environmental review is part of the screening criteria used for proposed changes to the facility.

In addition to the NRC staff's review of the licensee's procedures and documentation, there are two points during the decommissioning process when the licensee performs an evaluation of environmental impacts. The first evaluation occurs when the licensee must submit a PSDAR to the NRC (within two years following permanent cessation of operation). The PSDAR must include a discussion that provides the reasons for concluding that the environmental impacts associated with the licensee's planned site-specific decommissioning activities will be bounded by an appropriate previously issued environmental assessments, including this Supplement. If the licensee identifies environmental impacts that are not bounded by a previous NRC environmental assessment, the licensee must address the impacts in a request for a license amendment regarding the activities. The licensee must also submit a supplement to its environmental report (ER) that describes and evaluates the additional impacts. The NRC will review the supplement to the ER in conjunction with its review of the license-amendment request.

The second evaluation is near the end of decommissioning at the time when the licensee submits an application for license termination. In accordance with 10 CFR 50.82(a)(9), a licensee must submit its LTP at least 2 years before the anticipated termination date of the license. The LTP must be a supplement to the Final Safety Analysis Report or its equivalent for the facility and is submitted as a license amendment. The NRC requires an environmental review as part of the review of the license-amendment request. Thus, the LTP must include a supplement to the ER that describes any new information or significant environmental change associated with the licensee's proposed termination activities. The NRC staff will also rely upon this supplement as a basis for determining if anticipated decommissioning impacts require an additional review.

1.6 Development of This Supplement

The requirements in 10 CFR Part 51 were followed for the development of this Supplement. This included conducting scoping meetings and obtaining public comments (see Appendix N). From these meetings and meetings with other appropriate government agencies, the staff defined the scope of this Supplement (see Sections 1.2 and 1.3). During the scoping process, the staff developed an evaluation process for determining the environmental impacts from decommissioning. Section 4.2 provides additional discussion of the process and Appendix E provides a detailed description of the analysis used to identify the environmental impacts from decommissioning. The evaluation process involved determining the specific activities that occur during decommissioning and obtaining data from site visits and from an information request to decommissioning plants that was related to the impact of these activities at currently decommissioning facilities. The data obtained from the decommissioning sites were analyzed and then evaluated against a list of variables that defined the parameters for plants that are currently operating but which will one day be decommissioned. This evaluation resulted in a range of impacts for each environmental issue that may be used for comparison by licensees that are or will be decommissioning their facilities.

1.7 Parts of This Supplement

Chapter 2 provides background, describing the basis for the current regulations and summarizing the regulations. Chapter 3 describes the types of plants covered by this Supplement, which includes permanently shutdown reactor facilities as well as operating facilities that will eventually cease power operations. Chapter 3 also describes the location and types of buildings on the sites, the systems that may still be active after permanent shutdown, and changes in effluents after permanent shutdown. Chapter 4 describes activities conducted during the decommissioning process and impacts that could arise from these activities. The analysis of the impacts is based on variables such as the option of decommissioning, location of plant, type of plant, and timing of the activity. Chapter 5 discusses the “No Action” alternative to decommissioning, which is the abandonment of the facility after the cessation of operations. Chapter 6 contains the summary of findings and conclusions.

1.8 References

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, “Standards for protection against radiation.”

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR 60. Code of Federal Regulations, Title 10, *Energy*, Part 60, "Disposal of high-level radioactive wastes in geologic repositories."

10 CFR 61. Code of Federal Regulations, Title 10, *Energy*, Part 61, "Licensing requirements for land disposal of radioactive waste.

10 CFR 63. Code of Federal Regulations, Title 10, *Energy*, Part 63, "Disposal of high-level radioactive wastes in a geologic repository at Yucca Mountain, Nevada."

10 CFR 71. Code of Federal Regulations, Title 10, *Energy*, Part 71, "Packaging and transportation of radioactive material."

10 CFR 72. Code of Federal Regulations, Title 10, *Energy*, Part 72, "Licensing requirements for the independent storage of spent nuclear fuel, high-level radioactive waste, and reactor-related greater-than-Class-C waste."

40 CFR 1508. Code of Federal Regulations, Title 40, *Protection of the Environment*, Part 1508, "Terminology and Index."

54 FR 39767. "10 CFR Part 51 Waste Confidence Decision Review." *Federal Register*. September 28, 1989.

64 FR 68005. "Waste Confidence Decision Review." *Federal Register*. December 6, 1999.

66 FR 55732. "Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada." *Federal Register*. November 2, 2001.

Metropolitan Edison Co., et al v. People Against Nuclear Energy, 460 U.S. 766, at 774-775. 1983.

National Environmental Policy Act (NEPA) of 1969, as amended, 42 USC 4321 et seq.

Nuclear Waste Policy Act of 1982, as amended, 42 USC 10.101 et seq.

U.S. Nuclear Regulatory Commission (NRC). 1982. *Final Generic Environmental Impact Statement for 10 CFR Part 61*. NUREG-0945, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997. *Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities*. NUREG-1496, Vol. 1, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. "SECY-00-0041 Use of Rubblized Concrete Dismantlement to Address 10 CFR Part 20, Subpart E, Radiological Criteria for License Termination." NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001. Letter from U.S. NRC to Distribution: "Subject: Issuance of a scoping summary report of comments received related to the intent to develop a Supplement to NUREG-0586." Dated April 17, 2001.

2.0 Background Information Related to Decommissioning Regulations

This section provides background information that will assist the reader in understanding the requirements for decommissioning and license termination. The basis for the current decommissioning regulations and a summary of the current regulations are provided below. This chapter and Chapter 3, "Description of NRC Licensed Reactor Facilities and the Decommissioning Process," will give the reader a basic understanding of the overall reactor decommissioning process and environmental impact assessments used during the process.

2.1 Basis for Current Regulations

In the mid-1990s, the Commission initiated an effort to significantly change the regulations for decommissioning power reactor facilities. The new regulations were intended to make the decommissioning process more current, efficient, and uniform. On July 29, 1996, a final rule revising 10 CFR 50.82, "Decommissioning of Nuclear Power Reactors," was published in the Federal Register (61 FR 39278). This rule redefined the decommissioning process and modified the regulations written in 1988, which had required submittal of a detailed decommissioning plan before the start of decommissioning.

The regulations were revised based on experience gained from reactor decommissionings that had occurred during the 1980s and early 1990s. Review of the activities that occur during decommissioning showed that they are similar to the activities that occur during the construction, operation, maintenance, and refueling outages of a power reactor (e.g., decontamination, steam generator replacement, and pipe removal). However, the magnitude of some activities during decommissioning (e.g., removal of piping) is considerably greater than during operations. Activities associated with the decommissioning of facilities had resulted in impacts consistent with or less than those evaluated in the 1988 *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (GEIS), NUREG-0586 (NRC 1988). Based on the above reasons, the Commission determined that review and approval by the U.S. Nuclear Regulatory Commission (NRC) staff of a detailed decommissioning plan was not necessary.

2.2 Summary of Current Regulations

2.2.1 Regulations for Decommissioning Activities

The current regulations (10 CFR 50.82) specify the regulatory actions that both the NRC and the licensee must take to decommission a nuclear power facility. Once the licensee decides to permanently cease operations, it must submit, within 30 days, a written certification to the NRC.

The notification must contain the date on which the power-generating operations ceased or will cease. The licensee must permanently remove all fuel from the reactor and submit a written certification to the NRC confirming the completion of fuel removal. Once this certification has been submitted, the licensee is no longer permitted to operate the reactor, or to put fuel back into the reactor vessel. After certification that the fuel is removed, the annual license fee to the NRC is reduced as well as the licensee's obligation to adhere to certain requirements that are needed only during reactor operations.

In addition to the certifications, the licensee must submit a post-shutdown decommissioning activities report (PSDAR) to the NRC and any affected States no later than 2 years after the date of permanent cessation of operations. Section 10 CFR 50.82 requires that the PSDAR include

- a description of the licensee's planned major decommissioning activities
- a schedule for completing these activities
- an estimate of the expected decommissioning costs
- a discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by an appropriate previously issued environmental impact statement (EIS).

After receiving a PSDAR, the NRC publishes a notice of receipt in the Federal Register, makes the PSDAR available for public review and comment, and holds a public meeting in the vicinity of the facility to discuss the licensee's plans. The NRC will examine the PSDAR to determine if the required information is included and will inform the licensee in writing if there are deficiencies that must be addressed before the licensee initiates any major decommissioning activities. The regulations require a 90-day waiting period after submittal of the PSDAR before the licensee may commence major decommissioning activities.

The purpose of the PSDAR is to provide the NRC and the public with a general overview of the licensee's proposed decommissioning activities. The PSDAR serves to inform the NRC staff of the licensee's expected activities and schedule, which facilitates planning for inspections and decisions regarding NRC oversight activities. The PSDAR is also a mechanism for informing the public of the proposed decommissioning activities before those activities are conducted.

Prior to submission of the PSDAR, the licensee can conduct a variety of activities at the site including activities to ensure the safe shutdown of the facility. Systems can be drained, components removed, and certain structures demolished. However, the licensee is prohibited from undertaking any major decommissioning activity as defined in 10 CFR 50.2.

Once the PSDAR has been submitted and the 90-day period has been completed, the licensee may begin major decommissioning activities, which may include the following:

- permanent removal of major radioactive components, such as the reactor vessel, steam generators, or other components that are comparably radioactive
- permanent changes to the containment structure
- dismantling of components containing Greater-than-Class-C (GTCC) Waste.[(a)]

In accordance with 10 CFR 50.82(a)(6)(ii), licensees shall not perform any decommissioning activities "that result in significant environmental impacts not previously reviewed." If any decommissioning activity does not meet this requirement, the licensee must submit a license-amendment request before conducting the activity. The licensee also must submit a supplement to its environmental report (ER) that relates to the additional impacts. The NRC will review the ER Supplement, and prepare an environmental assessment (EA) or EIS, and amendment to the license in conjunction with its review.

The licensee can choose (1) to immediately decontaminate and dismantle the facility (DECON), or (2) to place the facility in long-term storage (SAFSTOR) followed by subsequent decontamination and dismantlement, or (3) to perform some incremental decontamination and dismantlement activities before or during the storage period of SAFSTOR. Under the current regulations, unless the licensee receives permission to the contrary, the site must be decommissioned within 60 years. Chapter 3 describes in more detail the decommissioning

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(a) The NRC has adopted a waste classification system for low-level radioactive waste based on its potential hazards, and has specified disposal and waste form requirements for each of the general classes of waste: A, B, and C. The classifications are based on the key radionuclides present in the waste and their half-lives. Tables defining these three classes are contained in 10 CFR 61.55. In general, requirements for waste form, stability, and disposal methods become more stringent when going from Class A to Class C. GTCC waste exceeds the concentration limits in 10 CFR 61.55 and is generally unsuitable for near-surface disposal as low-level waste (LLW), even though it is legally defined as LLW. The NRC's regulations in 10 CFR 61.55(a)(2)(iv) require that this type of waste must be disposed of in a geologic repository unless approved for an alternative disposal method on a case-specific basis by the NRC. 10 CFR Part 72 allows for interim storage of GTCC from a commercial power reactor.

options available to the licensee. In this Supplement, the staff also evaluates another option called ENTOMB, which encases the radioactive contaminants in a structurally long-lived material.

2.2.2 Regulations for License Termination

In order to terminate the license and allow release of the site, the licensee must submit a license termination plan (LTP). In accordance with 10 CFR 50.82(a)(9), an application for license termination must be accompanied or preceded by an LTP, which is subject to NRC review and approval. The licensee must submit the LTP at least 2 years before the date of license termination. The LTP approval process is by license amendment. By regulation, the LTP must include the following:

- a site characterization
- identification of remaining dismantlement activities
- plans for site remediation
- detailed plans for the final survey of residual contamination
- a description of the end-use of the site (if restricted use is proposed)
- an updated site-specific estimate of remaining decommissioning costs
- a supplement to the ER.

The licensee must submit the LTP as a supplement to its Final Safety Analysis Report or as an equivalent document, thus formalizing the steps necessary to revise the document.

After receiving the LTP, the NRC will place a notice of receipt of the plan in the Federal Register and will make the plan available to the public for comment. The NRC will schedule a public meeting near the facility to discuss the plan's contents and the staff's process for reviewing the submittal. The NRC will also offer an opportunity for a public hearing on the license-amendment request associated with the LTP. At this stage, a site-specific EA is required. Depending on the circumstances, the EA evaluation can result in the development of a full EIS. If the LTP demonstrates that the remainder of decommissioning activities will be performed in accordance with NRC regulations, are not detrimental to the health and safety of the public, and will not have a significant adverse effect on the quality of the environment, the

Commission will approve the plan by a license amendment (subject to whatever conditions and limitations the Commission deems appropriate and necessary).

After the approval of the LTP, the NRC will continue its inspection of the site. These inspections will include validation of commitments made in the LTP. Inspections may also include confirmatory surveys to verify that areas of the site have been decontaminated to the limits established in the LTP.

On July 21, 1997, the NRC published (also in the Federal Register) a final rule entitled, "Radiological Criteria for License Termination" (64 FR 39058) prescribing specific radiological criteria for license termination. At the end of the LTP process, if the NRC determines that the remaining dismantlement has been performed in accordance with the approved LTP, and if the final radiation survey and associated documentation demonstrate that the facility and site are suitable for release, then the Commission will terminate the license.

The radiological criteria for license termination are given in 10 CFR Part 20, Subpart E. There are two broad categories of uses for the facility after the license termination: unrestricted use and restricted use.

Unrestricted use means that there are no NRC-imposed restrictions on how the site may be used. State and local jurisdictions may, and have, imposed additional restrictions or requirements on licensees. The licensee is free to continue to dismantle any remaining buildings or structures and to use or sell the land for any type of application. The Commission has established a 0.25 mSv/yr (25 mrem/yr) total effective dose equivalent (TEDE) to an average member of the critical group[(a)] as an acceptable criterion for release of any site for unrestricted

(a) The "critical group" is that group of individuals reasonably expected to receive the highest exposure to residual radioactivity within the assumptions of a particular scenario. The average dose to a member of the critical group is represented by the average of the doses for all members of the critical group, which in turn is assumed to represent the most likely exposure situation. For example, when considering whether it is appropriate to "release" a building that has been decontaminated (allow people to work in the building without restrictions), the critical group would be the group of employees that would regularly work in the building. If radiation in the soil is the concern, then the scenario used to represent the maximally exposed individual is that of a resident farmer. The assumptions used for this scenario are prudently conservative and tend to overestimate the potential doses. The added "sensitivity" of certain members of the population, such as pregnant women, infants, children, and any others who may be at higher risk from radiation exposures, are accounted for in the analysis. However, the most sensitive member may not always be the member of the population that receives the highest dose. This is especially true if the most sensitive member (e.g., an infant) does not participate in activities that provide the greatest dose or if they do not eat specific foods that cause the greatest dose.

use. The licensee will be required to show that the site can meet this criterion before the license will be terminated for unrestricted use. In addition, the licensee will need to show that the amounts of residual radioactivity have been reduced to levels that are as low as reasonably achievable (ALARA).[(a)] For sites that have been determined to be acceptable for unrestricted use, there are no requirements for further measurement of radiation levels. It is not expected that these radiation levels would change (other than to be reduced over time through radioactive decay), and there would be no mechanism for further contamination or radiological releases.

Restricted use means that there are restrictions on the facility use after license termination. A site would be considered acceptable for license termination under restricted conditions if the licensee can demonstrate that further reductions in residual radioactivity necessary to meet the requirements for unrestricted use would result in net public or environmental harm, or were not being made because the residual levels were ALARA. In addition, the licensee must have made provisions for legally enforceable institutional controls (e.g., use restrictions placed in the deed for the property) that provide reasonable assurance that the radiological criteria set by the NRC (0.25 mSv/yr [25 mrem/yr] TEDE to an average member of the critical group) will not be exceeded. The licensee must also have provided sufficient financial assurance to an amenable independent third party to assume and carry out responsibilities for any necessary control and maintenance of the site. There are also regulations relating to the documentation of how the advice of individuals and institutions in the community who may be affected by decommissioning has been sought and incorporated in the LTP if the license is to be terminated under restricted conditions.

Residual radioactivity at the site must be reduced so that if the institutional controls were no longer in effect, there would be reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group would be ALARA and would not exceed either 1 mSv/yr (100 mrem/yr) or 5 mSv/yr (500 mrem/yr). In the latter case, the licensee must (1) demonstrate that further reductions in residual radioactivity necessary to comply with the 1 mSv/yr (100 mrem/yr) value are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm, (2) make provisions for durable institutional controls, and (3) provide sufficient financial assurance to enable a responsible government entity or independent third party to carry out periodic checks of the facility no less frequently than every 5 years to ensure that the institutional controls remain in place.

(a) The ALARA concept means that all doses are to be reduced below required levels to the lowest reasonably achievable level considering economic and societal factors. Determination of levels that are ALARA must consider any detriments, such as deaths from transportation accidents, that are expected to potentially result from disposal of radioactive waste.

Alternate release criteria may be used in specific cases. The use of alternate criteria to terminate a license requires the approval of the Commission after consideration of the NRC staff's recommendations that address comments provided by the U.S. Environmental Protection Agency and any public comments submitted pursuant to 10 CFR 20.1405. These alternate criteria are expected to be used only in very rare cases.

To date, the three NRC-licensed facilities (Shoreham, Fort St. Vrain, and Pathfinder) that have completed the decommissioning process have had their licenses terminated, allowing unrestricted use of the sites. License termination plans have been submitted for three other facilities. The LTPs describe plans for unrestricted use of the sites following license termination. No nuclear power licensees have indicated that they plan for restricted use of the site after license termination.

A proposed rule was issued on September 4, 2001 (66 FR 46230) for partial site release prior to license termination. Partial site release means release of part of a nuclear power reactor facility or site for unrestricted use prior to NRC approval of the LTP. The NRC proposes to add a new section to 10 CFR Part 50, separate from the existing rules for decommissioning and radiological criteria for license termination, that identifies the requirements and criteria necessary for partial site release. The proposed rule includes associated amendments to 10 CFR Part 2 and 10 CFR Part 20. The purpose of this rulemaking is to ensure that any remaining residual radioactive material from licensed activities on a portion the site released for unrestricted use will meet the radiological criteria for license termination.

Licensees will be required to submit information necessary to demonstrate the following:

- The release of radiologically impacted property complies with the radiological criteria for unrestricted use in 10 CFR 20.1402 (0.25 mSv/yr [25 mrem/yr] to the average member of the critical group and ALARA).

- The licensee will continue to comply with all other applicable regulatory requirements that may be affected by the release of property and changes to the site boundary. This would include, for example, requirements in 10 CFR Parts 20, 50, 72, and 100.

- Records of property-line changes and the radiological conditions of partial site releases are being maintained to ensure that the dose from residual material associated with these releases can be accounted for at the time of any subsequent partial releases and at the time of license termination.

The proposed rule provides additional flexibility to licensees who are releasing property that has never been radiologically impacted. While an amendment of the Part 50 operating license is required to release radiologically impacted property, the proposed rule offers the opportunity for a letter submittal for partial releases if the licensee can demonstrate that there is no reasonable potential for residual radioactivity from license activities.

2.3 References

10 CFR 2. Code of Federal Regulations, Title 10, *Energy*, Part 2, "Rules of practice for domestic licensing proceedings and issuance of orders."

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic licensing of production and utilization facilities."

10 CFR 61. Code of Federal Regulations, Title 10, *Energy*, Part 61, "Licensing requirements for land disposal of radioactive waste."

10 CFR 72. Code of Federal Regulations, Title 10, *Energy*, Part 72, "Licensing requirements for the independent storage of spent nuclear fuel high-level radioactive waste and reactor-related greater-than-Class-C waste."

10 CFR 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor site criteria."

61 FR 39278. "Decommissioning of Nuclear Power Reactors. Final Rule." *Federal Register*. July 29, 1996.

64 FR 39058. "Radiological Criteria for License Termination. Final Rule." *Federal Register*. July 21, 1997.

66 FR 46230. "Releasing Part of a Power Reactor Site or Facility for Unrestricted Use Before the NRC Approves the License Termination Plan. Proposed Rule." *Federal Register*. September 4, 2001.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.

3.0 Description of NRC Licensed Reactor Facilities and the Decommissioning Process

This chapter provides information on both the operating nuclear power plants and those being decommissioned. First, a general description of the nuclear power plants and sites is provided in Section 3.1 to help the reader understand the types of reactor facilities that will be decommissioned, the location of the radioactive material in these facilities, and the structures, systems, and components (SSCs) that will be referred to later in this document and that are important in the decommissioning process. Next, the methods that are commonly used during decommissioning are described in Section 3.2. Section 3.3 addresses the decommissioning experience of the currently decommissioning plant sites, their chosen method for decommissioning, and the activities that are being used to decommission the facilities.

There are currently 22 nuclear power reactors at 21 sites that are permanently shut down: 19 of these reactors are in various stages of decommissioning, and reactors at 3 sites have finished decommissioning and no longer maintain a license. The decommissioning efforts at these 22 plants equates to over 200 equivalent years of experience decommissioning commercial power reactors since the 1988 *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586 (1988 GEIS; NRC 1988) was published. There are also currently 104 nuclear plants that have a license and are either operating or have not yet certified that they have permanently ceased power operations. Between 2006 and 2035, these 104 plants will either permanently cease operations or renew their licenses. Ultimately, they will all permanently cease operations and be decommissioned.

3.1 Plants, Sites, and Reactor Systems[(a)]

Between 1957 and 1996, the U.S. Nuclear Regulatory Commission (NRC) issued 126 operating licenses for commercial power reactor operation at 80 sites. The history of and experience with the 22 reactors that are being decommissioned currently or have completed decommissioning are addressed in Section 3.3. Because each of the remaining 104 operating plants will eventually enter the decommissioning process, their attributes and characteristics are included in this section to ensure that this Supplement is appropriate for future decommissioning plants. The material presented in this section is also provided as background information for the reader.

(a) Much of the information in this section was taken from NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NRC 1996) and from NUREG-1628, *Staff Responses to Frequently Asked Questions Concerning Decommissioning of Nuclear Power Reactors* (NRC 2000a). This information has been supplemented and updated as appropriate to include all operating and currently decommissioning nuclear plants.

Nuclear power reactor facilities are located in 35 of the contiguous States, with none in Alaska or Hawaii. Thirty-nine sites contain two or three nuclear power reactors (units) per site. Of the 126 plants, 98 are located east of the Mississippi River with most of the nuclear capacity located in the northeast (New England States, New York, and Pennsylvania), the midwest (Illinois, Michigan, and Wisconsin) and the southeast (Virginia, North and South Carolina, Georgia, Florida, and Alabama).

Typically, nuclear power plants are sited in flat or rolling countryside, in wooded or agricultural areas away from urban areas. Most are located on or near rivers or lakes. Several plants are located in arid regions, and 19 plants are located along the seacoast on bays or inlets. More than 50 percent of the sites have 80-km (50-mile) population densities of less than 77 persons/km^2 (200 persons/mi^2) and over 80 percent have 80-km (50-mile) densities of less than 193 persons/km^2 (500 persons/mi^2). The most notable exception is the Indian Point Station, located within 80 km (50 mi) of New York City, which has a projected 1999 population density within 80 km (50 mi) of more than 770 persons/km^2 (2000 persons/mi^2). Indian Point has one permanently shutdown reactor and two operating reactors.

Site areas range from a minimum of 34 ha (84 ac) for the San Onofre Nuclear Generating Station, (a three unit site, with one permanently shutdown reactor) in California to 9700 ha (24,000 ac) for the Turkey Point Plant in Florida (two operating units). Almost 60 percent of plant sites cover from 200 to 800 ha (500 to 2000 ac). Larger land-use areas are associated with plant cooling systems that include reservoirs, artificial lakes, and buffer areas.

Appendix F contains summary tables for both permanently shutdown and currently operating nuclear power facilities showing location, reactor type, thermal power, site area, cooling system and cooling water source, and licensing dates.

3.1.1 Types of Nuclear Power Reactor Facilities

In the United States, nearly all reactors used for commercial power generation have been conventional (thermal) light water reactors (LWRs) that use water as a moderator and coolant. The two types of LWRs are pressurized water reactors (PWRs) and boiling water reactors (BWRs). Of the 123 LWRs, 80 are PWRs and 43 are BWRs. The three plants that are not LWRs are Fermi, Unit 1, which is a permanently shutdown fast breeder reactor (FBR), and Peach Bottom, Unit 1, and Fort St. Vrain, which are permanently shutdown high-temperature gas-cooled reactors (HTGRs). Fermi, Unit 1, is currently performing the decontamination and

dismantlement phase of SAFSTOR (see Section 3.2). Peach Bottom, Unit 1, is in long-term storage. Fort St. Vrain has had its license terminated following completion of decommissioning activities.

Brief descriptions of these different types of reactors are given below as background.

3.1.1.1 Pressurized Water Reactors

In PWRs, water is heated to a high temperature under pressure inside the reactor. The water is then pumped in the primary circulation loop to the steam generator. Within the steam generator, water in the secondary circulation loop is converted to steam that drives the turbines. The turbines turn the generator to produce electricity. The steam leaving the turbines is condensed by water in the tertiary loop and returned to the steam generator. The tertiary loop water flows either to cooling towers, where it is cooled by evaporation or discharged to a body of water such as a river, lake, or other heat sink. The tertiary loop is open to the atmosphere, but the primary and secondary cooling loops are not (see Figure 3-1).

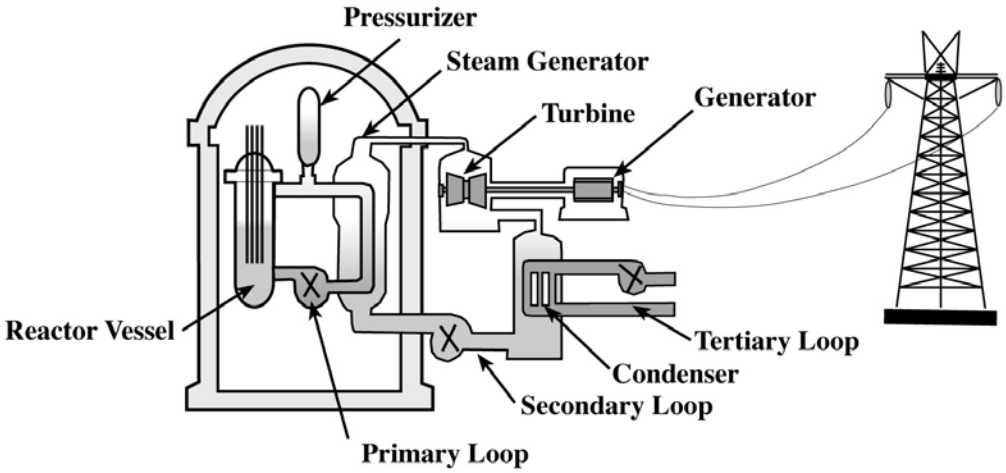

Figure 3-1. Pressurized Water Reactor

3.1.1.2 Boiling Water Reactors

The BWRs generate steam directly within the reactor vessel. The steam passes through moisture separators and steam dryers and then flows to the turbine. By generating steam directly in the reactor vessel, the power generation system contains only two heat transfer loops. The primary loop transports the steam from the reactor vessel directly to the turbine, which generates electricity. The secondary coolant loop removes excess heat from the primary

loop in the condenser. From the condenser the primary condensate proceeds into the feedwater stage and the secondary coolant loop removes the excess heat to the environment (see Figure 3-2).

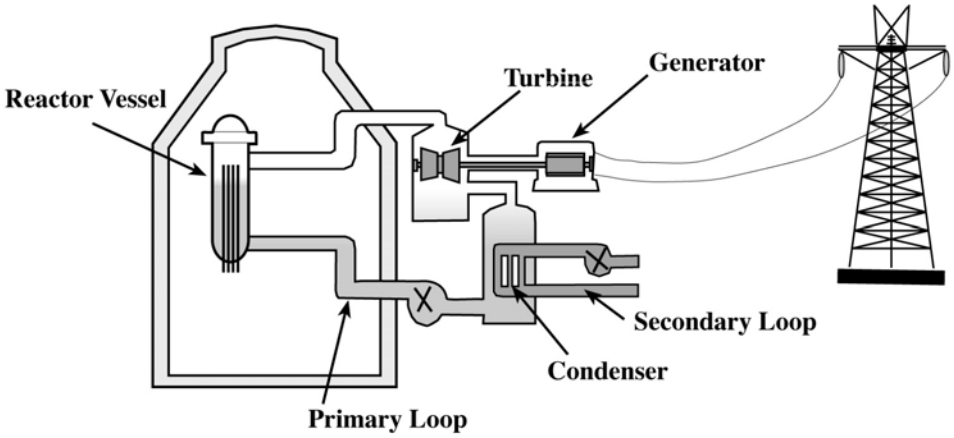

Figure 3-2. Boiling Water Reactor

3.1.1.3 Fast Breeder Reactors

In the FBR, such as Fermi, Unit 1, liquid sodium is used as the reactor coolant instead of water. The Fermi, Unit 1, FBR used the fissile isotope of uranium as fuel. During the chain reaction, while some neutrons are fissioning plutonium atoms and releasing heat energy, others are captured by uranium atoms, which are then converted into more plutonium atoms. Depending on design, a fast breeder can produce 1.4 new plutonium atoms for every one fissioned–enough to refuel another reactor in 10 years. Fast breeders also generally have a higher power density in the core (thus, a smaller reactor) and better heat transfer characteristics, which improves power-plant efficiency. The Fermi, Unit 1, reactor also utilized a steam cycle to generate electricity, similar to a PWR. However, the Fermi, Unit 1, reactor had two sodium loops. Primary-loop liquid sodium was circulated through the reactor core, where it absorbed the heat generated by the reactor, and then through a heat exchanger, where its heat was transferred to the second (intermediate) sodium loop. The intermediate-loop liquid sodium was then circulated through a steam generator. The steam produced in the steam generators was then circulated to the turbine generators to produce electricity.

At this time, there are no commercial FBRs operating or under construction in the United States. Fermi, Unit 1, is currently in SAFSTOR. The environmental impacts described in this Supplement for FBRs are applicable to Fermi, Unit 1.

3.1.1.4 High-Temperature Gas-Cooled Reactors

Commercial HTGRs, operated in the United States at Peach Bottom, Unit 1, and Fort St. Vrain, use helium gas instead of water (as in LWRs) to transfer the heat from the reactor core to produce steam. In HTGRs, the entire primary coolant system, including the reactor, the steam generators, and the helium circulators, is housed within a prestressed concrete or steel reactor vessel. The helium circulators pump the pressurized coolant through the core, where it absorbs the heat from the fission process. The helium then enters the steam generators, which transfer the heat to the secondary system. The secondary system is a steam cycle similar to that found in any modern fossil-fuel facility. Superheated steam is produced in the steam generators and routed to the turbine generator, which generates the electricity (Fuller 1988).

At this time, there are no HTGRs operating or under construction in the United States. Decommissioning at Fort St. Vrain is complete and the license is terminated, and Peach Bottom, Unit 1, is currently in SAFSTOR. The environmental impacts described in this Supplement for HTGRs are applicable to Peach Bottom, Unit 1.

3.1.2 Types of Structures Located at a Nuclear Power Facility

As discussed in Chapter 1, the definition of decommissioning includes the reduction of residual radioactivity to a level that permits release of the property and termination of the license. As a result, the decontamination and/or dismantlement of those SSCs that are radioactive are, by definition, included within the scope of this Supplement as part of decommissioning. If the structures must be decontaminated or parts of the structures removed to meet the requirements for the termination of the NRC license, those activities are also considered within scope as part of the decommissioning process. This includes removing nonradiological structures necessary to decontaminate another structure. Additionally, the impacts of dismantling all SSCs that were built or installed at the site to support power production are considered in this Supplement. This section discusses all the structures that will be referred to later in the document as background information for the reader.

Nuclear power plants generally contain similar facilities. They all contain a nuclear steam supply system, as described in Section 3.1.1 above. Additionally, there are a number of common SSCs necessary for plant operation. However, the layout of buildings and structures varies considerably among the sites. For example, control rooms may be located in the auxiliary building, in a separate control building, or in a radwaste and control building. Thus, the following list describes typical structures located on most sites.

- Containment or reactor building: The containment or reactor building in a PWR is a massive concrete or steel structure that houses the reactor vessel, reactor coolant piping and pumps, steam generators, pressurizer, pumps, and associated piping. The reactor building structure of a BWR generally includes a containment structure and a shield building. The containment is a massive concrete or steel structure that houses the reactor vessel, the reactor coolant piping and pumps, and the suppression pool. It is located inside a somewhat less substantive structure called the shield building. The shield building for a BWR also generally contains the spent fuel pool and the new fuel pool.

  The reactor building for both PWRs and BWRs is designed to withstand such disasters as hurricanes and earthquakes. The containment's ability to withstand such disasters and to contain the effects of accidents initiated by system failures are the principal protections against releasing radioactive material to the environment.

  The containment building for the FBR is a steel-domed structure that contains the upper end of the reactor vessel and the fuel-handling equipment. Below ground there is considerable concrete shielding.

  The HTGRs have two containment structures. Peach Bottom's inner containment structure is made of a steel pressure vessel and Fort St. Vrain's was made of prestressed concrete. This inner vessel houses the entire primary coolant system, the interconnecting ducts and plenums, the reactor core assembly, and the steam generator. The inner vessel is housed inside a second containment structure, which is designed to contain the entire primary coolant system helium under conditions postulated for the design basis accident.

- Fuel building: For PWRs, the fuel building has a fuel pool that is used for the storage and servicing of spent fuel and the preparation of new fuel for insertion into the reactor. This building is connected to the reactor building by a transfer tube or channel that is used to move new fuel into the reactor and to move spent fuel out of the reactor for storage.

- Turbine building: The turbine building houses the turbine generators, condenser, feedwater heaters, condensate and feedwater pumps, waste-heat rejection system, pumps, and equipment that supports those systems. Primary coolant is circulated through these systems in BWRs, thereby causing them to become slightly contaminated. Primary coolant is not circulated through the turbine building systems in PWRs. However, it is not unusual for portions of the turbine building to become mildly contaminated during power generation at PWRs.

- Auxiliary buildings: Auxiliary buildings house such support systems as the ventilation system, the emergency core cooling system, the laundry facilities, water treatment system, and waste treatment system. The auxiliary building may also contain the emergency diesel generators and, in some PWRs, the fuel storage facility. Often, the facility's control room is also located in the auxiliary building.

- Diesel generator building: Often, there is a separate building for housing the emergency diesel generators if they are not located in the auxiliary building. The emergency diesel generators do not become contaminated or activated.

- Pumphouses: Various pumphouses may be present onsite for circulating water, standby service water, or makeup water. Pumphouses that carry clean water do not require radiological decommissioning.

- Cooling towers: Cooling towers are structures that are designed to remove excess heat from the condenser without dumping the heat directly into water bodies, such as lakes or rivers. There are two principal types of cooling towers: mechanical draft towers and natural draft towers. Most nuclear plants that have once-through cooling do not have cooling towers associated with them (see the descriptions in Section 3.1.3). However, five facilities with once-through cooling also have cooling towers.

- Radwaste facilities: If the radwaste facilities are not contained in the auxiliary building, they may be located in a separate solid radwaste building. An interim radwaste storage facility may also be used.

- Ventilation stack: Many older nuclear power plants, particularly BWRs, have ventilation stacks to discharge gaseous waste effluents and ventilation air. These stacks can be 90 m (300 ft) tall or more and contain monitoring systems to ensure that radioactive gaseous discharges are below fixed release limits. Radioactive gaseous effluents are treated and processed prior to discharge out the stack.

The following structures may also be part of the nuclear reactor facility but are not evaluated in this Supplement.

- Independent spent fuel storage installations (ISFSI): An ISFSI is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage. ISFSIs may be located at the site of a nuclear power plant or at another location. The most common design for an ISFSI, at this time, is a concrete pad with dry casks containing spent fuel bundles. ISFSIs are used by operating plants that require increased spent fuel storage capability because their spent fuel pools have reached

capacity. Decommissioning facilities also use ISFSIs. The first dry-storage installation was licensed by the NRC in 1986. As of August 21, 2002, there were 23 nuclear power facilities licensed to use dry storage: Surry, Oconee, H.B. Robinson, Calvert Cliffs, Fort St. Vrain, Palisades, Point Beach, Prairie Island, Davis-Besse, Susquehanna, Arkansas Nuclear One, North Anna, Trojan, Dresden, Hatch, McGuire, Oyster Creek, Peach Bottom, Yankee Rowe, Fitzpatrick, Rancho Seco, Maine Yankee, and U.S. Department of Energy (DOE [TMI-2 fuel debris]) at Idaho National Engineering and Environmental Laboratory.

An ISFSI can be constructed and operated and decommissioned either under the same license that is used for the operating or decommissioning facility called a general license under 10 CFR Part 50 or a specific license under 10 CFR Part 72 license. If a licensee chose to operate the ISFSI under a Part 50 license, it could, seek a site-specific 10 CFR Part 72 license for the ISFSI, thus allowing termination of the Part 50 license at the end of the decommissioning process. The NRC staff would also be required to conduct an environmental assessment of the licensee's request for a site-specific 10 CFR Part 72 license.

- Switchyard: A plant site also contains a large switchyard, where the electric voltage is stepped up and fed into the regional power distribution system. The switchyard is an integral part of the electric power transmission grid, and may remain on the site even after termination of the license.

- Administrative, training, and security buildings: Normally, the administrative, training, and security buildings are located outside the radiation protection zones, and no radiological hazards are present.

3.1.3 Description of Systems

After permanent cessation of operations and transfer of the fuel from the reactor vessel, licensees begin to shut down systems that are no longer operated in a decommissioning plant. However, specific systems will continue to be used during the different phases of the decommissioning process although in some cases in reduced roles. This section provides background information related to the systems, explains the differences between the systems' use during operations and during the decommissioning process, and explains how their continued operation could impact the environment during the decommissioning process. Lobner et al. (1990) provides more comprehensive descriptions of these systems in U.S. commercial LWRs. The systems described below are typical and may differ at specific facilities.

- Cooling and auxiliary water systems: The predominant water use at an operating nuclear power plant is for removing excess heat generated in the reactor by the condenser cooling system. The quantity of water that is used for condenser cooling in an operating plant is a function of several factors, including the capacity rating of the plant and the increase in cooling water temperature from the discharge to the intake. The cooling water system for the reactor is not operated after the facility has permanently ceased power operations and the fuel has been removed from the reactor vessel. Therefore, water use is greatly reduced when operations cease. However, systems are not immediately drained upon cessation of operation and are frequently left in place for a period of time to provide shielding to the workers.

  There are two major types of cooling systems for operating plants: once-through cooling and closed-cycle cooling.

  In a once-through cooling system, circulating water for condenser cooling is obtained from an adjacent body of water, such as a lake or river, passed through the condenser tubes, and returned at a higher temperature to the adjacent body of water. Flow through the condenser for a 1000-MW plant during operations is typically 45 to 65 m^3/s (700,000 to 1,000,000 gpm) (NRC 1996). The waste heat is dissipated to the atmosphere mainly by evaporation from the water body and, to a much smaller extent, by conduction, convection, and thermal radiation loss.

  In a closed-cycle system at an operating plant, the cooling water is recirculated through the condenser after the waste heat is removed by dissipation to the atmosphere, usually by circulating the water through large cooling towers constructed for that purpose. The average for makeup water withdrawals for a 1000-MW plant during operations is typically about 0.9 to 1.1 m^3/s (14,000 to 18,000 gpm). Recirculating cooling systems consist of either natural draft or mechanical draft cooling towers, cooling ponds, lakes, or canals. Because the predominant cooling mechanism associated with closed-cycle systems is evaporation, most of the water used for cooling is consumed and is not returned to the water source.

  In addition to removing heat from the reactor of an operating facility, cooling water is also provided to the service water system and to the auxiliary water system. These systems account for 1 to 15 percent of the water needed for the condenser cooling. The auxiliary water systems include emergency core cooling systems, the containment spray and cooling system, the emergency feedwater system, the component cooling water system, and the spent fuel pool water systems. Most of these systems would not be needed following permanent cessation of operations. However, some, such as the systems for the spent fuel pool cooling, will be used after the plant has shut down.

- Waste systems (gaseous, liquid, solid, and nonradioactive): The gaseous waste management system in an operating nuclear facility collects fission products, mainly noble gases, that accumulate in the primary coolant. It is designed to reduce the radioactive material in gaseous waste before discharge to meet the dose design objectives in 10 CFR Part 50, Appendix I. During decommissioning, the gaseous waste management system is used during the decontamination and dismantlement of certain tanks or pipes. It is also used during dismantlement to assist in the control of radioactive dust or loose contamination. In addition, high-efficiency particulate air (HEPA) filters are used to remove radioactive material on a localized basis. For example, when removing concrete with a power hammer or drill in the containment building, a temporary plastic tent equipped with a HEPA filter, prevents contaminated dust particles from entering the building. A second set of HEPA filters is located on the exhaust vent pathway for the building. The quantities of gaseous effluents released from operating plants and those in the decommissioning process are controlled by the administrative limits that are defined in the Offsite Dose Calculation Manual (ODCM) or similar document, which is specific for each plant. The limits in the ODCM are designed to provide reasonable assurance that radioactive material discharged in gaseous effluents are not in excess of the limits specified in 10 CFR Part 20, Appendix B, thereby limiting the exposure of a member of the public in an unrestricted area.

  The liquid radioactive waste system in operating nuclear power plants is used to collect and process liquid wastes collected from equipment leaks, valve and pump seal leaks, laundry wastes, personnel and equipment wastes, and steam generator blowdown (for PWRs), as well as building, laboratory, and floor drains. Each of these sources of liquid wastes receives varying degrees and types of treatment before storage, reuse, or discharge to the environment. During decommissioning, any radioactive liquids from operation of decommissioning activities in the facility will be processed and disposed of, thus necessitating the use of the liquid radioactive waste system. Some systems such as the laundry will likely still operate for a period of time, but others like the steam generator blowdown will not. Controls for limiting the release of radiological liquid effluents are described in the facility's ODCM. Controls are based on (1) concentrations of radioactive materials in liquid effluents and projected dose or (2) dose commitments to a member of the public. Concentrations of radioactive material that may be released in liquid effluents to unrestricted areas are limited to the concentration specified in 10 CFR Part 20, Appendix B, Table 2.

  Solid low-level waste (LLW) from nuclear power plants is generated by removal of radionuclides from liquid waste streams, filtration of airborne gaseous emissions, and removal of contaminated material. The major source of solid LLW during decommissioning is the decommissioning process itself. Removal of contamination involves the use of protective clothing and cleaning rags. Dismantlement results in concrete or metal that has

low levels of contamination or activation products. While the amount of liquid and gaseous radioactive waste generated is usually lower for decommissioning plants than for operating plants, the quantity of solid LLW being generated is significantly higher during decommissioning.

Solid waste is packaged in containers to meet the applicable requirements of 49 CFR Parts 171 through 177. Disposal and transportation are performed in accordance with the applicable requirements of 10 CFR Part 61 and 10 CFR Part 71, respectively.

Solid radioactive waste generated during either decommissioning or operations is usually shipped to a LLW processor or, in some cases, directly to a LLW disposal site. Volume reduction may occur both onsite and offsite. The most common onsite volume reduction techniques are high-pressure compacting in waste drums, dewatering and evaporating wet wastes, monitoring waste streams to segregate wastes, and sorting. Offsite waste management vendors compact wastes at ultra-high pressures, incinerate dry active waste, separate and incinerate oily and organic wastes, and asphalt-solidify resins and sludges before the waste is sent to the LLW site.

Nonradioactive wastes, including storm water system and sewage waste, are also generated during the decommissioning process. For example, use of hazardous oils or other chemicals in solvent cleaning and repair of equipment produces some nonradioactive wastes. Also, during decommissioning, additional quantities of nonradioactive waste (paint, asbestos) are generated or removed. Disposal of essentially all of the hazardous chemicals used at nuclear power plants is regulated by the Resource Conservation and Recovery Act (RCRA) of 1976 or by National Pollutant Discharge Elimination System (NPDES) permits, which are regulated by the U.S. Environmental Protection Agency (EPA) and administered by EPA, or if authorized, by the States to control the amount and types of pollutants that may be discharged from the plant.

Mixed waste is regulated under RCRA, the Atomic Energy Act, and NRC and is sent to a facility that is licensed to handle mixed waste.

- Miscellaneous mechanical systems: A variety of existing plant mechanical systems may continue to be used during plant decommissioning, including

  - the fire protection system

  - the heating, ventilation, and air conditioning (HVAC) system

- the fuel-handling system
- various cranes and hoists.

The use of these systems generally does not have a direct impact on the environment. For example, the HVAC system that is used inside a contaminated area would be exhausted to the gaseous waste management system.

- Instrumentation and control systems: While most instrumentation and control systems in the plant can be deactivated after permanent shutdown and defueling of the reactor, a few may continue to be used to support decommissioning operations, including:

  - the radiation monitoring system, which detects, measures, and records radiation levels during decommissioning operations and alerts plant staff of off-normal readings, and
  - the security system, which monitors the plant protected area to prevent uncontrolled access.

  In most cases, these systems are altered or reduced during the decommissioning process. The use of these systems during the decommissioning process does not impact the environment.

- Electrical systems: Numerous electrical systems may continue to be used during decommissioning operations. These include systems needed to provide uninterrupted power, lighting, and communication. In some cases, licensees have installed a new power distribution system, re-energizing only those loads that are necessary for continued use during decommissioning. In many facilities, the circuits that are being used are color-coded so that workers can easily identify the live circuits. Both of these practices are intended to prevent workers from cutting into a live wire during the decommissioning process.

- Spent fuel storage systems: Before beginning the decommissioning process, the licensee must certify to the NRC that it has permanently removed the fuel from the reactor vessel. The fuel is first moved into the spent fuel pool, which is a specially designed water-filled basin. Even after the nuclear reactor is shut down, the fuel continues to generate decay heat from the radioactive decay of fission products. The rate at which the decay heat is generated decreases the longer the reactor has been shut down. Therefore, the longer the time from last criticality, the less heat the spent fuel gives off. Storing the spent fuel in a pool of water provides an adequate heat sink for the removal of heat from the irradiated fuel. In addition, the fuel is located far enough under water that the radiation emanating from the fuel is shielded by the water, thus protecting workers from the radiation. After the

fuel has cooled adequately, it can be stored in an ISFSI in air-cooled dry casks. Typically, transfer of spent fuel to an ISFSI occurs after the fuel has cooled for 5 years.

After removal of the fuel to the spent fuel pool, it is common for the licensee to reduce the security area at the facility to a "nuclear island" that focuses primarily on the storage area for the spent fuel. This allows the spent fuel to be protected and the security system to cover only the storage location for the spent fuel.

At this time, there are no facilities for permanent disposal of high-level radioactive wastes (HLW). The Nuclear Waste Policy Act of 1982 defined the goals and structure of a program for permanent, deep geologic repositories for HLW and unreprocessed spent fuel. Under this Act, the DOE is responsible for developing permanent disposal capacity for the spent fuel and other high-level nuclear wastes. At the present time, DOE, as directed by Congress, is investigating a site in Yucca Mountain, Nevada, for a possible disposal facility. A HLW repository would be built and operated by DOE and licensed by the NRC.

The Commission believes (10 CFR 51.23(a)) there is reasonable assurance that at least one mined geological repository will be available in the first quarter of the 21st Century and that, within 30 years beyond the licensed life of operation for any reactor, sufficient repository capacity will be available to dispose of the reactor's HLW and spent fuel generated up to that time.

Until a HLW repository is available or some interim central waste storage facility is approved and licensed, licensees generally store the fuel onsite, either in dry storage (ISFSI) or in wet storage in a spent fuel pool. Licensees are prohibited from shipping spent fuel from one reactor spent fuel pool to another without NRC approval by license amendment.

The Commission has independently, in a separate proceeding (the Waste Confidence Proceeding), made a finding that there is

> reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised license) of that reactor at its spent fuel storage basin, or at either onsite or offsite independent spent fuel storage installations (54 FR 39767).

The Commission has committed to review this finding at least every 10 years. In its most recent review, the Commission concluded that experience and developments since 1990 were not such that a comprehensive review of the Waste Confidence Decision was necessary at this time (64 FR 68005). Accordingly, the Commission reaffirmed its findings

of insignificant environmental impacts cited above. This finding is codified in the Commission's regulations at 10 CFR 51.23(a). The staff relies on the Waste Confidence Rule, but for completeness has elected to include in this Supplement information related to the storage and maintenance of fuel in a spent fuel pool.

- Transportation systems: There are four broad classes of shipments to and from operating nuclear power plants: (1) routinely generated LLW transported from plants to disposal facilities, (2) routine LLW shipped to offsite facilities for volume reduction, (3) nuclear fuel shipments from fuel-fabrication facilities to plants for loading into reactors, and (4) spent fuel shipments to other nuclear power plants with available storage space (an infrequent occurrence that is usually limited to plants owned by the same utility).

  The transportation of radioactive materials is regulated jointly at the Federal level by the U.S. Department of Transportation (DOT) and the NRC. The responsibilities of the two agencies are delineated in a Memorandum of Understanding (see 44 FR 38690). Most LLW is shipped in packages authorized by the DOT. Some packages for larger quantities of LLW require NRC certification. The LLW packages can be loaded onto trucks, trains, barges, or other ships for shipment to the LLW disposal site. In general, the areas regulated by the agencies are as follows:

  - DOT – Regulates shippers and carriers of radioactive material and the conditions of transport, including routing, tiedowns, radiological controls, vehicle requirements, hazard communication, handling, storage, emergency response information, and employee training. DOT regulations are located in the Code of Federal Regulations, Title 49, "Transportation."

  - NRC – Regulates users of radioactive material and the design, construction, use, and maintenance of shipping containers used for larger quantities of radioactive material and fissile material such as uranium. NRC regulations are located in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

  Title 10 CFR 71.47 states that under normal transportation conditions, each package of radioactive materials must be designed and prepared for shipment such that the radiation level does not exceed 2 mSv/h (200 mrem/h) at any point on the external surface of the package and 0.1 mSv/h (10 mrem/h) at any point 1 m (3.3 ft) from the packaging surface. This type of shipment is called a nonexclusive use shipment. If the package exceeds the limits specified for nonexclusive use shipments, it must be transported by exclusive use shipment only. The radiation limits for exclusive use packages are the following:

- At any point on the package surface: 2 mSv/h (200 mrem/h). For closed transport vehicle only: 10 mSv/h (1000 mrem/h)
- At 2 m (6.6 ft) from lateral surfaces of vehicle: 0.1 mSv/h (10 mrem/h)
- At all external surfaces of the vehicle: 2 mSv/h (200 mrem/h)
- In the occupied area of the vehicle: 0.02 mSv/h (2 mrem/h), with certain exceptions.

For more information regarding waste packaging and radioactive transportation regulations, see 10 CFR Part 71.

The frequency of waste shipments increases sharply during the decommissioning period. In some cases, such as the shipment of large components (e.g., steam generators, reactor vessels, or pressurizers), the waste packaging is unique compared to most shipments during operations. However, the licensee is still required to meet the regulations discussed above, unless the NRC approves an exemption after a thorough analysis of the licensee's proposal.

3.1.4 Formation and Location of Radioactive Contamination and Activation in an Operating Plant

During reactor operation, a large inventory of radioactive fission products builds up within the fuel. Virtually all of the fission products are contained within the fuel pellets. The fuel pellets are enclosed in hollow metal rods, which are hermetically sealed to prevent further release of fission products. Occasionally fuel rods develop small leaks, allowing a small fraction of the fission products to contaminate the reactor coolant. The radioactive contamination in the reactor coolant is the source of gaseous, liquid, and solid radioactive wastes generated at LWRs during operation. Most of the contamination in the reactor coolant system is from the activation of corrosion products and not from leaking fuel.

There are two sources of radioactive material: contamination and activation. Contaminated materials are unintentionally transported through the facility by workers, equipment, and, to some degree, air movement. Although many precautions are taken to prevent the movement of contaminated material in a nuclear facility and to clean up any contaminated materials that may be found, it is likely that contamination will occur in the reactor building, around the spent fuel pool, and around specific SSCs in the auxiliary building and other buildings and equipment in the area near the reactor. The areas known to contain contamination are labeled by the licensee, who routinely checks for contamination and removes as much as possible during operations. Radioactive contamination may be deposited from the air or dissolved in water and subsequently deposited onto material such as concrete. Radioactive contamination is generally

located on or near the surface of materials such as metals, high-density concrete, or painted walls. It can travel farther into unpainted surfaces or lower-density concrete. Radioactive contamination can usually be removed from surface areas by washing, scrubbing, spraying, or, in extreme cases, by physically removing the outer layers of the surface material.

Activation products are also formed during reactor operation. Activation products are radioactive materials created when stable substances are bombarded by neutrons. Concrete and steel surrounding the core of the reactor are the most common types of activated products. Activation products cannot be removed by the processes used to remove contamination. Activation products are incorporated into the molecular structure of the material and cannot be wiped off or removed. The entire structure (or portions) that have been activated must be removed and treated as radioactive waste. Activated metal and concrete contain the single largest inventory of radionuclides with the exception of the spent fuel, in facilities that are being decommissioned. The radioactive decay of activation products, both of structures as well as corrosion products, is the main source of radiation exposure to plant personnel.

The spent fuel contains the largest amount of radioactive material at a permanently shutdown facility followed by the reactor vessel, internals, and bioshield. Systems containing smaller amounts of radioactive material include the steam generator, pressurizer, piping of the primary system and other systems, piping, as well as the radwaste systems. Minor contamination is found in the secondary systems and miscellaneous piping.

3.2 Decommissioning Options

This Supplement evaluates the environmental impacts of three decommissioning options or combinations of the options. These options, first identified in the 1988 Generic Environmental Impact Statement (GEIS) using the acronyms DECON, SAFSTOR, and ENTOMB, are defined as follows:

DECON: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are promptly removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.

SAFSTOR: The facility is placed in a safe, stable condition and maintained in that state (safe storage) until it is subsequently decontaminated and dismantled to levels that permit license termination. The determination of SAFSTOR includes those activities necessary for the final decontamination and dismantlement of the facility. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel, and radioactive liquids have been drained from systems and components and then processed. Radioactive decay

occurs during the SAFSTOR period, thus reducing the quantity of contaminated and radioactive material that must be disposed of during decontamination and dismantlement. The definition of SAFSTOR also includes the decontamination and dismantlement of the facility at the end of the storage period.

ENTOMB: Radioactive SSCs are encased in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

The choice of decommissioning option is left entirely to the licensee, provided that it can be performed according to the NRC's regulations. This choice is communicated to the NRC and the public in the post-shutdown decommissioning activities report (PSDAR). In addition, the licensee may choose to combine the DECON and SAFSTOR options. For example, after power operations cease at a facility, a licensee could use a short storage period for planning purposes, followed by removal of large components (such as the steam generators, pressurizer, and reactor vessel internals), place the facility in storage for 30 years, and eventually finish the decontamination and dismantlement process.

Although the selection of the decommissioning option is up to the licensee, the NRC requires the licensee to re-evaluate its selection if the option (1) could not be completed as described, (2) could not be completed within 60 years of the permanent cessation of plant operations, (3) included activities that would endanger the health and safety of the public by being outside of the NRC's health and safety regulations, or (4) would result in a significant impact to the environment.

To date, most utilities have used DECON or SAFSTOR to decommission reactors. Several sites have performed some incremental decontamination and dismantlement during the storage period of SAFSTOR, a combination of SAFSTOR and DECON. A site using DECON may have a short period of time (1 to 4 years) when the facility is in SAFSTOR. Several licensees continue to conduct limited decommissioning activities during a SAFSTOR period as personnel, money, or other factors become available. This process of occasionally conducting active decontamination and dismantlement is referred to as incremental DECON. No utilities have used the ENTOMB option for a commercial nuclear power reactor.

The following sections provide a general overview of each decommissioning option.

3.2.1 DECON

The DECON decommissioning option involves removing or decontaminating equipment, structures, and portions of the facility and site that contain radioactive contaminants to a level that permits termination of the license, as defined in Regulatory Guide 1.184 (NRC 2000a).

There are several advantages to using the DECON option of decommissioning. One is that the facility license is quickly terminated so that the facility and site become available for other purposes. By beginning the decontamination and dismantlement process soon after permanent cessation of operation, the available work force can be maintained and is highly knowledgeable about the facility. The availability of facilities willing to accept LLW may also be a factor in the licensee's decision to pursue the DECON option. Currently, the estimated cost of decommissioning a site using DECON is less than SAFSTOR due primarily to price escalation in the disposal of LLW. Because most activities that occur during DECON also occur during SAFSTOR, the price for decommissioning at a later date is greater because of the cost of storage and inflation (NRC 2000c). DECON also eliminates the need for long-term security, maintenance, and surveillance of the facility (excluding the onsite storage of spent fuel), which is required for the other decommissioning options.

The major disadvantages of DECON are the higher worker dose and significant initial expenditures. Also, compared to SAFSTOR, DECON requires a larger potential commitment of disposal site space (NRC 2000c).

The general activities that may occur during DECON are listed below (NRC 2000d):

- draining (and potentially flushing) of some contaminated systems and removal of resins from ion exchangers
- setup activities such as establishing monitoring stations or designing and fabricating special shielding and contamination-control envelopes to facilitate decommissioning activities
- reduction of site-security area (setup of new security monitoring stations)
- modification of the control room or establishing an alternate control room
- site surveys
- decontamination of radioactive components, including use of chemical decontamination techniques

- removal of reactor vessel and internals
- removal of other large components, including major radioactive components
- removal of the balance of the primary system (charging system, boron control system, etc.)
- general activities related to removing other significant radioactive components
- decontamination and/or dismantlement of structures or buildings
- temporary onsite storage of components
- shipment and processing of LLW, including compaction or incineration of the waste
- removal of the spent fuel and Greater-than-Class-C (GTCC) Waste to an ISFSI
- removal of hazardous radioactive (mixed) wastes
- changes in management and staffing.

3.2.2 SAFSTOR

The SAFSTOR decommissioning option involves placing the facility in a safe, stable condition and maintaining that state for a period of time, followed by subsequent decontamination and dismantlement to levels that permit license termination. During the storage period of SAFSTOR, the facility is left intact. The fuel has been removed from the reactor vessel and radioactive liquids have been drained from systems and components and processed. Radioactive decay occurs during the storage period, reducing the quantity of contaminated and radioactive material that must be disposed of during decontamination and dismantlement.

There are several advantages to using the SAFSTOR option of decommissioning. A substantial reduction in radioactive material as a result of radioactive decay during the storage period reduces worker and public doses below those of the DECON alternative. Since there is potentially less radioactive waste, less waste-disposal space is required. Moreover, the costs immediately following permanent cessation of operations are lower than costs during the first years of DECON because of reduced amounts of activity and a smaller work force (NRC 2000c).

However, because of the time gap between cessation of operations and decommissioning activities, SAFSTOR can result in a shortage of personnel familiar with the facility at the time of dismantlement and decontamination. During the prolonged period of storage, the plant requires continued maintenance, security, and surveillance. Also, uncertainties regarding the availability and cost of LLW sites in the future could mean higher costs for decontamination and dismantlement (NRC 2000c).

Activities that typically occur during the preparation and storage stages of the SAFSTOR process are described below (NRC 2000d).

During preparation:

- draining (and potential flushing) of some systems and removal of resins from ion exchangers
- spent fuel pool cooling systems reconfiguration
- decontamination of highly contaminated and high dose areas as necessary
- performance of a radiological assessment as a baseline before storage
- removal of LLW that is ready to be shipped
- shipment and processing or storage of the fuel and GTCC waste
- de-energizing or deactivating systems and equipment
- reconfiguration of ventilation systems, fire protection systems, and spent fuel pool cooling system for use during storage
- establishment of inspection and monitoring plans for use during storage
- maintenance of any systems critical to final dismantlement during storage
- changes in management and staffing.

During storage:

- performance of preventative and corrective maintenance on plant systems that will be operating and/or functional during storage

- maintenance to preserve structural integrity
- maintenance of security systems
- maintenance of radiation effluent and environmental monitoring programs
- processing of any radwaste generated (usually small amounts).

Following the storage period, the facility is decontaminated and dismantled to radiological levels that allow termination of the license. Activities during this period of time will be the same activities that occur for DECON.

3.2.3 ENTOMB

The ENTOMB decommissioning method was defined in the Supplementary Information to the 1988 Decommissioning Rule (53 FR 24018) as the option in which radioactive contaminants are encased in a structurally long-lived material, such as concrete. The entombed structure is appropriately maintained and surveillance is continued until the radioactivity decays to a level permitting unrestricted release of the property (NRC 1988).

Currently, 10 CFR 50.82 (a)(3) requires that decommissioning be completed within 60 years of permanent cessation of operations, and completion of decommissioning beyond 60 years be approved by the NRC only when necessary to protect public health and safety. The factors that could be considered by the Commission in evaluating an option that provides for the completion of decommissioning beyond 60 years of permanent cessation of operation include unavailability of waste disposal capacity and site-specific factors affecting the licensee's capability to carry out decommissioning, including the presence of other nuclear facilities at the site.

The current regulations, pertaining to the decommissioning of nuclear reactors promulgated in 1988, are also structured to favor decommissioning options that result in unrestricted release of the site. As noted in the supplementary information for the June 27, 1988, final rule, the ENTOMB option was not specifically precluded because it was recognized that it might be an allowable option for protecting public health and safety.

The 1997 Rule for Radiological Criteria for License Termination (64 FR 39058) established criteria (10 CFR Part 20, Subpart E) that allow for both restricted and unrestricted release of property. Under a restricted release, the dose to the average member of the critical group must not exceed 0.25 mSv/yr (25 mrem/yr) total effective dose equivalent (TEDE) and must be as low as reasonably achievable (ALARA) with the restrictions in place. If the restrictions were no longer in effect, the dose due to residual radioactivity could not exceed 1 mSv/yr (100 mrem/yr)

(or 5 mSv/yr [500 rem/yr], if additional conditions are met) TEDE and must be ALARA. These caps were chosen to provide a safety net in the highly unlikely event that the restrictions failed.

In the Staff Requirements Memorandum on the ENTOMB option, dated July 20, 2000 (NRC 2000b), the Commission directed that

> [T]he staff closely coordinate this rulemaking effort for this rulemaking with the ongoing efforts to update the generic environmental impact statement for the decommissioning of power reactors. The staff should include the entombment option in the GEIS recognizing that not all entombment proposals can be forecast but that the GEIS would provide a bounding analysis. The staff should also address the issue of entombing Greater Than Class C waste for this category of waste.

On September 18, 2001, the Commission approved the staff's rulemaking plan (see Section 2.2.2) for potential development of a rule to allow entombment as a decommissioning option for power reactors. NRC published an Advance Notice of Proposed Rulemaking (ANPR) on October 16, 2001 (66 FR 52551) seeking stakeholder input on three proposed regulatory options and whether entombment was a viable decommissioning alternative. The ANPR comment period closed on December 31, 2001. NRC received 19 comments from: six States; eight licensees; the Nuclear Energy Institute (NEI); the U.S. Environmental Protection Agency (EPA); the Conference of Radiation Control Program Directors' E-24 Committee on Decommissioning and Decontamination (CRCPD E-24 Committee); the Southeast Compact Commission (SCC); and a private individual.

Generally, the eight utilities and NEI stated that they would have entombment available as a decommissioning option; however, none unequivocally committed to using entombment for their decommissioning process. Some Agreement State commenters endorsed the 10 CFR Part 20 dose limits, with one State adding that a time limit to reach the dose rates should be considered. Although one State advocated extending the decommissioning period beyond 60 years, most were silent on the decommissioning regulations in 10 CFR Part 50. The staff notes that there was no consensus on a preferred option. NRC staff has considered the comments received and has prepared a paper transmitting the staff's recommendations to the Commission. As of the date of this publication the Commission has not acted on the staff's recommendations.

The assessment of impacts associated with the ENTOMB option presented in this GEIS is independent of a prospective rulemaking before the Commission. The staff is making the assumption that environmental issues arising from any rulemaking effort will be addressed in the rulemaking and its supporting environmental documentation. These issues may include: (1) the long-term onsite retention of radioactive materials, including those that may be classified

as GTCC, (2) issues related to long-term NRC oversight and monitoring requirements, (3) durability of institutional controls and site-engineered barriers, and (4) site-specific requirements.

The purpose of the entombment process is to isolate the entombed radioactive waste so that the reactor facility can be released and the license terminated. Therefore, prior to entombment, (1) an accurate characterization of the radioactive materials that are to remain is needed, and (2) the adequacy of the entombment configuration to isolate the entombed radioactive waste must be determined. Because of the requirement in the regulation to complete decommissioning within 60 years, no licensee has proposed the use of ENTOMB as the preferred decommissioning option for any of the nuclear power reactors currently undergoing decommissioning. The staff can envision a large number of entombment scenarios arranged along a continuum, differing primarily on the amount of decontamination and dismantlement done prior to the actual entombment.

The staff evaluated the impacts associated with the entombment options by developing two scenarios that have been designated ENTOMB1 and ENTOMB2. These two scenarios were developed specifically to envelope a wide range of potential options by describing two possible extreme cases of entombment. ENTOMB1 assumes significant decontamination and dismantlement and removal of all contamination and activation involving long-lived radioactive isotopes prior to entombment. ENTOMB2 assumes significantly less decontamination and dismantlement, significantly more engineered barriers, and the retention onsite of long-lived radioactive isotopes. Both options assume that the spent fuel would be removed from the facility and either transported to a permanent HLW repository or placed in an onsite ISFSI. Licensees choosing ENTOMB will adapt the entombment option to fit their specific site requirements.

ENTOMB1 is envisioned by the staff to begin the decommissioning process in a manner similar to the DECON option. The reactor would be defueled and the fuel initially placed into the spent fuel pool for some period prior to disposal at a licensed HLW repository or placed in an onsite ISFSI. Any decommissioning activity would be preceded by an accurate radiological characterization of SSCs throughout the facility. Active decommissioning would begin with draining and decontamination of SSCs throughout the facility with the goal of isolating and fixing contamination. SSCs would either be decontaminated or removed and either shipped to a LLW burial site or placed inside the reactor containment building. Offsite disposal of resins and considerable amounts of contaminated material would occur. There would likely be a chemical decontamination of the primary system. The reactor pressure vessel (RPV) and reactor internals would be removed, either intact or after sectioning, and disposed of offsite.

Any other SSCs that have long-lived activation products would be removed. Interim dry storage of the vessel, vessel internals, and any other SSCs containing long-lived activation products could occur onsite until a final disposal site for this waste (predominately GTCC waste) is identified. Steam generators and the pressurizer, depending on whether or not the components are contaminated with long-lived radioisotopes, would either be removed and disposed of offsite or retained inside the reactor containment. The spent fuel pool would be drained and decontaminated. The reactor building or containment would then be filled with SSCs

contaminated with relatively short-lived isotopes from the balance of the facility. Material would be placed in the building in a manner that would minimize the spread of any contamination (i.e., dry, contamination fixed, isolated). Engineered barriers would be put in place to deny access and eliminate the possibility of the release of any contamination to the environment. The reactor building or containment would be sealed and made weather tight.

The license termination monitoring program would be submitted and the site would be characterized. A partial site release would be completed for almost all of the site and the balance of the plant. The staff makes no assumptions as to when the license would be terminated and whether it would be terminated under the restricted or unrestricted provisions of 10 CFR Part 20, Subpart E. These decisions would likely be addressed as part of the staff's rulemaking effort related to entombment, explained above. The staff does assume that there would be a monitoring program period as long as 20 to 30 years to demonstrate that there was isolation of the contamination and adequate permanence of the structure.

The general activities that would occur during ENTOMB1 are listed below:

- planning and preparation activities
- draining (and potentially flushing) of contaminated systems and removal of resins from ion exchangers
- reduction of site-security area (optional)
- deactivation of support systems
- decontamination of radioactive components, including use of chemical decontamination techniques
- removal of the reactor vessel and internals
- removal of other large components, including major radioactive components

- removal of fuel from the spent fuel pool to an ISFSI
- dismantlement of remaining radioactively contaminated structures and placement of the dismantled structures in the reactor building
- installation of engineered barriers and other controls to prevent inadvertent intrusion and dispersion of contamination outside of the entombed structure
- filling of the void spaces in the previous reactor building structure with grout (concrete).

ENTOMB2 is also envisioned by the staff to begin the decommissioning process in a manner similar to the DECON option. The reactor would be defueled and the fuel initially placed into the spent fuel pool for some period prior to disposal at a licensed HLW repository or placed in an onsite ISFSI. Any decommissioning activity would be preceded by an accurate radiological characterization of SSCs throughout the facility. Active decommissioning would begin with the draining and decontamination of SSCs throughout the facility with the goal of isolating and fixing contamination. The spent fuel pool would be drained and decontaminated. SSCs would either be decontaminated or removed and either shipped to a LLW burial site or placed inside the reactor containment building (PWR) or the reactor building (BWR). Disposal offsite of resins would occur. The primary system would be drained, the RPV filled with contaminated material, all penetrations sealed, the RPV head reinstalled, and the reactor vessel filled with low-density concrete. Reactor internals would remain in place. Emphasis would be placed on draining and drying all systems and components and fixing contamination to prevent movement, either by air or liquid means. The steam generators and pressurizer would be laid up dry and remain in place. The reactor building or containment would then be filled with contaminated SSCs from the balance of the facility. Material would be placed in the building in a manner that would minimize the spread of any contamination (i.e., dry, contamination fixed, isolated).

Engineered barriers would be put in place to deny access and eliminate the possibility of the release of any contamination to the environment. The ceiling of the containment or reactor building, in the case of BWRs, may be lowered to near the refueling floor and to the top of the pressurizer for PWRs. The cavity of the remaining structure would be filled with a low-density concrete. The resulting structure would be sealed and made weather tight and covered with an engineered cap designed to deny access, and prevent the intrusion of water or the release of radioactive contamination to the environment.

The license termination monitoring program would be submitted and the site would be characterized. A partial site release would be completed for almost all of the site and the balance of the plant. The license would be likely terminated under the restricted release

provisions of 10 CFR Part 20, Subpart E, after a site-monitoring program that demonstrates the isolation of the contamination and the permanence of the structure. Monitoring could be as long as 100 years.

The general activities that would occur during ENTOMB2 are listed below:

- planning and preparation activities
- draining (and potentially flushing) of contaminated systems and removal of resins from ion exchangers
- deactivation of support systems
- removal of fuel from the spent fuel pool to an ISFSI
- dismantlement of all radioactively contaminated structures (other than the reactor building) and placement of the dismantled structures in the reactor building
- potentially lowering of the ceiling of the reactor building to near the refueling floor (in BWRs) or near the top of the pressurizer (in PWRs)
- installation of engineered barriers and other controls to prevent inadvertent intrusion and dispersion of contamination outside of the entombed structure
- filling of the cavity of the reactor building structure with low-density concrete
- placement of an engineered cap over the entombed structure to further isolate the structure from the environment.

The advantages of both ENTOMB options are reduced public exposure to radiation due to significantly less transportation of radioactive waste to an LLW disposal site and corresponding reduced cost of LLW disposal. An additional advantage of ENTOMB2 is related to the significant reduction in the amount of work activity, and thus a significant reduction in occupational exposures, as compared to the DECON or SAFSTOR decommissioning options.

3.3 Summary of Plants That Have Permanently Ceased Operations

Twenty-two of the commercial nuclear reactors licensed by the NRC have permanently shut down and have had their licenses terminated or are currently being decommissioned. This section presents the significant characteristics of these plants, the decommissioning options being used by each plant, and each plant's decommissioning activities.

3.3.1 Plant Sites

An overview of the shutdown plants can be found in Table 3-1, which includes 22 units shut down between 1963 and 1997. Table 3-2 summarizes important characteristics of the shutdown plants. The thermal power capabilities of the reactors ranged from 23 to 3411 MW(t). The reactors operated from just a few days (Shoreham) to 33 years (Big Rock Point). Since 1987, an average of one plant per year has been shut down.

Three of the 22 plants (Fort St. Vrain, Shoreham, and Pathfinder) have completed decommissioning and have had their 10 CFR Part 50 licenses terminated. Two of these three (Fort St. Vrain and Shoreham) used the DECON process for decommissioning. One facility, Shoreham, operated less than three full power days before being shut down and decommissioned so there was relatively little contamination. Another facility, Pathfinder, was placed in SAFSTOR and subsequently decommissioned. Eleven of the plants shut down prematurely. Three Mile Island, Unit 2, ceased power operations as a result of a severe accident. Three Mile Island, Unit 2, has been placed in a monitored storage mode until Unit 1 permanently ceases operation, at which time both units are to be decommissioned.

Eleven of the permanently shutdown plants were part of the U.S. Atomic Energy Commission's (AEC's) Demonstrations Program, including Big Rock Point; Dresden, Unit 1; Fermi, Unit 1; GE-VBWR; Humboldt Bay, Unit 3; Indian Point, Unit 1; La Crosse; Pathfinder; Peach Bottom,

Unit 1; Yankee Rowe; and Saxton. These plants were prototype designs that were jointly funded by the AEC and commercial utilities. One of the plants, Pathfinder, has completed decommissioning and had its license terminated.

The most recent of the Demonstration Program reactors to shut down was Big Rock Point, which operated for 33 years and permanently shut down in 1997.

Table 3-1. Summary of Shutdown Plant Information

Types and Number of Shutdown Reactors	
BWR	8
PWR	11
HTGR	2
FBR	1
Decommissioning Option	
SAFSTOR	14
DECON	7
Accident cleanup followed by storage	1
Fuel Location	
Fuel onsite in pool	13
No fuel onsite[(a)]	8
Fuel onsite in ISFSI	1
Plan to move fuel to an ISFSI between 2000 and 2005	9

(a) Includes Three Mile Island, Unit 2, which has approximately 900 kg of fuel remaining onsite due to the accident.

Eight of the decommissioned or decommissioning plants are located in the northeast (or mid-Atlantic states), six in the west, six in the midwest, and one in the east. The majority of the shutdown plants (13) are situated on freshwater or impoundments, five others are in coastal or estuarine environments, and three others are on the Great Lakes.

3.3.2 Description of Decommissioning Options Selected

Seven decommissioned units are located on multi-unit sites in which the remaining units continue to operate and one multi-unit site shut down both units permanently. All eight of these licensees chose SAFSTOR as the decommissioning option. In most cases, SAFSTOR was chosen so that all units on a site could be decommissioned simultaneously. For various reasons, however, most shutdown units have done some decontamination and dismantlement.

The reasons cited by licensees for choosing DECON have included the availability of LLW capacity, availability of staff familiar with the plant, available funding, the licensee's intent to use the land for other purposes, influence by State or local government to complete decommissioning, or a combination of other reasons.

A number of the plants have combined the DECON and SAFSTOR process by either entering shorter SAFSTOR periods or by doing an incremental DECON, allowing the plant to use resources and "decommission as they go." Sites have combined the options, usually to achieve

economic advantages. For example, one site decided to shorten the SAFSTOR period and begin incremental dismantlement out of concern over future availability of a waste site and future costs of disposal. One site that prematurely shut down had a short SAFSTOR period to allow short-lived radioactive materials to decay and to conduct more detailed planning. Safety is another reason for combining the two options. Because of seismic safety concerns, one site undertook a major dismantling project to remove a 76-m (250-ft) concrete vent stack after it had been in SAFSTOR for 10 years.

The licensee determines the physical condition of the site after the decommissioning process. Some licensees intend to restore the site to “greenfield” status at the end of decommissioning, while others may install a non-nuclear facility. The NRC’s regulatory authority is only over that portion of the facility that is contaminated. Some licensees will leave structures standing at the time of license termination, and others will not. While undergoing the decommissioning process, some licensees have opted for partial site release to decrease the size of the site area.

3.3.3 Decommissioning Process

The processes of decommissioning a power reactor facility for the SAFSTOR and DECON options can be divided into four stages, as shown in Figure 3-3. Figure 3-4 identifies the comparable stages that could be postulated for the two ENTOMB options. The order of each step and the duration of each stage vary, depending on plant-specific characteristics, such as location, operating history, reactor vendor, and licensee. The staff considered the differences in timing and choice of activities in evaluating the environmental impacts of decommissioning based on the experiences of currently decommissioning facilities.

Stage 1 in Figures 3-3 and 3-4 includes the licensee's initial preparations to shut down the plant and begin decommissioning. This stage is primarily administrative. Stage 1 typically lasts 1½ to 2½ years, regardless of the decommissioning option chosen. The main activities during the planning and preparation stage are determining the decommissioning option, making changes to the organization structure (layoffs, hiring experienced decommissioning contractors, etc.), and initiating licensing-basis changes.

The planning and preparation activities of Stage 1 vary, depending on when the licensee decides to cease operation. If the end of service is planned, the licensee may make plans for the decommissioning process and may even submit the PSDAR in advance of shutdown. This allows the plant to start major decommissioning activities immediately following the certification of permanent shutdown and the removal of the fuel (see Chapter 2, “Background Information

Related to Decommissioning Regulations," for a discussion of major decommissioning activities). If the end of service is unplanned, the licensee will probably not be ready to start decommissioning activities immediately following the certification of permanent shutdown and removal of fuel. Therefore, the order and duration of the activities in Stage 1 might vary compared to a planned shutdown. For most plants, the organizational changes will include a reduction in the number of staff as well as implementation of an employee-retention program to encourage the needed staff to stay on. However, one site actually had to increase staffing levels at the time of the permanent cessation of operation to start the DECON process. Initial plant characterization will be made during the planning activities and will continue throughout the decommissioning process. Because these activities are mostly planning, administrative, and organizational in nature, there is little potential for onsite or offsite impacts from these activities and only small amounts of decommissioning-related LLW generated.

Stage 2 in Figures 3-3 and 3-4 involves the transition of the plant from reactor operation to decommissioning. Stage 2 will last from about ½ to 1½ years for plants in SAFSTOR, DECON, and ENTOMB. All plants will have to transfer fuel out of the reactor and into the spent fuel pool. Isolation and stabilization of all unnecessary SSCs are also conducted during this stage.

Licensing-basis changes will continue during this stage, and the licensee may request an exemption from offsite emergency preparedness requirements.

For DECON and SAFSTOR, there are a number of activities during Stage 2 that the plant can either choose not to perform or can perform at a later date. Chemical decontamination of the primary system and creation of a nuclear island are the two main activities that several decommissioning sites have undertaken. Chemical decontamination is optional for ENTOMB1 and would not likely occur for ENTOMB2. Support systems no longer necessary to reactor operation may also be removed for all four options. Likewise, additional support systems needed for decommissioning activities may be installed at this stage for DECON, SAFSTOR, and ENTOMB1. Changes to electrical systems are common during Stage 2.

Chemical decontamination of the primary system has been performed at several facilities, resulting in a reduction of total person-rem during decommissioning activities. One facility evaluated conducted a system decontamination, aiming at significant reduced dose to workers and reduced cost, by reducing both the amount and level of contamination from disposal of contaminated piping. This chemical decontamination was performed following the removal of the steam generators, pressurizer, and reactor coolant pump motors, as well as most of the

Table 3-2. Permanently Shutdown Plants

Nuclear Plant	Reactor Type	Thermal Power	Shutdown Date [a]	Decommissioning Option[b]	Location	Fuel Status and License Termination Date
Plants Currently in Decommissioning Process						
Big Rock Point	BWR	240 MW	08/30/97	DECON	Michigan	Fuel in pool
Dresden, Unit 1	BWR	700 MW	10/31/78	SAFSTOR	Illinois	Fuel in ISFSI
Fermi, Unit 1	FBR	200 MW	09/22/72	SAFSTOR[c]	Michigan	No fuel onsite
GE-VBWR	BWR	50 MW	12/09/63	SAFSTOR	California	No fuel onsite
Haddam Neck	PWR	1825 MW	07/22/96	DECON	Connecticut	Fuel in pool
Humboldt Bay, Unit 3	BWR	200 MW	07/02/76	SAFSTOR[c]	California	Fuel in pool
Indian Point, Unit 1	PWR	615 MW	10/31/74	SAFSTOR	New York	Fuel in pool
La Crosse	BWR	165 MW	04/30/87	SAFSTOR	Wisconsin	Fuel in pool
Maine Yankee	PWR	2700 MW	12/06/96	DECON	Maine	Fuel in pool[d]
Millstone, Unit 1	BWR	2011 MW	11/04/95	SAFSTOR	Connecticut	Fuel in pool
Peach Bottom, Unit 1	HTGR	115 MW	10/31/74	SAFSTOR	Pennsylvania	No fuel onsite
Rancho Seco	PWR	2772 MW	06/07/89	SAFSTOR[c]	California	Fuel in ISFSI/Partial DECON proposed in 1997
San Onofre, Unit 1	PWR	1347 MW	11/30/92	SAFSTOR[c]	California	Fuel in pool
Saxton	PWR	28 MW	05/01/72	SAFSTOR[c]	Pennsylvania	No fuel onsite/Currently in DECON
Three Mile Island, Unit 2	PWR	2772 MW	03/28/79	Accident cleanup followed by storage	Pennsylvania	Approx 900 kg fuel onsite/ Post-defueling monitored storage
Trojan	PWR	3411 MW	11/09/92	DECON	Oregon	Fuel in pool
Yankee Rowe	PWR	600 MW	10/01/91	DECON	Massachusetts	Fuel in pool[d]
Zion, Unit 1	PWR	3250 MW	02/21/97	SAFSTOR	Illinois	Fuel in pool
Zion, Unit 2	PWR	3250 MW	09/19/96	SAFSTOR	Illinois	Fuel in pool
Terminated Licenses						
Fort St. Vrain	HTGR	842 MW	08/18/89	DECON	Colorado	Fuel in ISFSI/License terminated in 1997
Pathfinder	BWR	190 MW	09/16/67	SAFSTOR	South Dakota	No fuel onsite/License terminated in 1992
Shoreham	BWR	2436 MW	06/28/89	DECON	New York	No fuel onsite/License terminated in 1995

(a) The shutdown date corresponds to the date of the last criticality.
(b) The option shown in the table for each plant is the option that has been officially provided to NRC. Plants in DECON may have had a short (1 to 4 yr) SAFSTOR period. Likewise, plants in SAFSTOR may have performed some DECON activities or may have transitioned from the storage phase into the decontamination and dismantlement phase of SAFSTOR.
(c) These plants have recently performed or are currently performing the decontamination and dismantlement phase of SAFSTOR.
(d) Licensee is in process of transferring fuel to dry storage in onsite ISFSI.

auxiliary piping. At a second facility evaluated, a chemical decontamination was considered necessary to keep doses within previously issued EAs. The chemical decontamination was performed early in the decommissioning process to allow dismantling to proceed unimpeded. Other plants, both operating and permanently shutdown, have also performed chemical decontamination.

Some plants have also created nuclear islands, which reduce the scope of the required safeguards and security systems to only the fuel storage facilities and isolate the spent fuel so decontamination and dismantlement can proceed on the balance of the facility without the potential for affecting the spent fuel. Creating a nuclear island may involve installing an electrical power supply at the spent fuel pool, installing or modifying chemistry controls, designing and constructing a new heat removal system, and moving or installing new security-related equipment. For plants going into SAFSTOR, creation of a nuclear island is primarily a cost savings, but for plants in active decontamination and dismantlement, work activities may be done more conveniently when workers are not constrained by security requirements. ENTOMB2 would not benefit from the “nuclear island” concept.

Environmental impacts may vary at each site, depending on the activities and the timing of the activities performed. Examples of impacts include activities such as chemical decontamination, which result in the use of small quantities of water and produce LLW as well as some liquid effluents that would not be released unless they are below the limits allowed by the regulations in 10 CFR Part 20. Smaller amounts of waste will likely be generated during the creation of a nuclear island or the rewiring of a facility.

Stage 3 in Figure 3-3 involves decontamination and dismantlement of the plant for DECON, SAFSTOR, and ENTOMB1. For ENTOMB2, Stage 3 involves dismantlement of all radioactively contaminated SSCs external to the reactor building and placement of these SSCs in the reactor building, followed by lowering the ceiling to the D-rings (PWRs) or refueling floor (BWRs). For both ENTOMB options, it includes installation of concrete and engineered barriers and development of the license termination monitoring program. For those sites that have a SAFSTOR period, Stage 3 includes the storage time. The decontamination and dismantlement activities performed for SAFSTOR can occur before, after, or during the storage period. For the SAFSTOR period, Stage 3 can be from just a few years to about 54 years. For a site going straight through the DECON option, the time for Stage 3 would be expected to take between 3½ and 10 years. For either ENTOMB option Stage 3 would be expected to take 2 to 4 years.

The greatest variability in the decommissioning process is seen in Stage 3 and is related to dismantlement. Every plant that has completed decommissioning or has started dismantlement has performed the activities in different ways and at different times during the decommissioning

process. Two examples of large-component removal are at Rancho Seco and Trojan. Rancho Seco has started its dismantlement on the secondary side, removing the moisture separators, diesel generators, steam piping, and related components. Dismantlement of the equipment in the auxiliary building was also initiated. Plans for large-component removal are still in process. The primary issues related to decisions on large-component removal are how to transport the components. Because there are no convenient waterways for transport, the large components from Rancho Seco will have to be shipped by both road and rail, which will require segmentation or cutting up the larger components. Trojan took a different approach to dismantlement, based on the ability to ship by barge and the availability of disposal at Hanford. Trojan removed its four steam generators and pressurizer, pumped grout into them, and shipped them by barge for burial at Hanford. Following that activity, the reactor vessel and internals were removed whole, filled with grout, welded closed, and shipped. For Trojan, removing and shipping these large components as whole units saved millions of dollars and significantly reduced dose to workers.

Stage 4 of decommissioning is license termination. Activities for this stage, which are similar for all options, include final site characterization, final radiation survey submission of final license termination plan, and final site survey. The ENTOMB options would include both a partial site release and a site monitoring program.

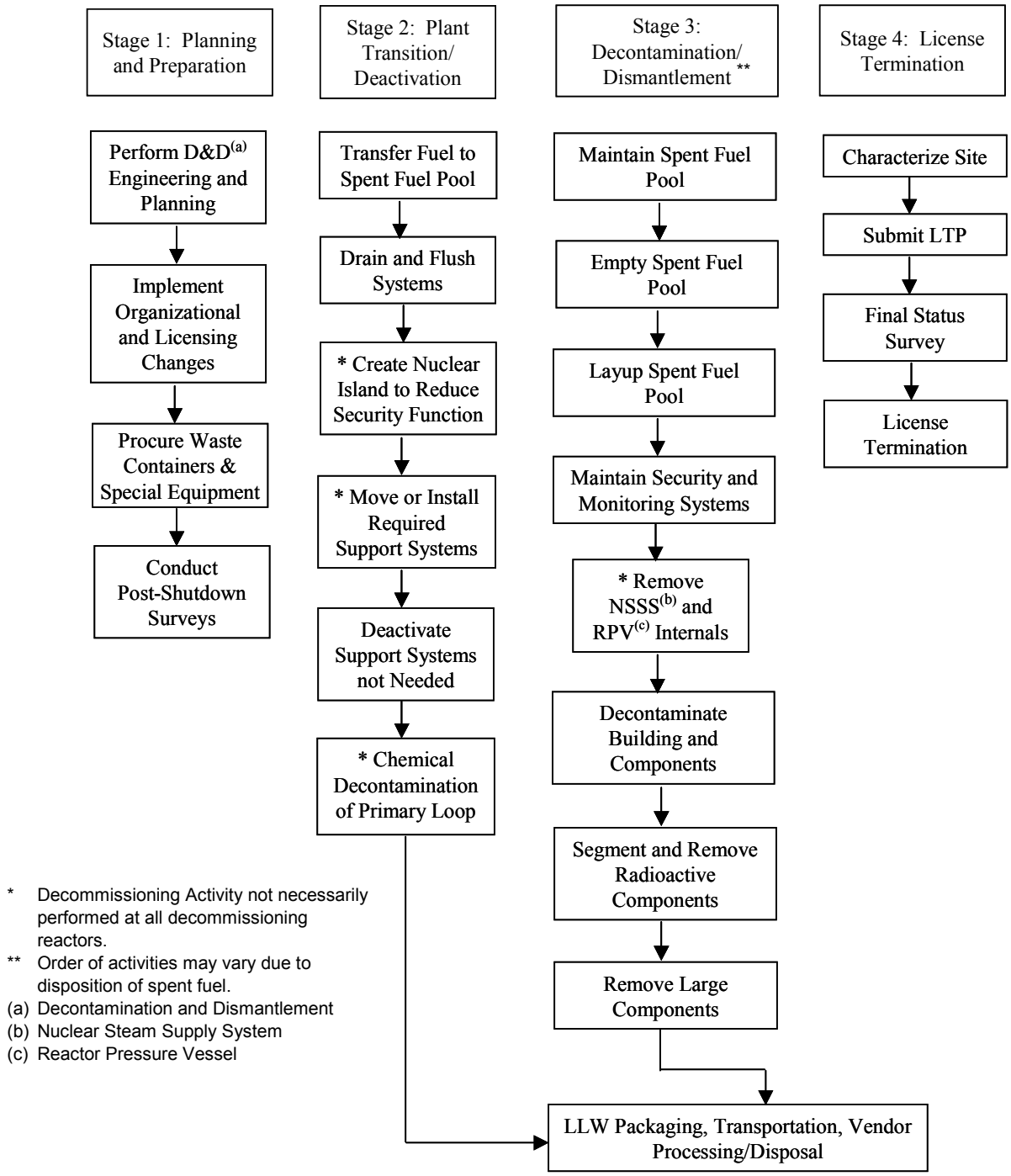

Figure 3-3. Reactor Decommissioning Process - DECON or SAFSTOR

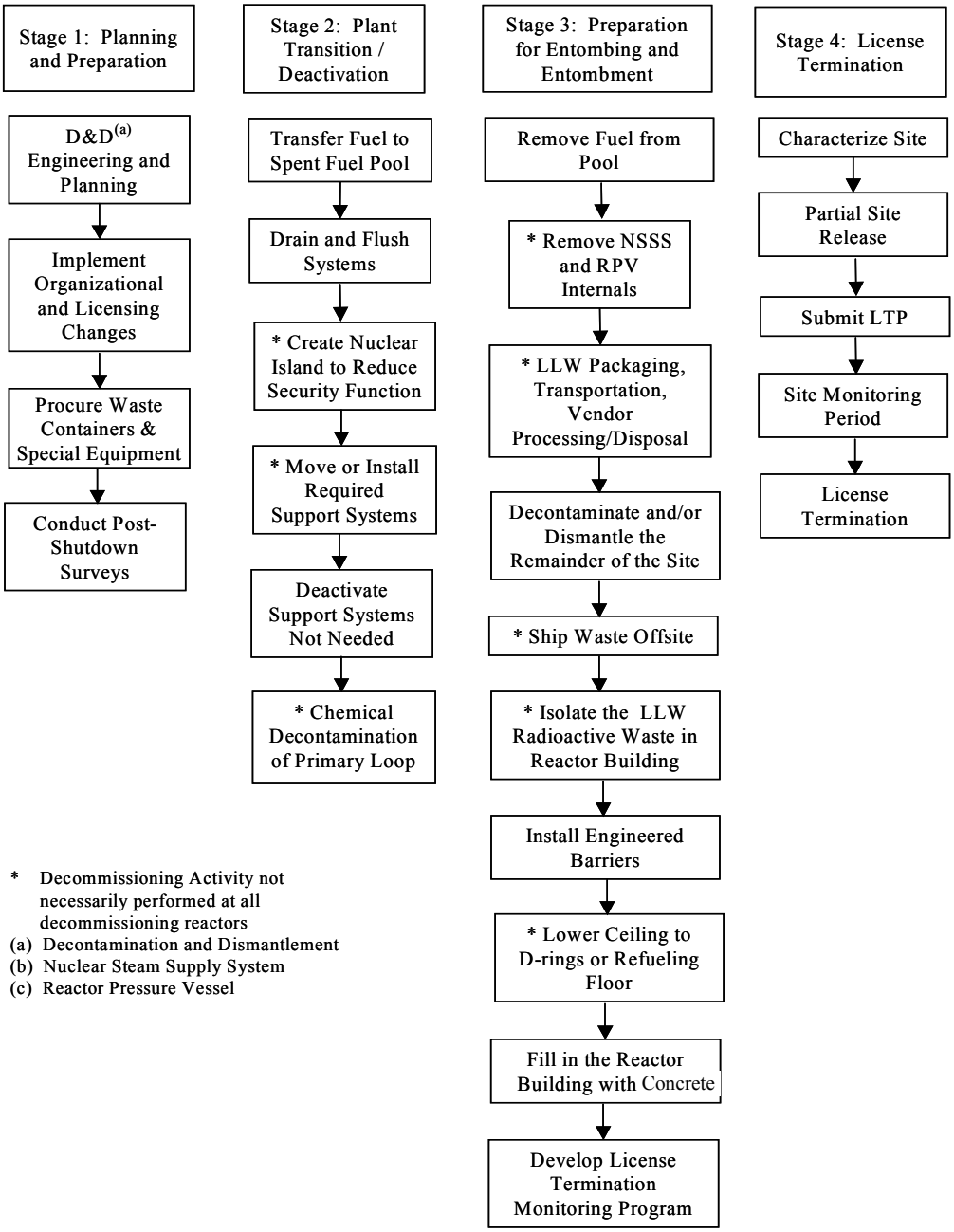

Figure 3-4. Reactor Decommissioning Process - ENTOMB

3.4 References

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, “Standards for protection against radiation.”

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, “Environmental protection regulations for domestic licensing and related regulatory functions.”

10 CFR 61. Code of Federal Regulations, Title 10, *Energy*, Part 61, “Licensing requirements for land disposal of radioactive waste.”

10 CFR 71. Code of Federal Regulations, Title 10, *Energy*, Part 71, “Packaging and transportation of radioactive material.”

10 CFR 72. Code of Federal Regulations, Title 10, *Energy*, Part 72, “Licensing requirements for the independent storage of spent nuclear fuel, high-level radioactive waste and reactor-related greater-than-Class-C waste.”

49 CFR 171-177. Code of Federal Regulations. Title 49, *Transportation*, Parts 171-177, “General information, regulations, and definitions;” “Hazardous materials table, special provisions, hazardous materials, communications, emergency response information, and training requirements;” “Shippers—general requirements for shipments and packagings;” “Carriage by rail;” “Carriage by aircraft;” “Carriage by vessel;” “Carriage by public highway.”

44 FR 38690. “Transportation of Radioactive Materials. Memorandum of Understanding.” U.S. Nuclear Regulatory Commission and U.S. Department of Transportation. *Federal Register*. July 2, 1979.

53 FR 24018. “General Requirements for Decommissioning Nuclear Facilities.” *Federal Register*. June 27, 1988.

54 FR 39767. “10 CFR Part 51 Waste Confidence Decision Review.” *Federal Register*. September 28, 1989.

64 FR 39058. “Radiological Criteria for License Termination.” *Federal Register*. July 21, 1997.

64 FR 68005. "Waste Confidence Decision Review." *Federal Register*. December 6, 1999.

66 FR 52551. "Entombment Options for Power Reactors." *Federal Register*. October 16, 2001.

Fuller, C. H. 1988. "Fort St. Vrain Operational Experience." In *Technical Committee Meeting on Design Requirements, Operation, and Maintenance of Gas-Cooled Reactors.* San Diego, California. September 21-23, 1988, pp. 55-61. International Atomic Energy Agency, International Working Group on Gas-Cooled Reactors, IWGCCR-19, Vienna. Available: org/inis/aws/htgr/fulltext/iwggcr19_9.pdf.

Lobner, P, C. Donahoe, and C. Cavallin. 1990. *Overview and Comparison of U.S. Commercial Nuclear Power Plants*. NUREG/CR-5640, NRC, Washington, D.C.

Resource Conservation and Recovery Act (RCRA) of 1976, as amended by the Hazardous and Solid Waste Amendments Act of 1984, 42 USC 6901 et seq.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000a. *Decommissioning of Nuclear Power Reactors*. Regulatory Guide 1.184, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000b. "Staff Requirements SECY-00-0129 Workshop Findings in the Entombment Options for Decommissioning Power Reactors and Staff Recommendations on Further Activities." Staff Requirements Memorandum, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000c. *Staff Responses to Frequently Asked Questions Concerning Decommissioning of Nuclear Power Reactors*. NUREG-1628, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000d. *Standard Format and Content for Post-Shutdown Decommissioning Activities Report*. Regulatory Guide 1.185, NRC, Washington, D.C.

4.0 Environmental Impacts of Decommissioning Permanently Shutdown Nuclear Power Reactors

This section discusses the environmental impacts of decommissioning permanently shutdown nuclear power reactor facilities. Section 4.1 defines the terms used to describe environmental impacts of decommissioning activities. Section 4.2 briefly describes the process that was used to identify the environmental impacts of the decommissioning activities. The environmental impacts, including the staff's conclusions, are discussed in Section 4.3.

4.1 Definition of Environmental Impact Standards

This Supplement provides a measure of (1) the significance and severity of potential environmental impacts and (2) the applicability of these decommissioning impacts to a variety of facilities, both permanently shutdown and operating. The significance of each environmental impact is described as SMALL, MODERATE, or LARGE. The applicability of these impacts to a class of plants or site characteristics is categorized as either generic or site-specific. The following sections define the significance and applicability terms used in the Chapter 4 analyses.

4.1.1 Terms of Significance of Impacts

For decommissioning, the staff is using a standard of significance derived from the Council on Environmental Quality (CEQ) terminology for "significantly"[(a)] (40 CFR 1508.27, which considers "context" and "intensity"). The NRC has defined three significance levels: SMALL, MODERATE, and LARGE.

> SMALL – Environmental impacts are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts in this Supplement, the NRC has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

(a) The National Environmental Policy Act of 1969 (NEPA) requires consideration of both *context* and *intensity* when determining the significance of an environmental impact. **Context** means that the significance of an action must be analyzed in several contexts, such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. **Intensity** refers to the severity of the impact and depends on many different factors, such as the unique characteristics of the site and the degree to which the proposed action affects public health or safety or may establish a precedent.

MODERATE – Environmental impacts are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE – Environmental impacts are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The discussion of each environmental issue in this Supplement includes an explanation of how the significance level was determined. In determining the significance level, the staff assumed that ongoing mitigation measures would continue (including those mitigation measures implemented during plant construction and/or operation) during decommissioning, as appropriate. Additionally, the staff has assumed that a licensee will obtain all relevant permits and appropriate consultations, will continue to comply with the conditions of those permits or consultations, and will use appropriate best management practices (BMPs) to minimize impacts of decommissioning activities. Benefits of additional mitigation measures during or after decommissioning are not considered in determining significance levels.

The cumulative impacts of all activities were assessed. Cumulative impacts are incremental impacts of the decommissioning activity when added to other past, present, and reasonably foreseeable future actions at the licensed site.

4.1.2 Terms of Applicability of Impacts

In addition to determining the significance of environmental impacts, this Supplement includes a discussion of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Each environmental issue is assigned to one of two categories:

- Generic – For the issue, the analysis reported in this Supplement presents the following:

  (a) Environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues to plants of a specific size, a specific location, or having a specific type of cooling system or site characteristics, and

  (b) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts, and

  (c) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

- Site-specific – For the issue, the analysis reported in this Supplement has shown that one or more of the generic criteria was not met. Therefore, additional plant-specific review is required. An example of a site-specific issue is threatened and endangered species.

For many issues, similar activities may be performed either on the plant site or offsite. In several cases, the conclusions as to generic or site-specific are different for these locations. In this Supplement, the term "operational areas" are the areas within the protected area fences, the intake and discharge structures, the cooling system, and other site structures, and the associated paved, graveled, and maintained landscaped areas. The operational area is defined as the portion of the plant site where most or all of the site activities occur, such as reactor operation, materials and equipment storage, parking, substation operation, facility service and maintenance, etc.

4.2 Evaluation Process

This section briefly describes the process that the staff used to determine the environmental impacts from decommissioning nuclear power facilities. For a detailed description of this process, see Appendix E, "Evaluation Process for Identifying the Environmental Impacts of Decommissioning Activities." Figure 4-1 is a flowchart showing the evaluation process. Figure 4-1 identifies activities that occur during decommissioning and shows whether the activities affect any of the identified environmental issues. The environmental issues analyzed by the staff are the following: onsite/offsite land use, water use, water quality, air quality, aquatic ecology, terrestrial ecology, threatened and endangered species, radiological, radiological accidents, occupational issues, cost, socioeconomics, environmental justice, cultural impacts, aesthetic issues, noise, transportation, and irretrievable resources. To analyze each issue, the staff used the data obtained from previous studies and environmental reviews, information obtained during site visits and provided by the plants undergoing decommissioning, and information from currently operating nuclear power facilities. The staff's assessment includes an assessment of cumulative impacts. For discussions of cumulative impacts, the NRC used the terminology defined in 40 CFR 1508.7. "Cumulative impact is the impact on the environment, which results from the incremental impact of the action (in the case of this Supplement, that is decommissioning activities) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The staff examined the cumulative impacts of decommissioning activities and other past, present, and reasonably foreseeable future activities at the licensed sites.

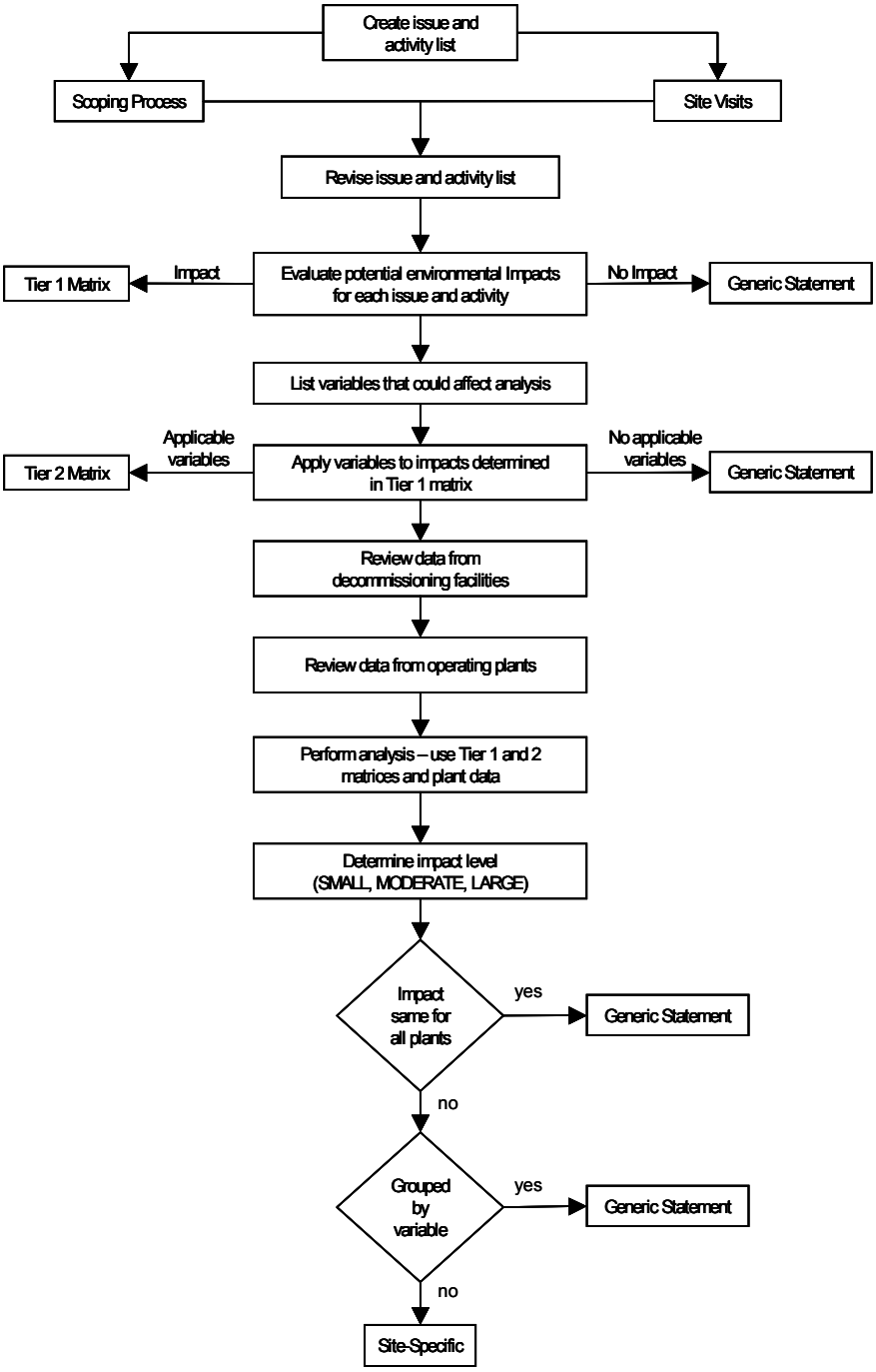

Figure 4-1. Environmental Impact Evaluation Process

Previous or anticipated decommissioning activities at the fast breeder reactor (FBR) or high-temperature gas-cooled reactor (HTGR) have not and are not expected to result in impacts that are different from those found at other nuclear reactor facilities.

After analyzing each issue, the staff determined the nature of the impact (site-specific or generic) and the significance level of the environmental impact (SMALL, MODERATE, or LARGE). This evaluation resulted in a range of impacts for each issue that may be used for comparison by licensees that are or will be decommissioning their facilities.

4.3 Environmental Impacts from Nuclear Power Facility Decommissioning

The following sections are organized by issue and discuss environmental impacts. Each section has four parts:

(1) Regulations – Identifies statutes, regulations, or limits relevant to the issue.

(2) Potential impacts from decommissioning activities - Discusses possible impacts related to the issue and defines, where appropriate, the terms detectable and destabilizing for the issue.

(3) Evaluation – Describes analysis and professional judgement used to estimate whether an activity or group of activities is likely to make a noticeable impact on the environment, considering the available data. If an impact is likely, existing and additional mitigation measures that can be taken to avoid the impact are evaluated. If an impact cannot be avoided, a determination is made as to whether the impact is likely to destabilize the resource.

(4) Conclusion – Provides the staff's conclusion on significance (SMALL, MODERATE, LARGE) and applicability (generic or site-specific) of impacts to the issue.

The conclusions from this chapter are summarized in two tables in Appendix H. Table H-1 provides a list of decommissioning activities that have been determined to have no environmental impacts. These activities can be performed by licensees without further analysis. Table H-2 provides a comprehensive summary of the decommissioning activities and associated environmental issues that have been determined by the staff to have potential environmental impacts. Providing they fall within the range of the impacts identified, these activities can be performed with no further analysis by the licensee.

4.3.1 Onsite/Offsite Land Use

Nuclear power facilities are large physical entities, of which 20 to 40 ha (50 to 100 ac) may actually be disturbed during plant construction. Other land commitments can amount to many thousands of hectares for transmission line rights-of-way (ROWs) and cooling lakes. Farming and other types of agricultural land use occur on some nuclear reactor facility sites. Some utilities have designated portions of their sites for land uses such as recreation, management of natural areas, and wildlife conservation.

4.3.1.1 Regulations

Nuclear power facilities that began initial operation after the promulgation of the National Environmental Policy Act of 1969 (NEPA; 42 USC 4321 to 4347) or the Endangered Species Act of 1973 (ESA; 16 USC 1531 to 1544) were sited and are operated in compliance with these statutes. Any modifications to the facilities after the effective dates of these acts and others (see Appendix L-2) must be in compliance with the requirements of these statutes. The ESA applies to both terrestrial and aquatic biota. The individual States may also have requirements regarding threatened and endangered species; the State-listed species may vary from those on the Federal lists. In addition, activities such as decommissioning must take into account and avoid disturbance of historic and archeological sites, and American Indian grave sites. (Native American Graves Protection and Repatriation Act of 1990; 25 USC 3001 et seq.)

4.3.1.2 Potential Impacts of Decommissioning Activities on Land Use

Temporary changes in onsite land use could occur at a nuclear reactor facility site during decommissioning. Temporary changes may include addition or expansion of staging and laydown areas or construction of temporary buildings and parking areas. These temporary changes in onsite land use do not change the fundamental purpose or use of the reactor site. The major activities that may influence onsite land use are removal of large components, such as the reactor vessel and steam generators, structure dismantlement, and low-level waste (LLW) packaging and storage. Table E-3 in Appendix E describes the activities that occur during decommissioning that influence offsite and onsite land use.

The need for land during decommissioning is affected by the site layout. Most sites have sufficient area existing within the previously disturbed area (whether during construction or operation of the site) and, therefore, no additional land needs to be disturbed. The major activities projected to occur for decommissioning that are expected to temporarily require land include activities such as staging of equipment and removal of large components. In addition, the large number of temporary workers needed to accomplish the major decommissioning

activities may require that temporary facilities be installed for onsite parking, training, site security access, office space, change areas, fabrication shops, mockups, and related needs.

Some activities, such as widening and rebuilding access roads or creating or expanding gravel pits for building roads, may occur offsite. The experience of plants that are being decommissioned has not included any needs for additional land offsite.

Changes to land use are considered detectable if changes in the area's general land-use pattern result. The change would be destabilizing if large-scale new development and major changes in the land-use pattern occur. For example, a new local access route through rural land to the plant would represent a detectable, but not destabilizing, change in many localities.

4.3.1.3 Evaluation

Nuclear power facility site areas range from 34 ha (84 ac) for the San Onofre Nuclear Generating Station in California to 9,700 ha (24,000 ac) for the Turkey Point Plant in Florida. According to NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NRC 1996), of the operating reactors, 29 site areas range from 200 to 400 ha (500 to 1000 ac), with an additional 13 sites ranging from 400 to 800 ha (1000 to 2000 ac). Thus, almost 60 percent of the plant sites encompass 200 to 800 ha (500 to 2000 ac). Larger land-use areas are associated with plant cooling systems that include reservoirs, artificial lakes, and buffer areas.

The nuclear reactor facilities being decommissioned are predominantly on the smaller sites, primarily because the older, smaller reactors have already permanently ceased operation. Only 6 out of 21 sites (29 percent) were between 400 and 800 ha (100 to 2000 ac); 6 (29 percent) were larger than 800 ha (2000 ac); and the rest (43 percent) were smaller than 400 ha (1000 ac) (see also Appendix F).

Almost all of the sites undergoing active decommissioning are utilizing areas used during construction. Land requirements for decommissioning activities appear to be well within the range of land requirements for activities during major outages that occur in the course of normal operations. There does not appear to be any significant differences in land use between plants using SAFSTOR or DECON options. There is no experience with either ENTOMB option with commercial power reactors in the United States, although there is some entombment experience with former U.S. Department of Energy (DOE) scientific and nuclear materials production reactors. Because of the potential need for large amounts of concrete and aggregate for ENTOMB2, it is possible that a concrete batch plant might be set up onsite. There might not be adequate room within the operational area at some of the sites for such a

facility, but it is likely that the impact of such a disturbance would be temporary and minor. Smaller amounts of concrete and aggregate would likely be required for the ENTOMB1 option.

Many of the facilities currently being decommissioned are relatively small reactors and located on small areas of land. However, a comparison of the land-use needs shows that many activities require the same amount of land for reactors whether the reactor size is small or large. It does not appear that land use will be significantly greater for future decommissioning at remaining sites. Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in onsite or offsite land-use impacts that are different from those found at other nuclear reactor facilities. There has been limited experience with multi-unit sites. Multiple-plant sites that are being decommissioned may be able to economize on space by reusing laydown areas.

Large-component removal is similar in its land requirements to major component replacement activities, such as steam generator replacement and refurbishment activities. Based on previous experience with steam generator replacement at a pressurized water reactor (PWR), it was estimated in NUREG-1437 that ~1 to 4 ha (~2.5 to 10 ac) of land may be needed to accommodate laydown, staging, handling, temporary storage, personnel processing, mockup and training, and related needs (NRC 1996). The impacts of steam generator or other major component removal during decommissioning should be similar or less. Generally, this land has been previously disturbed during the construction of the facility. Once the major decommissioning activities are completed, this land could be returned to its previous uses.

Based on current information collected at sites using the DECON and SAFSTOR options, decommissioning activities that affect offsite land use are not expected unless major upgrades to transportation links are required. It may be necessary to establish or re-establish road, rail, or water transportation links into the site for the purpose of bringing in equipment (especially large equipment), removing large components, and shipping offsite certain chemicals, waste concrete and metal, or other materials created, contaminated, or used in the decontamination and dismantlement processes. In such cases, offsite land-use impacts may be detectable or destabilizing. Additional attention to transportation routing and to the organization of activities to minimize the need for transportation re-establishment or upgrade may be able to reduce the impacts to undetectable levels. The ENTOMB options may require additional land offsite for a concrete batch plant, but in most cases the land use for this activity will be temporary, though detectable.

4.3.1.4 Conclusions

The staff has considered available information on the potential impacts of decommissioning on land use, including comments received on the draft of Supplement 1 of NUREG-0586. For

facilities having only onsite land-use changes as a result of large component removal, structure dismantlement, and LLW packaging and storage, the impacts on land use are not detectable or destabilizing. Therefore, the staff makes a generic conclusion that the potential impacts to land use onsite are SMALL. The staff has considered mitigation and concludes that no additional measures are likely to be sufficiently beneficial to be warranted.

If changes in land use beyond the site boundary are anticipated, the impacts may or may not be detectable or destabilizing, depending on the site-specific conditions, and cannot be predicted generically. Therefore, the staff has concluded that if new land uses beyond the site boundary are anticipated, the magnitude of the potential impact may be SMALL, MODERATE, or LARGE, depending on the nature, size, and permanence of the disturbance to existing land use and must be determined through a site-specific analysis.

4.3.2 Water Use

Nuclear reactor facilities are usually located near or adjacent to significant water bodies (aquifers, rivers, lakes, etc.) that are important to the region. Operating nuclear reactor facilities use water from multiple sources. For example, water from an adjacent lake might provide cooling water, whereas potable water may come from groundwater wells located onsite. Reactor cooling is the greatest use of water at an operating reactor. Other uses include waste treatment, potable water, process water, and site maintenance.

4.3.2.1 Regulations

Water use at nuclear reactor facilities is regulated by State- and locally-issued permits. Most States require permits for surface water or groundwater withdrawals.

4.3.2.2 Potential Impacts of Decommissioning Activities on Water Use

Cessation of plant operations will result in a significant decrease in water consumption because reactor cooling is no longer required. Although water will still be required for spent fuel cooling, this demand will decrease as the fuel ages. Dewatering systems may remain active during decommissioning of a nuclear facility to control the water pathway for the release of radioactive material. Table E-3 in Appendix E lists decommissioning activities that may influence water use. These activities include fuel removal, staffing changes, large component removal, decontamination and dismantlement (using high-pressure water sprays), structure dismantlement, and entombment.

Impacts to water resources of decommissioning activities would be considered detectable if such activities result in a significant change in water supply reliability. The reliability of water supplies is impacted by a variety of factors, such as natural climatic variability and the reliability of the regional and local water-supply infrastructures. For example, an additional incremental drawdown attributable to a groundwater well at a decommissioning site may be measurable at an offsite well. However, this does not necessarily constitute a detectable change in the reliability of the water supply. It would be detectable if the offsite well is unable to withdraw its permitted volumes as a result of this increased drawdown. The impacts of decommissioning activities are considered destabilizing if they result in a permanent and/or significant loss of water supply reliability. For instance, heavy pumping of an aquifer that results in subsidence may cause a permanent loss of aquifer capacity. Another example of a destabilizing impact is a change in site drainage or stream-channel changes that would result in a detectable and significant change in the probability of flooding.

4.3.2.3 Evaluation

In general, the impact of nuclear reactor facilities on water resources dramatically decreases after plants cease operation. The flow through the condenser of an operating plant can range from 3 to 78 m^3/s (49,000 to 1,200,000 gpm) (NRC 1996), depending upon the size of plant. This operational demand for cooling and makeup water is largely eliminated after the facility permanently ceases operation. As the plant staff decreases, the demand for potable water also generally decreases. However, in a few cases staffing levels have temporarily increased above levels that were common for routine operations. For these short periods of time, commonly during the early stages of decontamination and dismantlement activities, there may be a slight increase in demand for potable water.

Most of the impacts to water resources likely to occur during decommissioning of a nuclear facility are also typical of the impacts that would occur during decommissioning or construction of any large industrial facility. For example, providing water for dust abatement is a concern for any large construction project, as is potable water usage. However, the quantities of water required are trivial compared to the quantity used during operations. There are some activities affecting water resources and decommissioning nuclear facilities that are different from other industrial non-nuclear activities. The demand for water for spent fuel maintenance (approximately 200 to 2000 L [50 to 500 gal.] of water per day, depending on the size and location of the pool) and wet decontamination methods (such as a full flush of the primary system or hydrolasing embedded piping in place), although not large, are unique to nuclear facilities. One facility reported using approximately 9500 to 11,000 L (2500 to 3000 gal.) of water per day for spent fuel pool spray-cooling during the summer months. Additionally, water in some of the systems or piping may continue to be used during decontamination and dismantlement to

provide shielding from radiation for workers who are dismantling structures, systems, and components (SSCs) in the vicinity. For example, 912,000 L (240,000 gal.) of water was used at one site to fill the reactor cavity in preparation for the segmentation of the reactor vessel.

Common engineering practices, such as water reuse, are used to limit water use impacts at most construction or industrial sites. However, use of some of these practices may be limited by radiological exposure considerations at decommissioning sites.

Water use at decommissioning nuclear reactor facilities is significantly smaller than water use during operation. The water use will be greater in facilities that are undergoing decontamination and dismantlement than those that are in the storage phase. During ENTOMB, water will be required as the concrete for entombment is mixed. Greater amounts of water will be needed for the ENTOMB2 option than for ENTOMB1. However, in both cases, this process would be of short duration and would not consume quantities of water in excess of those used in the construction of large buildings.

Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in water use impact that is different from those found at other nuclear reactor facilities.

4.3.2.4 Conclusions

The staff considered available information on the potential impacts of decommissioning on water use, including information received on the draft of Supplement 1 of NUREG-0586. This information indicates that the impacts of decommissioning on water use are neither detectable nor destabilizing. Therefore, the staff makes a generic conclusion that the potential impacts to water use are SMALL. The staff has considered mitigation and concludes that no additional measures are likely to be sufficiently beneficial to be warranted.

4.3.3 Water Quality

There are quality standards for drinking water, protection of aquatic and terrestrial habitats, and release of potential pollutants to surface and groundwater environs. Nuclear reactor facilities are usually located above aquifers or adjacent to important sources of water. Intended and accidental releases of potential pollutants may impact the quality of these waters. This section considers water quality impacts of nonradioactive material for both surface water and groundwater during the decommissioning process. Impacts from releases of radioactive material in liquid effluents are discussed in Section 4.3.8, “Radiological.”

4.3.3.1 Regulations

Intentional releases of nonradioactive discharges to surface waters are regulated through the National Pollutant Discharge Elimination System (NPDES; Section 402 of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act [CWA] [33 USC 1251 to 1387]) to protect water quality. Congress has delegated the responsibility for NPDES implementation to the U.S. Environmental Protection Agency (EPA). When the EPA determines that State programs are equivalent to the Federal NPDES program, the NPDES permitting process is delegated to the State. Generally, discharge limits specified by the NPDES permit are revisited every 5 years. Ongoing monitoring programs may be required as part of an NPDES permit.

The Resource Conservation and Recovery Act of 1976 (RCRA; 42 USC 6901 et seq.) addresses the need to investigate and clean up contamination in the event of the release of nonradioactive hazardous material not covered within the limits of the NPDES permit. As with the NPDES permitting process, Congress has delegated the responsibility for RCRA implementation to the EPA. Because NPDES permits regulate only intentional discharges to surface water, any accidental releases of nonradioactive hazardous materials that may impair water quality (surface water or groundwater) are regulated through the RCRA process. RCRA requires responsible parties to clean up environmental contaminants regardless of the time of their release. The degree of investigation and subsequent corrective action necessary to protect human health and the environment vary significantly among facilities. When the EPA determines that State programs are equivalent to the Federal RCRA program, the corrective action program is delegated to the State.

Based on an October 1978 decision by the Atomic Safety and Licensing Board, (TVA 1978a, TVA 1978b), NRC authority does not extend to matters within the jurisdiction of the EPA. More specifically, the NRC authority is limited for those matters expressly assigned to the EPA by the Federal Water Pollution Control Act Amendments of 1972. This decision would also apply to decommissioning nuclear reactor facilities.

4.3.3.2 Potential Impacts of Decommissioning Activities on Water Quality

Table E-3 in Appendix E shows the activities during decommissioning that may affect water quality. These major activities include fuel removal, stabilization, decontamination and dismantlement, and structure dismantlement. Separate assessments of potential impacts were performed for surface water and groundwater. Surface waters are most likely to be impacted either by stormwater runoff or by releases of substances during decommissioning activities.

Because water quality and water supply are interdependent, changes in water quality must be considered simultaneously with changes in water supply. For example, reduced groundwater pumping may result in a rise in the water table, providing a new pathway for contaminants currently in the subsurface. Changes in the landscape (terrain and vegetation) during decommissioning can alter the hydrologic pattern of recharge and surface-water runoff. The convergence of surface water over unvegetated soils may result in accelerated erosion and the delivery of sediment to important downstream habitat.

Impacts to water quality of decommissioning activities would be considered detectable if such activities result in a significant change in water-supply reliability. For example, stormwater erosion at a facility undergoing decommissioning may result in a measurable increase in suspended sediment in an adjacent stream or disposal of concrete onsite could alter local water chemistry of the groundwater. However, this does not constitute a detectable change in the reliability of the water supply unless the incremental change in sediment concentration precludes permitted or environmental uses. The impacts of decommissioning activities would be considered to be destabilizing on water quality if they result in a permanent or significant loss of water-supply reliability. For instance, significant increases in erosion might result in a permanent loss of benthic habitat for certain fish species.

4.3.3.3 Evaluation

Both the decommissioning activities themselves and the order in which the activities are performed control the impacts to water quality. The same activities performed in a different order can have a significantly different impact on water quality. The time between activities may also be important in assessing impacts. Delaying activities during SAFSTOR may exacerbate water-quality issues. For example, the aging of structures may create new pathways for groundwater to enter contaminated subgrade structures. This would be less of an issue for entombment of a facility, where the plant's contaminated SSCs are encased in concrete and maintained as a solid structure isolated from the environment.

Stormwater runoff and erosion control are issues faced at many industrial sites, and it is expected that after application of common BMPs, any changes in surface-water quality will be nondetectable and nondestabilizing.

All commercial nuclear power facilities have NPDES permits that regulate intentional releases of hazardous materials. Historically, unintentional releases of hazardous substances have been an infrequent occurrence at decommissioning facilities. Because the focus of decommissioning is the ultimate cleanup of the facility, considerable attention is placed on minimizing spills. Except for a few substances such as hydrocarbons (diesel fuel), such hazardous spills are

localized, quickly detected, and relatively easy to remediate. Relevant regulations are listed in Appendix L. Some of the groundwater parameters measured in the license termination plan (LTP) might also be indicators of a heretofore undetected nonradiological subsurface plume. If such indications were observed, further characterization and corrective actions would be dictated by the relevant regulations discussed in Appendix L and permits, if appropriate.

Certain decommissioning activities or options may result in changes in local water chemistry. For example, if licensees dismantle structures by demolition and disposal of the concrete rubble on the site, then there is a potential that the hydration of concrete could cause an increase in alkalinity of groundwater. The pH of interstitial (pore) water very close to the concrete rubble would remain above 10.5 for several hundred thousand years (Krupa and Serne 1988). However, as the leachate migrates away from the demolition debris, it is reasonable to expect the leachate pH to be rapidly reduced (within meters) to natural conditions due to the large buffering capacity of soils. While the leachate's pH may not be a water-quality concern, such leachate may affect the transport properties of radioactive and nonradioactive chemicals (notably metals) in the subsurface although this transport would not be detectable offsite. Surface spreading of the demolition debris over large areas may provide adequate opportunity for soils to buffer the pH to background. Because the nonradiological impacts would be nondetectable, they are considered to be generic for all sites. However, concentrated disposal of demolition debris, either within or outside of existing below-grade structures, would require below-grade compliance with RCRA guidelines. The radiological aspects of onsite disposal of slightly contaminated material would require a site-specific analysis and would be addressed at the time the LTP is submitted.

Current or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in water-quality impacts that are different from those found at other nuclear reactor facilities.

4.3.3.4 Conclusions

The staff considered available information on the potential impacts of decommissioning on nonradioactive aspects of water quality for both surface water and groundwater, including comments received on the draft of Supplement 1 of NUREG-0586. This information indicates that for all facilities the impacts of decommissioning on water quality will be neither detectable nor destabilizing. Therefore, the staff makes a generic conclusion that for all facilities, the impacts on nonradioactive aspects of water quality are SMALL. The staff has considered mitigation and concludes that no additional measures are likely to be sufficiently beneficial to be warranted.

4.3.4 Air Quality

Decommissioning activities have the potential to adversely impact air quality. The activities may be direct, such as demolition of buildings, or indirect, such as transportation of decommissioning workers to and from the site. This section discusses the nonradiological impacts of decommissioning on air quality. Radiological impacts on air quality are addressed in Section 4.3.8, "Radiological."

4.3.4.1 Regulations

The purpose of the Clean Air Act (CAA) as amended (42 USC 7401 et seq.) is to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the CAA, as amended, requires that each Federal agency, such as NRC, with jurisdiction over any property or facility that might result in the discharge of air pollutants, comply with "all Federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution. Pursuant to the Act, the EPA established National Ambient Air Quality Standards to protect public health, with an adequate margin of safety, from known or anticipated adverse effects of regulated pollutants (42 USC 7409). Hazardous air pollutants and radionuclides are regulated separately (42 USC 7412).

EPA's regulations are found in Title 40 of the Code of Federal Regulations. The National Primary and Secondary Ambient Air Quality Standards are found in 40 CFR Part 50. The standards related to particulate matter (40 CFR 51.06 and 40 CFR 51.07) are particularly relevant to decommissioning activities. Other regulations that may cover decommissioning activities are found in 40 CFR Part 61, which deals with hazardous air pollutants such as asbestos, chlorofluorocarbons, and radionuclides; 40 CFR Part 81, which deals with designation of areas for air-quality planning purposes; and 40 CFR Part 82, which deals with protection of stratospheric ozone.

In addition, State and local agencies have developed and enforce a variety of air-quality regulations. These regulations require permits for emission sources, limit emission rates, and set maximum atmospheric concentrations for pollutants. Finally, different regulations apply to indoor air quality and worker safety.

4.3.4.2 Potential Impacts of Decommissioning Activities on Air Quality

Table E-3 in Appendix E shows activities that may have an effect on air quality. These include organizational changes, stabilization, storage preparation for SAFSTOR, decontamination and dismantlement, structural dismantlement, entombment, and transportation. The potentially adverse impacts identified include (1) degradation of air quality caused by emissions (e.g., NO_x, CO, and hydrocarbons) from internal combustion engines, (2) increased particle loading of the atmosphere caused by the movement of vehicles and equipment, demolition of structures, dismantlement of systems, and operation of concrete batch plants, and (3) alteration of other characteristics of the atmosphere (e.g., the ozone layer) by releases of gases used in plant systems (e.g., in fire suppression or refrigeration).

Air-quality impacts of emissions from internal combustion engines and changes in atmospheric particle loading can be assessed by comparison with standards set in air-quality regulations. These potential impacts are considered detectable if a decommissioning activity is likely to cause a measurable increase in the concentration of one or more regulated air pollutants that can be directly attributed to the activity. The impact is considered to be destabilizing if the impact is detectable and causes a change in the attainment status of the region. Air-quality impacts of the releases of other gases can be assessed by comparison with the magnitude of potential releases during decommissioning with the magnitude of releases of the same or similar gases from other sources.

4.3.4.3 Evaluation

Decommissioning activities that have the potential to have a nonradiological impact on air quality include:

- worker transportation to and from the site
- dismantling of systems and removing of equipment
- movement and open storage of material onsite
- demolition of buildings and structures
- shipment of material and debris to offsite locations, and
- operation of concrete batch plants.

These activities typically take place over a period of years from the time the facility ceases operation until the decommissioning is complete and the license is terminated. The magnitude and the timing of the potential impacts of each activity will vary from plant to plant, depending on the decommissioning options selected by the licensee and the status of facilities and structures at the time of license termination.

Worker transportation: Air-quality impacts of transportation of workers to and from the site are caused by emissions from the vehicles and by fugitive dust from traffic on paved and unpaved roads. Consequently, the impacts can be estimated directly from the size of the work force. Experience with decommissioning indicates that for most sites the onsite work force tends to decrease from the time that plants cease operation until decommissioning is complete. There are occasional increases during specific decontamination and dismantlement activities. However, the work force during decommissioning is smaller than the construction work force and the work force during refueling outages, and almost always smaller than the work force during facility operation.

Assuming that neither the mix of vehicles used for worker transportation nor the vehicle occupancy is different during decommissioning than during plant construction or operation, emissions from vehicles and fugitive dust associated with traffic is expected to decrease during the decommissioning period. These decreases are expected to improve air quality rather than degrade it. Consequently, the change in air quality associated with changes in worker transportation during decommissioning should not be detectable or destabilizing at any site.

Dismantling systems and removing equipment: Air-quality impacts of dismantling systems and removing equipment may be caused by the generation and release of particulate matter associated with the physical activities of dismantling and by the release of gases from the systems (for example, refrigeration systems and fire-protection systems).

The predominant potential effluent from system dismantling and removal of equipment will be particulate matter and fugitive dust. This material will generally be released in and remain within buildings and other structures because most decommissioning activities associated with dismantling systems and removing equipment will be conducted inside the containment, auxiliary, and fuel-handling buildings. These buildings have systems to minimize airborne contamination, such as whole-building air filtration. Filtration systems control the release of particulate matter to the environment. These systems, which are typically maintained and periodically operated during decommissioning, reduce the impact of airborne particulate material. Where filtration systems are not in place to control particulate releases, temporary systems can be established, as needed. Special air-ventilation pathways may be established before the start of a SAFSTOR period to ensure that air ventilates from the building through

high efficiency particulate air (HEPA) filters. It is unlikely that particulate matter released to the environment as a result of system dismantlement and equipment removal will be sufficient to be detectable offsite. Special precautions are required for worker protection where hazardous materials such as asbestos may become airborne, as discussed in Section 4.3.10, "Occupational Issues."

Various systems associated with reactors contain gases that are of environmental concern. For example, some gases used in refrigeration systems and fire-suppression systems have been identified as ozone-depleting compounds. Venting of these gases to the atmosphere is prohibited by law. Standard methods exist to purge systems with these gases and limit releases to the environment to insignificant quantities. Other fire suppression and refrigeration systems may contain greenhouse gases. The quantities of these gases at a nuclear plant are generally small in comparison with the quantities of greenhouse gases released hourly by a fossil-fuel combustion plant used for heating or power generation. The impacts of ozone-depleting and greenhouse gases are global rather than local. Therefore, it is unlikely that releases of ozone-depleting or greenhouse gases during decommissioning of any nuclear power plant will be detectable or destabilize the environment.

Movement and open storage of material onsite: Movement of equipment and open storage of materials onsite during decommissioning are similar to activities during construction or demolition of an industrial facility. The air-quality impacts of the movement of equipment and open storage of materials onsite are primarily associated with fugitive dust. Movement of equipment outside of the buildings may generate fugitive dust. Movement of equipment may also alter the size distribution of particles on the ground, making the particles more susceptible to suspension by the wind. Mitigation measures will be taken to minimize dust to comply with local air-quality regulations. Common mitigation measures include watering and other soil stabilization measures, such as spraying sealants on the area and seeding. Therefore, it is unlikely that the movement of equipment and open storage of materials will be detectable or destabilize regional air quality.

Demolition of buildings and structures: Once decontamination has been completed, the demolition of buildings and other structures at a nuclear power plant is similar to demolition of buildings and structures at industrial facilities. Demolition of buildings and major structures may cause a temporary increase in fugitive dust from the site. Fugitive dust from demolition of buildings and structures will involve large particles that will settle to the ground quickly. Demolition will generally be limited to a small number of short-duration events. Mitigation measures will be used to minimize dust. Therefore, it is unlikely that the fugitive dust from demolition of buildings and structures will be detectable or destabilize air quality.

If residual contamination is present at the time of demolition, then the demolition of buildings and structures must be conducted using techniques that keep releases of contaminated material within regulatory limits. For purposes of assessing radiological impacts, impacts are of small significance if doses and releases do not exceed limits established by the Commission's regulations.

Shipment of material and debris to offsite locations: Dismantled equipment, material, and debris from decommissioning are typically removed from the site as decommissioning progresses. The number of shipments required during the decommissioning period depends on the method of transportation and the decommissioning option chosen. Although the number of shipments may be relatively large, the decommissioning period extends over several years. As a result, the number of shipments per day is small. Current experience is that there is an average of less than one shipment per day of LLW from the plant (see Section 4.3.17, "Transportation"). Therefore, it is unlikely that the emissions from a shipment or a small number of shipments per day would be detectable or destabilize local or regional air quality at any nuclear power plant undergoing decommissioning.

Operation of a concrete batch plant: The ENTOMB options will require a large amount of concrete and aggregate. Unloading, movement, and dispensing of the materials that make concrete result in fugitive dust in the vicinity of concrete batch plants. Most of the dust is associated with unloading dry cement at the concrete batch plant and loading mixers or trucks. This dust tends to consist of large particles that settle out of the air quickly. As a result, dust associated with concrete batch plant operations is likely to be localized near the concrete batch plant. There will also be emissions from heavy equipment at concrete batch plants and vehicles used to transport concrete from the concrete batch plant to the entombment site. The likely impacts of these emissions will be smaller than those from dust.

There are a number of mitigation measures that can be used to control dust. Dust control measures commonly used at concrete batch plants include enclosure of dumping and unloading areas and conveyors, use of filters, and use of water sprays. There would be no significant difference between a concrete batch plant used in the ENTOMB option and a batch plant used for any other major construction activity. Therefore, the staff considers it unlikely that the environmental impacts of operation of a concrete batch plant for a plant undergoing entombment would be detectable or destabilize air quality.

In summary, the most likely impact of decommissioning on air quality is degradation of air quality by fugitive dust. Fugitive dust during decommissioning should be less than during plant construction because the size of the disturbed areas is smaller, the period of activity is shorter, and paved roadways may exist. Use of BMP, such as seeding and wetting, can be used to

minimize fugitive dust. During demolition activities, some particulate matter in the form of fugitive dust may be released into the atmosphere, but much of this fugitive dust consists of large particles that settle quickly. To date, licensees decommissioning nuclear reactor facilities have taken appropriate and reasonable control measures to minimize fugitive dust. No anticipated new methods of conducting decommissioning and no peculiarities of operating plant sites are anticipated to affect this pattern.

The selection of the decommissioning option (DECON, SAFSTOR, ENTOMB1, or ENTOMB2) is more likely to affect the timing of air-quality impacts than the magnitude of the impacts. Immediate decontamination and dismantlement of the facility (DECON) results in impacts earlier than the SAFSTOR option, in which most decommissioning activities are postponed to permit residual activity in the plant to decay. ENTOMB1 and ENTOMB2 may include the dismantlement of structures outside of containment and, thus, could result in air-quality impacts related to fugitive dust that would be the same as or greater than during DECON.

Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in air-quality impacts that are different from those found at other nuclear facilities.

4.3.4.4 Conclusions

The staff has considered available information on the potential impacts of decommissioning on air quality, including comments received on the draft of Supplement 1 of NUREG-0586. This information indicates that the impacts of decommissioning on air quality are neither detectable nor destabilizing. Therefore, the staff makes the generic conclusion that the impacts on air quality are SMALL. The staff has considered mitigation and concludes that current and commonly used measures are sufficient and no additional measures are likely to be sufficiently beneficial to be warranted.

4.3.5 Aquatic Ecology

Aquatic ecology issues incorporate all of the plants, animals, and species assemblages in the rivers, streams, oceans, estuaries, or any other aquatic environments near a nuclear power facility. Aquatic ecology also includes the interaction of those organisms with each other and the environment.

4.3.5.1 Regulations

Federal laws that are included within a NEPA evaluation of aquatic ecology issues include the CWA, the ESA of 1973, the Fish and Wildlife Coordination Act (16 USC 661 to 667c), and NEPA. Although some biota may be affected by a number of decommissioning activities, full consideration is usually reserved for the more important aquatic resources, which may be either individual species or habitat-level resources. Some activities, such as removal of in-stream or shoreline structures, may require permits from other agencies.

4.3.5.2 Potential Impacts of Decommissioning Activities on Aquatic Ecological Resources

Table E-3 in Appendix E identifies decontamination and dismantlement and structural dismantlement as activities that may affect aquatic ecology. Aquatic ecological resources may be impacted during the decommissioning process via either the direct or the indirect disturbance of plant or animal communities near the plant site. Direct impacts can result from activities such as the removal of shoreline or in-water structures (i.e., the intake or discharge facilities), the active dredging of a stream, river, or ocean bottom, or the filling of a stream or bay while indirect impacts may result from effects such as runoff. During decommissioning, aquatic environs at the plant site may be disturbed for the construction of support facilities, such as to build a dock for barges or to bridge a stream or aquatic area. Additionally, aquatic environs away from the plant site may be disturbed to upgrade or install new transportation systems (e.g., a new rail line to support large component removal) or to install or modify transmission lines. In most cases, aquatic disturbances will result in relatively short-term impacts and the aquatic environs will either recover naturally or impacts can be mitigated. Minor impacts to aquatic resources could result from sediment runoff generation due to ground disturbance and surface erosion and runoff. Impacts may occur if shoreline or in-water structures, such as the intake or discharge facilities and pipes, are removed. These impacts will typically be temporary and will not be detectable nor will they destabilize important attributes of the resource. It is important that shoreline or in-water structure removal is managed in a manner that does not result in the establishment of nonindigenous or noxious plants and animals to the exclusion of native species.

If decommissioning does not include removal of shoreline or in-water structures, very little aquatic habitat is expected to be disturbed during decommissioning. Thus, practically all aquatic habitat that was used during regular plant operations or, at a minimum, was not previously disturbed during construction of the site will not be impacted. If all activities are confined to the plant operational areas, impacts are expected to be minor and would primarily result from increased sediment from physical alterations of the site. If no disturbances occur

beyond the regular operational areas of the site, it is expected that the impact to aquatic resources will be nondetectable, nondestabilizing, and easily mitigated.

In some cases, the aquatic habitats that were originally disturbed during the construction of the site will continue to be of low habitat quality at the time of site decommissioning, even beyond the normal operations boundaries. However, important resources could either develop on the site or colonize the area disturbed by the construction. If a decommissioning activity results in the “removal” of species from an area (e.g., if a commercial or recreational fishery is no longer possible), this may be detectable. Reworking the ground surface during construction could alter the surface-drainage patterns such that wetlands on the original construction site may no longer support an aquatic community. If this is an important local or regional resource, it may be considered destabilizing.

4.3.5.3 Evaluation

The primary factors that must be considered in evaluating the potential for adverse impacts in areas previously disturbed by construction include the quantity of habitat to be disturbed, the length of time since initial disturbance, and the successional patterns of the aquatic communities (especially nuisance species). Most of the important aquatic ecological resources are not likely to occur on most plant sites. If they do occur, the decommissioning activities can probably be planned to avoid or minimize detectable and destabilizing effects.

Two decommissioning activities may result in impacts to the aquatic environment: removal of structures from the shoreline or in-water environment and removal of contaminated soil from the site (the latter applies only if the soil is in or near an aquatic environment).

Additionally, dredging and modification of barge loading facilities may result in impacts to aquatic ecological resources. Periodic permitted, maintenance dredging of the barge unloading facility is not expected to result in long term detectable or destabilizing impacts to the aquatic environment. Impacts to the aquatic resources would be within the bounds of the generic assessment. However, a significant expansion of the barge unloading facility necessary to accommodate, for example, a large shipping package such as a reactor vessel would require a site specific assessment. The environmental assessment may be performed by the U.S. Corps of Engineers as part of the review to permit the enlargement of the barge unloading facility.

In most cases, the aquatic environment required to support the decommissioning process is relatively small and is normally a very small portion of the overall plant site. Usually, the areas disturbed or utilized to support decommissioning are within the boundaries of the site operational areas and typically are immediately adjacent to the reactor, auxiliary, and control

buildings. Discharge permits to the aquatic environment for operation are almost always greater than planned or realized during decommissioning. In almost all cases examined, licensees expect to restrict activities to previously disturbed areas and operate within the limits of operational permits.

The potential for adverse impacts are likely to be nondetectable or nondestabilizing regardless of the decommissioning option selected. The activity most likely to result in impacts to aquatic environments is specific to removal of shoreline or in-water structures. The decision to conduct these activities would not be dependent on the decommissioning option. The only option where shoreline or in-water structure removal appears to be guaranteed is for those plants where return to a “Greenfield” is desired or required.

When there is a decommissioning activity outside the operational area, the significance of the potential impacts are more difficult to define and will depend on site-specific considerations. The primary factors that need to be considered include the total acreage of habitat to be disturbed, and the overall importance of the plant or animal species or communities to be disturbed. If important resources may be affected by the decommissioning activities, the impacts may be detectable and destabilizing.

Current or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in aquatic ecology impacts that are different from those found at other nuclear reactor facilities.

4.3.5.4 Conclusion

The staff has considered available information on the potential impacts of removing facility structures or contaminated soil from or near the aquatic environment on the aquatic ecological resources, including comments received on the draft of Supplement 1 of NUREG-0586. For facilities where disturbance of lands beyond the operational areas is not anticipated, the impacts on aquatic ecology are not detectable or destabilizing. The staff believes that activities within operational areas including the removal of shoreline or in-water structures, will have minimal impact on aquatic resources provided all applicable BMPs are employed and required permits are obtained. Therefore, the staff makes a generic conclusion that for such activities, the potential impacts to aquatic ecology are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

If disturbance beyond the operational areas is anticipated, the impacts may or may not be detectable or destabilizing, depending on site-specific conditions and cannot be predicted

generically. Therefore, the staff concludes that if disturbance beyond the operational areas is anticipated, the potential impacts may be SMALL, MODERATE, or LARGE, and must be determined through site-specific analysis.

4.3.6 Terrestrial Ecology

Terrestrial ecology considers all of the plants, animals, and species assemblages in the vicinity of the nuclear power facility as well as the interaction of those organisms with each other and the environment. Evaluations of impacts to terrestrial ecology are usually directed at important habitats and species, including plants and animals that are important to industry, recreational activities, the area ecosystems, and those protected by endangered species regulations and legislation. Federally listed threatened and endangered species, and designated critical habitat for such species, are addressed in a separate section of this Supplement (Section 4.3.7). There are also many species identified by State agencies as endangered or threatened, and potential impacts to such species should be evaluated and mitigated, as appropriate. Important habitat resources include (but are not limited to) wetlands, riparian areas, resting or nesting areas for large numbers of waterfowl, rookeries, communal roost sites, strutting or breeding grounds for gallinaceous birds, calving grounds, and areas containing rare plant communities. Some States have programs to formally designate priority or rare habitat community types.

4.3.6.1 Regulations

Federal statutes that are directly applicable in a NEPA evaluation of terrestrial ecology issues include the ESA of 1973, the Migratory Bird Treaty Act of 1918 (MBTA) (16 USC 703-712), and portions of other statutes, such as the wetlands provisions of the CWA (see Section 4.3.5.1, “Regulations”).

The MBTA was initially enacted in 1918 to implement the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds. Specifically, the Act established a Federal prohibition, unless otherwise regulated, to pursue, hunt, take, capture, or kill any bird included in the terms of the convention, or any part, nest, or egg of any such bird. The MBTA was amended in 1936 to include species included in a similar convention between the United States and Mexico, in 1974 to include species included in a convention between the United States and Japan, and in 1978 in a treaty between the United States and the Soviet Union. Executive Order 13186 (2001) further defined the responsibilities of Federal agencies, such as the NRC, to ensure the protection of migratory birds and to consider potential impacts to migratory birds during the preparation of NEPA documents.

4.3.6.2 Potential Impacts of Decommissioning Activities on Terrestrial Ecological Resources

Table E-3 in Appendix E identifies stabilization, large-component removal, structure dismantlement, and decontamination and dismantlement as activities that may affect terrestrial ecology. Terrestrial ecological resources may be impacted during the decommissioning process via direct or indirect disturbance of native plant or animal communities in the vicinity of the plant site. Direct impacts can result from activities such as the clearing of native vegetation or filling of a wetland. Indirect impacts may result from effects such as erosional runoff, dust, or noise. During decommissioning, land at the site may be disturbed for the construction of laydown yards, stockpiles, and support facilities. Additionally, land away from the plant site may be disturbed to upgrade or install new transportation or utility systems. For example, building a new rail line may be necessary to support large-component removal. Installing or altering existing transmission lines could also have an effect on the terrestrial environment. In most cases, land disturbances will result in relatively short-term impacts and the land will either recover naturally or will be landscaped appropriately for an alternative use after completion of decommissioning.

Minor impacts to terrestrial resources could result from dust generation due to ground disturbance and traffic, noise from dismantlement of facilities and heavy equipment traffic, surface erosion and runoff, and migratory bird collisions with crane booms or other construction equipment. Most of these minor, indirect impacts are temporary and will not be significant issues after the completion of decommissioning. The effects of such impacts can also be minimized using standard BMPs.

Impacts to terrestrial resources are considered to be detectable if they result in changes to local species populations or plant or animal communities beyond the typical levels of natural variability (i.e., normal year-to-year variations). The impacts are considered to be destabilizing if they result in the extirpation of important species or result in long-term changes in ecological functions (such as flow of energy), species richness, diversity, or proportion of invasive species.

4.3.6.3 Evaluation

At most commercial nuclear facilities, there is a relatively distinct operational area where most or all site activities occur (e.g., materials and equipment storage, parking, substation operation, facility service and maintenance, etc.). This operational area usually includes all areas within the protected area fence, the intake, discharge, cooling, and other associated structures, as well as adjacent paved, graveled, and maintained landscaped areas. The operational area may include the entire area disturbed during facility construction, but is often considerably smaller.

Terrestrial habitats disturbed during the construction of the site will often continue to be of low habitat quality during plant operation and decommissioning. However, sensitive habitats can develop on the site or rare species can colonize the area disturbed during construction. This is especially true if the site has been in SAFSTOR for several decades. For example, reworking the ground surface during construction may have altered the surface-drainage patterns such that wetlands develop on the original construction site. Trees could grow to the point where they become usable as roosting or nesting sites for eagles, osprey, or wading birds. These habitats may be inhabited by sensitive species at the time of decommissioning. Rare species have colonized portions of the site at several operating commercial nuclear power plants.

In most cases, the amount of land required to support the decommissioning process is relatively small and is a small portion of the overall plant site. Usually, the areas disturbed or utilized to support decommissioning are within the operational areas of the site and typically are within the protected area. Usually, there is sufficient room within the operational areas to function as temporary storage, laydown, and staging sites. In most cases, management, engineering, and administrative staff would have been assigned space in existing support or administration buildings. In some cases, the licensees have installed trailers or temporary buildings to house engineering and administrative staff or to otherwise support decommissioning. Most licensees expect to restrict decommissioning activities to highly disturbed operational areas but a few expect to use lands beyond the operational areas, as defined above. The licensees typically anticipate utilizing an area of between 0.4 ha (1 ac) to approximately 10.5 ha (26 ac) to support the decommissioning process. One facility (Big Rock Point) required a new transmission line ROW to provide electrical power to the plant site during decommissioning (this line will also provide power to the onsite independent spent fuel storage installation [ISFSI] after decommissioning is completed). However, construction of a new transmission line ROW is probably an unusual situation. It is expected that some sites will require the reconstruction or installation of new transportation links, such as railroad spurs, road upgrades, or barge slips. Activities conducted within the operational areas are not expected to have a detectable impact on important terrestrial resources. Activities conducted outside the operational areas may have detectable impacts, depending on the magnitude and type of activity and the resources potentially affected.

None of the decommissioning options have a greater likelihood of resulting in detectable or destabilizing impacts to terrestrial resources. The selection of the decommissioning option is more likely to affect the timing of the impact on ecological resources than it is the magnitude of the impacts. DECON may require slightly more land area to support a larger number of simultaneous activities. The ENTOMB2 option would probably have the least likelihood of adverse impacts onsite because some large components may be left in place, reducing the land requirements needed for large construction equipment, waste storage, and barge or rail loading

areas. However, impacts of ENTOMB2 could be larger if additional land disturbance is required to install a concrete batch plant and associated material stockpiles. The potential impacts of SAFSTOR may be smaller than DECON, depending on the time over which activities are performed. If decontamination and dismantlement occur slowly over many years (incremental DECON), the same storage and staging areas can be reused for sequential activities. If many activities are performed over a short time period at the end of the SAFSTOR period, the impacts may be as large as those for DECON. The activity of demolition of construction material should not have significant nonradiological impacts beyond other decommissioning activities except for potential short-term noise and dust effects.

Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in impacts on terrestrial ecology that are different from those found at other nuclear facilities.

4.3.6.4 Conclusions

The staff has considered available information on the potential impacts of decommissioning activities on terrestrial resources, including comments received on the draft of Supplement 1 of NUREG-0586. For facilities where habitat disturbance is limited to operational areas, the impacts on terrestrial ecology are not detectable or destabilizing. Therefore, the staff makes a generic conclusion that for such facilities the potential impacts to terrestrial ecology are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

If habitat disturbance beyond the operational areas is anticipated, the impacts may or may not be detectable or destabilizing, depending on site-specific conditions and cannot be predicted generically. Therefore, the staff concludes that if disturbance beyond the operational areas is anticipated, the potential impacts may be SMALL, MODERATE, or LARGE and must be determined through site-specific analysis.

4.3.7 Threatened and Endangered Species

Plants and animals protected under the ESA of 1973 may be present at or near all commercial nuclear power facilities (Sackschewsky 1997). At operating plants, the most common potential impacts to endangered aquatic species are effects related to the operation of the cooling water system via impingement, entrainment, or occasional temperature or chemical effects. Because the cooling system is not used at a plant undergoing decommissioning, it is anticipated that the potential impacts of decommissioning on threatened or endangered aquatic species will normally be no greater than and likely far less than the potential impacts of plant operations.

For terrestrial species that are threatened or endangered, the most common potential impacts for operating plants are from transmission ROW maintenance activities. Most transmission lines beyond the switchyard are expected to remain energized, even after a commercial nuclear power facility closes operation, and the ROW maintenance activities are expected to continue. Therefore, the potential impacts of decommissioning on terrestrial species will normally be no greater than the potential impacts of plant operations.

4.3.7.1 Regulations

The ESA is the Federal statute that is directly applicable in a NEPA evaluation of threatened and endangered species issues. The ESA is intended to protect plant and animal species that are threatened with extinction and to provide a means to conserve the ecosystems on which they rely. Under the ESA, the U.S. Fish and Wildlife Service (USFWS) is responsible for all terrestrial and freshwater organisms. Marine and anadromous fish species are the responsibility of the National Marine Fisheries Service (NMFS). The ESA prohibits the taking of listed species and the destruction of designated critical habitat for listed species. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct (16 USC 1532). The ESA applies to Federal agencies as well as individuals. However, in general, the prohibitions against take in respect to listed plant species are only applicable to Federal agencies or to individuals on Federal lands.

Section 7 of the ESA provides a means for Federal agencies to consult with USFWS and NMFS concerning impacts to endangered species resulting from Federal actions. Although USFWS and NMFS are the administering agencies, it is the responsibility of the action agency to determine the potential impacts of a proposed action (including licensing actions) on endangered or threatened species via the preparation of a biological assessment. If the consultation process results in a determination that there may be adverse impacts to listed species, Section 10 of the ESA provides a means for permitted takes that are incidental to otherwise legal activities.

4.3.7.2 Potential Impacts of Decommissioning Activities on Threatened and Endangered Species

Table E-3 in Appendix E indicates that stabilization, large-component removal, structural dismantlement, and decontamination and dismantlement are activities that may affect threatened or endangered species. Such species may be impacted during the decommissioning process either through direct take (kill, maim, or unable to reproduce) or via disturbances of native plant or animal communities near the plant site that the species relies on for food or

shelter. Additionally, an extended period of SAFSTOR may allow the establishment of onsite populations of protected species that may be adversely affected by facility decontamination and dismantlement at the end of the storage period.

The greatest potential for impact to protected species is associated with physical alteration or dismantlement of the facilities, landscape, or aquatic environment. Impacts can result from activities such as the removal of near-shore or in-water structures (e.g., the intake or discharge facilities); the active dredging of a stream, river, or ocean bottom; the filling of a stream, bay, or wetland; or the clearing of native vegetation. Indirect impacts may result from runoff, sedimentation, dust generation, or noise disturbance. The aquatic environment at a plant site may be disturbed for the construction of support facilities to allow barges to dock or to bridge a stream or other aquatic area. Additionally, terrestrial and aquatic environments away from the plant site may be disturbed to upgrade or install new transportation or utility systems. For example, a new rail line may be necessary to support large component removal. Installing or altering transmission lines could also affect the terrestrial and aquatic environment. In most cases, disturbances will result in relatively short-term impacts and the environment and local populations will either recover naturally or impacts can be mitigated using standard BMPs. An important exception may occur if near-shore or in-water structure removal or land surface disturbances result in the establishment of nonindigenous or noxious plants and animals to the exclusion of threatened or endangered species.

Impacts to endangered or threatened species are considered detectable if there are changes (attributable to the facility) in the species behavior or in the local population size that are greater than normal year-to-year variation. Impacts would be considered destabilizing if they result in direct mortality or major behavior changes (such as abandonment of most suitable habitat areas in the plant vicinity) or if they otherwise jeopardize the local population.

4.3.7.3 Evaluation

Usually, very little land will be disturbed during decommissioning that was not used during regular plant operations or previously disturbed during construction of the facility. If all activities are confined to site operational areas (i.e., within protected area fences, intake, discharge, cooling, and other associated structures, and adjacent paved, graveled, and maintained landscaped areas), the impacts to terrestrial threatened or endangered species are expected to be minor and nondetectable. Any impacts that did occur would primarily result from increased noise and dust generation from physical alterations of the plant site and from increased truck

traffic to and from the site. If no disturbances occur beyond the operational areas of the site, it is expected that the impact to threatened or endangered terrestrial species will be relatively small, temporary, and mitigable. The impacts of activities beyond the operational areas would depend on the activity, the species potentially affected, and the mitigation options available.

Unless there are major structural changes in the aquatic environment, the potential for adverse impacts to aquatic threatened or endangered species is expected to be minimal and nondetectable. Impacts to aquatic threatened or endangered species resulting from runoff/ sedimentation or chemical inputs during decommissioning will be significantly less than the potential entrainment and impingement impacts that were present when the plant was operating because of the drastically reduced water use.

The different decommissioning options will probably not differ significantly in potential impacts to threatened or endangered species, except in those cases where the plant is held in SAFSTOR for extended periods. In those cases, there is a greater potential for rare species to colonize areas that may subsequently be disturbed during the decommissioning process.

The likelihood of impacts to threatened and endangered species is related to their presence or absence. This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected. Consultation under Section 7 of the ESA must be initiated to determine if protected species are near the plant. If species are identified, an assessment of the potential impacts of decommissioning must be determined. Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in impacts on threatened and endangered species that are different from those found at other nuclear facilities.

4.3.7.4 Conclusions

The staff has considered available information on the potential impacts of decommissioning on threatened and endangered species, including comments received on the draft of Supplement 1 of NUREG-0586. Based on this information, the staff has considered that the adverse impacts and associated significance of the impacts must be determined on a site-specific basis.

The ESA imposes two basic requirements on the NRC. First, the ESA requires the NRC to ensure that any action authorized, funded, or carried out by NRC is not likely to jeopardize the continued existence of any endangered or threatened species, or to result in the destruction or impairment of any critical habitat for such species. Second, the NRC is required to consult with the Secretary of the Interior (for freshwater and terrestrial species through the USFWS) or the Secretary of Commerce (for marine and some anadromous fish through the NMFS) to

determine if any listed species may be affected by an action. This consultation may be formal or informal, depending on the nature of the action, the species potentially affected, and the level of impacts to those species.

Acknowledging the site- and species-specific nature of threatened and endangered species and the special obligations imposed on the NRC by the ESA, the staff has concluded that the potential impacts to threatened and endangered species may be SMALL, MODERATE, or LARGE, and is not a generic issue. Informal consultation will be initiated by the NRC staff with the appropriate service after the licensee announces permanent cessation of operations. It is expected that any formal or informal consultation will be completed prior to the licensee beginning major decommissioning activities, which can occur 90 days after the submission of the post-shutdown decommissioning activities report (PSDAR). At that time, it will be determined whether such species could be affected by decommissioning activities and whether formal consultation will be required to address the impacts. Each State should also be consulted about its own procedure for considering impacts to State-listed species.

4.3.8 Radiological

The NRC considers radiological doses to workers and members of the public when evaluating the potential consequences of decommissioning activities. Radioactive materials are present in the reactor and support facilities after operations cease and the fuel has been removed from the reactor core. Exposure to these radioactive materials during decommissioning may have consequences for workers. Members of the public may also potentially be exposed to radioactive materials that are released to the environment during the decommissioning process. All decommissioning activities were assessed to determine their potential for radiation exposures that may result in health effects to workers and the public. This section considers the impacts to workers and the public during decommissioning activities performed up to the time of the termination of the license. Any potential radiological impacts following license termination are not considered in this Supplement. Such impacts are covered by the *Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities*, NUREG-1496 (NRC 1997).

4.3.8.1 Regulations

Decommissioning reactors in the United States continue to be licensed by the NRC and must comply with NRC regulations and conditions specified in the license. The regulatory standards for radiation exposure to workers and members of the public are found in 10 CFR Part 20 (see detailed discussion in Appendix G). Title 10 CFR Part 20 requires that the sum of the external and internal doses (total effective dose equivalent, or TEDE) for a member of the public may

not exceed 1 mSv/yr (0.1 rem/yr). Compliance is demonstrated by measurement or calculation, to show (1) that the highest dose to an individual member of the public from sources under the licensee's control does not exceed the limit or (2) that the annual average concentrations of radioactive material released in gaseous and liquid effluents do not exceed the levels specified in 10 CFR Part 20, Appendix B, Table 2, at the unrestricted area boundary. In addition, the dose from external sources in an unrestricted area should not exceed 0.02 mSv (0.002 rem) in any given hour or 0.5 mSv (0.05 rem) in 1 yr. Occupational doses are limited to a maximum of 0.05 Sv (5 rem) TEDE per year, with separate limits for dose to various tissues and organs.

Potential radiological impacts following license termination are not covered in this Supplement. Specific radiological criteria for license termination were added as Subpart E of 10 CFR Part 20 in 1997, and the basis for public health and safety considerations is discussed in NUREG-1496 (NRC 1997). These criteria limit the dose to members of the public to 0.25 mSv/yr (25 mrem/yr) from all pathways following unrestricted release of a property. In cases where unrestricted release is not feasible, the licensee must provide for institutional controls that would limit the dose to members of the public to 0.25 mSv/yr (25 mrem/yr) during the control period and to 1 mSv/yr (100 mrem/yr) after the end of institutional controls. These criteria will largely determine the types and extent of activities undertaken during the decommissioning process to reduce the radionuclide inventory remaining onsite.

Power reactor licensees are required to meet the requirements in 10 CFR 50.36a for effluent releases after permanent cessation of operations. Licensees are also required to keep releases of radioactive materials to unrestricted areas at levels as low as reasonably achievable (ALARA).

In addition to NRC limits on effluent releases, nuclear power facility releases to the environment must comply with EPA standards in 40 CFR Part 190, "Environmental radiation protection standards for nuclear power operations." These standards specify limits on the annual dose equivalent from normal operations of uranium fuel-cycle facilities (except mining, waste disposal operations, transportation, and reuse of recovered special nuclear and by-product materials). Radon and its decay products are excluded from these standards.

The NRC has not established standards for radiological exposures to biota other than humans on the basis that limits established for the maximally exposed members of the public would provide adequate protection for other species. In contrast to the regulatory approach applied to human exposures, the fate of individual nonhuman organisms is of less concern than the maintenance of the endemic population (NCRP 1991). Because of the relatively lower

sensitivity of nonhuman species to radiation, and the lack of evidence that nonhuman populations or ecosystems would experience detrimental effects at radiation levels found in the environment around nuclear power facilities, these effects are not evaluated in detail for the purposes of this Supplement.

4.3.8.2 Potential Radiological Impacts of Decommissioning Activities

As indicated in Table E-3 in Appendix E, all decommissioning activities have potential radiological concerns. Radiological impacts during decommissioning include offsite dose to members of the public and occupational dose to the work force at the facility. For this Supplement, public and occupational radiation exposures from decommissioning activities have been evaluated on the basis of information derived from recent decommissioning experience. Effluent releases anticipated during decommissioning were estimated from experiences in recent decommissioning activities from both PWRs and boiling water reactors (BWRs).

Many activities that take place during decommissioning are generally similar to those that occur during normal operations and maintenance activities. Those activities include decontamination of piping and surfaces in order to reduce the dose to nearby workers. Removal of piping or other components, such as pumps and valves, and even large components, such as heat exchangers, is performed in operating facilities during maintenance outages. However, some of the activities, such as removal of the reactor vessel or demolition of facilities, would be unique to the decommissioning process. Those activities would have the potential to result in exposures to workers who are close to contaminated structures or components, and to provide pathways for release of radioactive materials to the environment that are not present during normal operation.

4.3.8.3 Evaluation

At the cessation of plant operations, there are areas of the plant structures where residual radiation exceeds the radiation standards for license termination set forth in 10 CFR Part 20, Subpart E. One of the goals of decommissioning is to reduce this residual radiation to levels that would permit license termination. Most of the decommissioning activities listed in Table E-3 in Appendix E have the potential for radiological impacts. The staff expects that all of the activities that have potential radiological impacts will be conducted following approved procedures to keep doses ALARA and well within regulatory limits. Radiological impacts are considered to be undetectable and nondestabilizing, in the NEPA sense, if doses remain within regulatory limits.

For this Supplement, information gained from experience in decommissioning facilities has been used to evaluate radiological dose to workers and members of the public. Occupational

doses, radionuclide emissions, and doses to members of the public during decommissioning were compared to those experienced during periods of routine operation at the same facilities or at similar facilities. They were also compared to estimates presented in the 1988 GEIS (NUREG-0586 [NRC 1988]). This comparison was intended to demonstrate that the radiological consequences actually experienced at facilities undergoing decommissioning were bounded either by the site's EIS for normal operations or by the 1988 GEIS. The data were also used to determine whether it was appropriate to update the estimates for these impacts as presented in the 1988 GEIS.

In estimating the health effects resulting from both offsite and occupational radiation exposures as a result of decommissioning of nuclear power facilities, the staff used the risk coefficients per unit dose recommended by the International Commission on Radiological Protection (ICRP) (1991) for stochastic health effects such as development of cancer or genetic effects. The coefficients consider the most recent radiobiological and epidemiological information available and are consistent with those used by the United Nations Scientific Committee on the Effects of Atomic Radiation. The coefficients used in this Supplement are the same as those published by ICRP (1991) in connection with a revision of its recommendations for public and occupational dose limits. Excess hereditary effects are listed separately because radiation-induced effects of this type have not been observed in any human population, as opposed to excess malignancies that have been identified among populations receiving instantaneous and near-uniform exposures in excess of 0.1 Sv (10 rem). Regulatory limits for radiation exposure to specific organs and tissues are set at levels that would prevent development of nonstochastic effects. Therefore, nonstochastic effects, such as development of radiation-induced cataracts, would not be expected in any individual whose exposure remains within the regulatory limits.

Occupational Dose: As part of the occupational dose analysis, data were collected for annual occupational doses, doses by activity, and total dose from decommissioning, when that information was available. Because many of the facilities that provided information have not completed the decommissioning process, the data included in this analysis is from both actual operating data and from projections for specific activities. Routine occupational doses as reported to the NRC were used to compare collective worker doses during normal operations to those experienced during decommissioning. Projections for specific activities were also used to determine which were the greatest contributors to the cumulative occupational doses over the entire decommissioning period.

The data used for this evaluation are presented in Appendix G. Average occupational doses during the 5 years of normal operations preceding shutdown ranged from about 1.5 to 5 person-Sv (150 to 500 person-rem) per year for each reactor. The average annual collective doses during the years following shutdown were generally lower, ranging from less than 0.1 to

1.8 person-Sv (10 to 180 person-rem), although specific years during the most active decommissioning period may have produced collective worker doses comparable to, or greater than, those typically experienced during normal operation. Average annual doses to individual workers are also generally lower during decommissioning than during normal operation.

Table 4-1 compares cumulative occupational dose estimates from the 1988 GEIS (NRC 1988) to estimates for plants that are currently in the decommissioning process. The types of activities included in these estimates may vary between plants. For example, some estimates include doses from transportation or from activities related to spent fuel management, which are not considered part of the decommissioning process, as defined in the scope of this document. In general, estimates for currently decommissioning plants fell within the range of estimates in the 1988 GEIS, and in some cases were substantially lower than the Supplement 1 estimates for the corresponding type of reactor and decommissioning option.

The estimated cumulative doses for the entire decommissioning process ranged from about 3.5 to 16 person-Sv (350 to 1600 person-rem) for the facilities that provided data. Estimated doses for the reference facilities discussed in the 1988 GEIS ranged from 3 to 19 person-Sv (300 to 1900 person-rem). Because the range of cumulative occupational doses reported by reactors undergoing decommissioning was similar to the range of estimates for reference plants presented in the 1988 GEIS, it was not considered necessary to update the estimates in the previous document at this time.

Activities that resulted in the largest doses during decommissioning included removal of large components, such as the reactor vessel and steam generators. Dismantling the internal structures within the containment building was the activity producing the largest overall doses. Transportation and management of spent fuel each accounted for less than 10 percent of the total. Appendix G provides a more in-depth review of the exposures recorded and anticipated for various activities.

One of the major decommissioning activities that is not performed during routine operation or refurbishment is removal of the reactor vessel. Industry experiences from this activity were reviewed to estimate worker exposure and the amount of radioactive material removed (see Appendix H). As each utility performed this major activity, experiences were shared within the industry and the lessons learned have been used to reduce collective dose to workers and improve the process. Collective worker dose at these sites ranged from 0.14 to 1.8 person-Sv (14 to 180 person-rem). The dismantlement of radioactive structures for the ENTOMB2 option would involve placement of contaminated SSCs in the reactor or containment building.

Facilities could use a demolition process for dismantlement of uncontaminated or slightly contaminated structures; there is a potential for this activity to occur during the dismantlement phases of SAFSTOR, DECON, or ENTOMB1 options. The demolition debris could be disposed of onsite if nonradiologically contaminated. If the debris is radiologically contaminated, it could be sent to a LLW site (except for the ENTOMB1 option, where it would be disposed of in the reactor or containment building structure). However, in cases where the remaining activity was low enough that the licensee could meet the criteria in 10 CFR Part 20, Subpart E, and other regulations, the demolition debris could potentially be disposed onsite for either the DECON or SAFSTOR options. This process has been termed “Rubblization” (see Section 1.3). Rubblization would require a site-specific analysis. The site-specific analysis would be conducted at the time the LTP is submitted for the site. Occupational doses during the activity of crushing the material would be similar to those for dismantlement of the facility in preparation for demolition and offsite disposal. The occupational doses would need to meet the regulatory standards in 10 CFR Part 20. Disposal of the radiologically contaminated demolition debris onsite would also have to meet the radiological criteria for license termination given in 10 CFR Part 20, Subpart E.

Occupational doses to individual workers during decommissioning activities are estimated to average approximately 5 percent of the regulatory dose limits in 10 CFR Part 20, and to be similar to, or lower than, the doses experienced by workers in operating facilities. The average increase in fatal individual cancer risk to a worker during decommissioning, about 8×10^{-5} per year of employment, is less than 2 percent of the lifetime accumulation of occupational risk of premature death of 4.8×10^{-3}. Because the ALARA program continues to reduce occupational doses, no additional mitigation program is warranted.

Public Dose: This section addresses the impacts on members of the public from radiation doses caused by decommissioning activities, including doses from effluents as well as from direct radiation. To determine the relative significance of the estimated public dose for decommissioning, the staff compared dose projections for decommissioning with the historical (baseline) doses experienced at PWRs and BWRs during normal operations. The dose estimates were based on reports evaluating effluent releases during decommissioning efforts and are shown in Appendix G. Levels of radionuclide emissions from facilities undergoing decommissioning decreased because the major sources generating emissions in gaseous and liquid effluents are absent in facilities that have been shut down. However, decommissioning facilities continued to report low levels of radionuclide emissions that resulted from the residual radioactive materials remaining in the facilities. The doses to members of the public from these emissions were also very low. Collective doses to members of the public within 80 km (50 mi) were lower than 0.01 person-Sv (1 person-rem) per year at all decommissioning facilities for

Table 4-1. Comparison of Occupational Dose Estimates from NUREG-0586 (NRC 1988) to those for Decommissioning Reactors

Reactor Type/ Decommissioning Option	1988 GEIS Estimates - Cumulative Occupational Dose, person-Sv (person-rem)	Range of Estimates for Decommissioning Plants - Cumulative Occupational Dose, person-Sv (person-rem)[a]
Boiling Water Reactors		
DECON	18.74 (1874)	7 - 16 (700 - 1600)
SAFSTOR	3.26 - 8.34 (326 - 834)	3.5 (350)
ENTOMB	15.43 - 16.72 (1543 - 1672)	–
Pressurized Water Reactors		
DECON	12.15 (1215)	5.6 - 10 (560 - 1000)
SAFSTOR	3.08 - 6.694 (308 - 664)	4.8 - 11 (480 - 1100)[b]
ENTOMB	9.16 - 10.21 (916 - 1021)	–
Other Reactors (HTGR; FBR)	–[c]	4.3 (430)

(a) These data are based on information provided by plants that are undergoing or have completed the decommissioning process. For facilities that have been completely decommissioned, they represent actual doses accumulated during the decommissioning period. For facilities that are still undergoing decommissioning, they represent a combination of actual doses accumulated during activities that have been completed and projected doses for future activities.

(b) The plant reporting a dose estimate of 1100 person-rem is designated as having elected the SAFSTOR option; however, the period between shutdown and active decommissioning was shorter than the minimum 10-year SAFSTOR period that was evaluated in the 1988 GEIS. Therefore, it may be more appropriate to compare the estimated dose for that facility to the 1988 GEIS estimates for the DECON option.

(c) The 1988 GEIS did not provide dose estimates for reactors other than reference light water reactors. Therefore, there are no previous estimates with which to compare the doses for decommissioning the HTGRs and FBR, which are somewhat unique in the commercial nuclear power industry. The dose estimates are expected to be consistent with PWRs and BWRs.

which data were available, and, in most cases, they were comparable to or lower than the doses from operating facilities. Doses to a maximally exposed individual were less than 0.01 mSv/yr (1 mrem/yr) at both operating and decommissioning facilities, which is well within the regulatory standards in 10 CFR Part 20 and Part 50.

Offsite doses to the public attributable to decommissioning have been examined for both the maximally exposed individual and the collective doses to the population within 80 km (50 mi) of the plants. To date, effluents and doses during periods of major decommissioning have not differed substantially from those experienced during normal operation. Consequently, direct

exposure and effluents in gaseous and liquid discharges are not expected to result in maximum individual doses exceeding the design objectives of Appendix I to 10 CFR Part 50, the dose and effluent concentration limits in 10 CFR Part 20, or the limits established by EPA in 40 CFR Part 190. Both the average individual dose and the 80-km (50-mi) radius collective doses are expected to remain at least 1000 times lower than the dose from natural background radiation. It should also be noted that the estimated increased risk of fatal cancer to an average member of the public is much less than 1×10^{-6}. Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in occupational or public doses that are different from those found at other nuclear facilities.

4.3.8.4 Conclusions

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, on the potential radiological impacts of decommissioning. This information indicates that the radiological impacts of decommissioning will remain within regulatory limits. Therefore, the staff makes the generic conclusion that the radiological impacts of decommissioning activities are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

The staff also determined that the issue of the long-term radiological aspects of Rubblization or onsite disposal of slightly contaminated material could not be evaluated generically and would require a site-specific analysis. The site-specific analysis would be conducted at the time the LTP for the site is submitted.

4.3.9 Radiological Accidents

As indicated in the Introduction to this Supplement, the staff relies on the Waste Confidence Rule for determining the acceptability of environmental impacts from the storage and maintenance of fuel in the spent fuel pool. The Rule states, in part, that there is, “reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant impact for at least 30 yrs beyond the licensed life for operation...of that reactor at its spent fuel storage basin” (54 FR 39767).[(a)] However, for the purpose of public information, the staff has elected to include a discussion of potential accidents related to the spent fuel pool in this Supplement.

(a) The Commission reaffirmed this finding of insignificant environmental impacts in 1999 (64 FR 68005). This finding is codified in the Commission’s regulations in 10 CFR 51.23(a).

The likelihood of a large offsite radiological release that impacts public health and safety from a facility that has permanently ceased operation is considerably lower than the likelihood of a release from an operating reactor that impacts public health and safety. This is because the potential accidents associated with reactor operation are no longer relevant after the reactor fuel has been removed.

Radiological accidents considered in licensing nuclear power plants are classified as design basis accidents (DBAs) and severe (beyond design basis) accidents. DBAs are those accidents that both the licensee and the NRC staff evaluate to ensure that the plant can withstand normal and abnormal transients and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public. Severe accidents are those that are beyond the design basis of the plant. They are more severe than DBAs because they may result in substantial damage to the fuel, whether or not there are serious offsite consequences. For the most part, DBAs focus on reactor operation and are not applicable to plants undergoing decommissioning. The only DBAs or severe accidents (beyond design basis) applicable to a decommissioning plant are those involving the spent fuel pool. These postulated accidents are not expected to occur during the life of the plant, but are evaluated to establish the design basis for the preventive and mitigative safety systems of the spent fuel storage facility.

4.3.9.1 Regulations

Regulations governing accidents that must be addressed by nuclear power facilities, both operating and shutdown, are found in 10 CFR Part 50 and 10 CFR Part 100. The environmental impacts of DBAs, including those associated with the spent fuel pool, are evaluated during the initial licensing process. The ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the operating license. The results of these evaluations are found in license documentation, such as the staff's safety evaluation report, the final environmental statement (FES), and in the licensee's Final Safety Analysis Report (FSAR) or equivalent. The consequences for these events are evaluated for the hypothetical maximally exposed individual. The licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant.

In addition, Appendix E to 10 CFR Part 50 requires each licensee to develop emergency plans and implementing procedures to protect health and safety in the event of an accident. These plans and procedures are maintained up to date during the period of operation of the plant and until such time afer the cessation of plant operations that the NRC grants relief from the emergency planning requirements.

4.3.9.2 Potential for Radiological Accidents as a Result of Decommissioning Activities

Table E-3 in Appendix E indicates that fuel removal, organizational changes, stabilization, chemical decontamination, large component removal, decontamination and dismantlement, system dismantlement, entombment, and transportation are activities that may lead to radiological accidents. Many activities that occur during decommissioning are similar to activities, such as decontamination and equipment removal that commonly take place during maintenance outages at operating plants. However, during decommissioning such activities may be more extensive than similar activities during the period of reactor operations. Consequently, potential accidents associated with these activities may have a higher probability during decommissioning than when the plant is operating. Accidents that occur during these activities may result in injury and local contamination; they are not likely to result in contamination offsite. This section addresses worker injuries from radiological accidents. Injuries from other causes are addressed in Section 4.3.10,"Occupational Issues."

Once the reactor fuel has been moved to the spent fuel pool, the only DBAs contained in the plant's FSAR that are applicable are those associated with the spent fuel pool. These accidents are generally related to fuel handling or dropping heavy objects into the spent fuel pool. As long as the integrity of the spent fuel pool and its supporting systems is maintained, the potential impacts of accidents are bounded by the impacts of those for the spent fuel pool DBAs.

After permanent shutdown of the reactor, the only severe accident of concern is one where the fuel in the spent fuel pool becomes uncovered and results in a zircaloy fire. In this regard, the staff recently conducted a study of spent fuel pool accident risk at decommissioning nuclear power facilities to support development of a risk-informed technical basis for reviewing exemption requests and a regulatory framework for integrated rulemaking (NRC 2001b). As part of its effort to develop generic, risk-informed requirements for decommissioning, the staff determined the frequency of beyond-design-basis spent fuel pool accidents. The event initiators included:

- seismic events (earthquakes)aircraft crashes
- aircraft crashes
- tornadoes and high winds

- impact of a dropped heavy load (such as a fuel cask), resulting in pool drainage or compression or buckling of stored assemblies.

Those spent fuel pool accident sequences that resulted in the spent fuel being uncovered were assumed to culminate in a zirconium fire. The consequences of a zirconium fire event are likely to be severe. The staff's study performed some bounding-consequences analyses.

The impacts of accidents where onsite and offsite doses remain below those allowable for the workers or the public are considered to be undetectable. Accidents that are likely to be undetectable include temporary loss of services, certain decontamination-related accidents, such as liquid spills or leaks during in situ decontamination, and, in some cases, the temporary loss of offsite power or compressed air. The impacts of accidents that could result in offsite doses that exceed EPA's protective action guides (PAGs) (EPA 1991) are considered to be destabilizing. The only accidents that are likely to have destabilizing impacts are those that involve pool drainage that leads to a zirconium fire.

4.3.9.3 Evaluation

The information in this section is based on reviews of existing information from licensees' documents analyzing accidents from decommissioning activities and from a technical review of spent fuel pool accident risk at decommissioning nuclear power facilities. The review of spent fuel pool accidents at decommissioning reactors was performed to support development of a risk-informed technical basis for reviewing emergency plan exemption requests and a regulatory framework for integrated rulemaking (NRC 2001b). Further detail on the sources of information that were used to develop the analysis is given in Appendix I. Because the sources of information included the FBR and the HTGR, the results given in this section are applicable for these facilities.

The accidents and malfunctions covered by licensing documents can be divided into five main categories:

- Fuel-related accidents: These include maintenance and storage of fuel in the spent fuel pool and the movement of fuel into the pool, which could result in fuel rod drops, heavy load drops, and loss of water.

- Other radiological- (nonfuel)-related accidents: These include onsite accidents related to decontamination or dismantlement activities (e.g., material-handling accidents or accidental cutting of contaminated piping) or storage activities (e.g., fires or ruptures of liquid waste tanks).

- External events: These include aircraft crashes, floods, tornadoes and extreme winds, earthquakes, volcanic activity, forest fires, lightening storms, freezing, and sabotage.

- Offsite events: These consist solely of transportation accidents that occur offsite (transportation accidents are discussed in Section 4.3.17).

- Hazardous (nonradiological) chemical-related accidents: These have the potential for injury to the offsite public, either directly from the accident or as a result of further actions initiated by the accident.

A detailed list of the types of accidents that could occur in each of these five categories is given in Appendix I. Appendix I also contains a table showing the estimated dose consequences of accidents during the decommissioning period that were reported in various licensing-basis documents. The highest doses result from postulated fuel-related accidents and radioactive-material-related accidents. Information obtained from licensing-basis documents for the fuel-related accidents showed that the highest offsite doses were from the cask or heavy load-handling accidents, the accidents that assumed a 100 percent fuel failure, and the spent fuel-handling accidents. The postulated accident with the greatest estimated offsite dose was a spent resin-handling accident that had a calculated offsite dose consequence accident of 0.0096 Sv (0.96-rem) TEDE.

The likelihood of an accident as well as its consequence are activity-dependent. Accidents related to dropping fuel elements occur only when the fuel is being moved. Accidents related to dismantlement activities would occur only during the decontamination and dismantlement process and not during a storage period or after a facility has been entombed. External events, however, could occur during any activity or decommissioning option. Table I-5 in Appendix I compares the types of accidents with the different activities that are performed during SAFSTOR, ENTOMB, and DECON.

The staff has reviewed activities associated with decommissioning and determined that many decommissioning activities not involving spent fuel that are likely to result in radiological accidents are similar to activities conducted during the period of reactor operations. The radiological releases from potential accidents associated with these activities may be detectable. However, work procedures are designed to minimize both the likelihood of an accident and the consequences of an accident, should one occur, and emergency plans and procedures will remain in place to protect health and safety while the possibility of significant radiological accidents exists.

In addition to the licensing-basis documents reviewed, the staff's report, *Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants* (NRC 2001b), provides an analysis of the consequences of the spent fuel pool accident risk and includes a limited analysis of the offsite consequences of a severe spent fuel pool accident. These analyses showed that the consequences of a spent fuel accident could be comparable to those for a severe reactor accident. As part of its effort to develop generic, risk-informed requirements for decommissioning, the staff performed analysis of the offsite radiological consequences of beyond-design-basis spent fuel pool accidents using fission product inventories at 30 and 90 days and 2, 5, and 10 years. The results of the study indicate that the risk at spent fuel pools is low and well within the Commission's Quantitative Health Objectives. The risk is low because of the very low likelihood of a zirconium fire even though the consequences from a zirconium fire could be serious.

The Commission has considered the storage of spent fuel and has concluded in the Waste Confidence Rule in 10 CFR 51.23 that "... spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation...." The staff has reviewed the potential accidents associated with spent fuel storage during decommissioning, the likelihood of the accidents, and the potential consequences of the accidents. Emergency plans and procedures will remain in place to protect health and safety while the possibility of significant radiological accidents associated with spent fuel exists.

4.3.9.4 Conclusions

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, concerning the potential impacts of non-spent-fuel-related radiological accidents resulting from decommissioning. This information indicates, that with the mitigation procedures in place, the impacts of radiological accidents are neither detectable nor destabilizing. Therefore, the staff makes the generic conclusion that the impacts of non-spent-fuel-related radiological accidents are SMALL. The staff has considered mitigation and concludes that no additional measures are likely to be sufficiently beneficial to be warranted.

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, on the potential impacts of spent-fuel-related radiological accidents resulting from decommissioning. The staff affirms the conclusions in the Waste Confidence Rule and concludes that the impacts of spent fuel storage are SMALL. The staff concludes that additional mitigation measures are not likely to be sufficiently beneficial to be warranted.

4.3.10 Occupational Issues

Occupational issues are related to human heath and safety. The discussion here includes physical, chemical, ergonomic, and biological hazards. This discussion does not include radiological impacts, which are discussed in Section 4.3.8.

4.3.10.1 Regulations

The Occupational Safety and Health Act of 1970 (29 USC 651 et seq.) was enacted to safeguard the health of the worker. Regulations implementing the act are found in Title 29 ("Labor") of the Code of Federal Regulations, Subtitle B, "Regulations Relating to Labor." Subpart A of 29 CFR Part 1910 adopts, by reference, occupational safety and health standards which have been found to be national consensus standards or established Federal standards. Standards adopted in 29 CFR 1910.6 include, among others, standards of the American National Standards Institute, the American Society for Testing and Materials, the American Welding Society, the National Fire Protection Association, the National Institute for Occupational Safety and Health, the Society of Automotive Engineers, and Underwriters Laboratories. Specific safety and health regulations for Construction are included in 29 CFR Part 1926. These regulations are administered by the Occupational Safety and Health Administration (OSHA).

States may also develop and enforce State standards for occupational safety and health. However, State agencies may not assert jurisdiction over any occupational safety or health issue with respect to which a Federal standard has been issued under Section 6 of the Occupational Safety and Health Act unless the State has a plan for the development and enforcement of State standards. State plans for development and enforcement of State standards are covered by 29 CFR Part 1902. Approved State plans for enforcement of State standards are listed in 29 CFR Part 1952. These plans identify the State agency responsible for development and enforcement of the State standards.

4.3.10.2 Potential Impacts of Decommissioning Activities on Occupational Issues

Table E-3 in Appendix E indicates that nearly all decommissioning activities may impact occupational issues. Typical hazards of concern can be grouped into the following categories: physical, chemical, ergonomic, biological, and radiological (Plog 1988). Radiological hazards are discussed in Section 4.3.8, and other hazards are discussed in this section in the context of decommissioning activities.

The impacts of decommissioning activities on occupational issues are considered detectable if the accident or injury rate during decommissioning exceeds average U.S. industrial accident rates. The impacts of decommissioning activities on occupational issues are considered destabilizing if the accident or injury rate during decommissioning becomes sufficiently large that decommissioning activities must be halted to address worker safety and the decommissioning schedule is threatened.

4.3.10.3 Evaluation

Typically, any significant operation, such as decommissioning, will have an environment, safety and health (ES&H) plan that serves as the guidebook for anticipating and preventing any injury or harm occurring to the worker while working on that particular job. This plan addresses all the major occupational hazards and is used to ensure that OSHA, State, and other local standards are met. The site-specific ES&H plan for a decommissioning activity should be referred to for detailed information regarding specific worker health and safety information; the occupational hazards described in this Supplement should not be used for ensuring the protection of an individual worker health and safety.

Physical hazards: During the decommissioning process, the major sources of physical occupational hazards involve the operation and use of construction and transportation equipment. Vehicles, grinders, saws, pneumatic drills, compressors, and torches are some of the more common equipment that can cause injury if improperly used. Heavy loads, which are often moved about by cranes and loaders, must be controlled to avoid injury. The majority of these hazards will be part of dismantlement. Workplace designs and controls should be the first line of defense when preventing workplace injuries. Hard hats and other personal protective equipment (PPE) are also important interventions and can serve as a secondary protective measure should workplace controls fail.

Many activities during decommissioning, for example, the use of cutting torches, have the potential to initiate fires. These activities, which are common during construction and demolition, should be identified in advance. It is expected that precautions will be taken to minimize the likelihood of fires and that suitable measures will be available for dealing with fires should they occur.

Table 4-2. Predicted Noise Ranges from Significant Construction Equipment (EPA 1971)

Equipment	Levels in dBA at 15 m (50 ft)
Trucks	82-95
Front loader	73-86
Cranes (derrick)	86-89
Pneumatic impact equipment	83-88
Jackhammers	81-98
Pumps	68-72
Generators	71-83
Compressors	75-87
Back hoe	73-95
Tractor	77-98
Scraper/grader	80-93

Noise is also a physical hazard that will be significant during decommissioning. The majority of noise will come from equipment such as rivet busters, grinders, and fans. Table 4-2 lists the typical A-weighted sound levels (decibel [dBA] levels) of standard construction equipment without the use of noise control devices or other noise-reducing design features. Although workplace controls and designs are the best methods for reducing noise, PPE (e.g., earplugs) can also be used to protect against hearing loss. If workers need to use PPE, their ability to communicate effectively is reduced and safety may be compromised.

Temperature is a physical hazard that will vary, depending on the decommissioning location and the amount of indoor versus outdoor activity. Heat and cold stress should be considered in any decommissioning plans. Normal core temperatures are 37.6°C (99.6°F) or 37°C (98.6°F) as measured by mouth. Fluctuations in core temperatures of 1.1°C (2°F) below or 1.7°C (3°F) above the normal impair performance markedly. If this range is exceeded, health hazards, e.g., hypothermia or heatstroke, exist (Plog 1988).

Physical hazards are prevalent at all the decommissioning sites. The loudest dBA noise hazard at one plant was the fan noise of 107 dBA (see Section 4.3.16, “Noise”). One facility undergoing decommissioning provided information on the number of safety occurrences (minor and injuries), accident prevention notices, PPE violations, near misses, and OSHA reportables. Many PPE violations appear to be repeat offenders. Most of the injuries and incidents noted occur in the construction area. The maximum yearly number of incidents and injuries (37) appeared in 1998 with a high number of PPE violations (53) also occurring during this reporting year. Typically, no lost work time is attributed to injuries or incidents.

Electrical hazards are a significant concern during decommissioning. During stabilization, licensees often rewire the site to eliminate unneeded electrical circuits or repower certain operations from outside. For SAFSTOR, monitoring equipment may need to be installed and some systems will need to be de-energized. All of these activities, plus various other activities (operating cranes near power lines, digging near buried cables, etc.), pose electrical threats to workers. Proper precautions should be taken to avoid injury.

Chemical hazards: Inhalation and dermal contact with chemicals are serious worker health hazards. Ingestion is typically not a voluntary route of exposure but accidental ingestions (pipetting with mouth, siphoning gasoline, etc.) have been known to occur at the job site. Solvents and particulates are the two contaminants of greatest concern. Some of the key chemicals of concern found in building materials, paints, light bulbs, light fixtures, switches, electrical components, and high-voltage cables include asbestos, lead, polychlorobiphenyls (PCBs), and mercury. Other chemicals that have been found during decommissioning activities include low levels of potassium, sodium chromate, and nickel found in the suppression chamber. Also, quartz and cristobalite silica were detected during concrete demolition. Fumes, often including lead and arsenic, and smoke from flame cutting and welding are significant sources of chemical exposure during decommissioning.

Decommissioning involves many activities that expose workers to chemical hazards:

- chemical decontamination of the primary loop
- removal of reactor components
- decontamination of the piping walls
- removal of contaminated soil
- removal of radioactive structures

- removal of hydrocarbon fuel from storage
- removal of hazardous coatings
- removal of asbestos
- removal of chemical-containing systems, such as demineralizers and acid- and caustic-containing tanks
- removal of sodium and NaK residue.

Proper planning, workplace design, and engineering controls should be supplemented with PPE and appropriate administrative solutions to ensure adequate worker protection from not only chemical hazards but all hazards.

Chemical hazards at one facility undergoing decommissioning included lead and arsenic vapors, created from torch cutting and using the plasma arc, and quartz and cristobalite particulates, created from chipping and hammering. At the facility, air sample summary logs indicate a few exposures that exceeded OSHA's permissible exposure limit (PEL). Arsenic (PEL = 0.01 mg/m^3) levels exceeded the PEL four times during the sampling period. The highest arsenic reading was 0.03 mg/m^3 when using the torch and grinder to cut a hole during one activity. The same activity reported the only lead (PEL = 0.05 mg/m^3) reading above PEL at 1.5 mg/m^3. Quartz (PEL = 0.1 mg/m^3) and cristobalite (PEL = 0.05 mg/m^3) particulates greatly exceeded the PELs when using the chipping hammer (817.84 and 1.5 mg/m^3, respectively). The drill and chipping hammer also created too much quartz dust (9.2 mg/m^3).

Ergonomic hazards: The physiological and psychological demands of decommissioning work create ergonomic hazards in the workplace. Discomfort and fatigue are two indicators of ergonomic stress that can lead to decreased performance, decreased safety, and increased chance of injury (Plog 1988). The typical sources of ergonomic stress during decommissioning activities include mechanical vibrations, lifting, and static work. Workplace designs, work shifts, and breaks should be planned accordingly to avoid ergonomic stress.

Biological hazards: Biological hazards include any virus, bacteria, fungus, parasite, or living organism that can cause a disease in human beings (Plog 1988). Typical sanitation practices can help avoid the obvious vectors for disease. Having clean, potable drinking water, marking nonpotable water, and providing cleansing areas are the most important elements of a sanitation system.

Given that many nuclear reactor facilities undergoing decommissioning are old, there is an increased chance that workers will be exposed to molds and other biological organisms that grow in and on the buildings. Molds and fungus, when inhaled, can cause minor to serious pulmonary problems. Dermal contact could cause rash and/or irritation. A thorough inspection of the facility should be conducted and proper cleansing and PPE should be used when biological agents are identified.

In general, human health risks for most decommissioning options are expected to be dominated by occupational injuries to workers engaged in activities such as construction, maintenance, and excavation. Historically, actual injury and fatality rates at nuclear reactor facilities have been lower than the average U.S. industrial rates. Occupational injury and fatality risks are reduced by strict adherence to NRC and OSHA safety standards, practices, and procedures. Appropriate State and local statutes must also be considered when assessing the occupational hazards and health risks for any decommissioning activity. The staff assumes strict adherence to NRC, OSHA, and State safety standards, practices, and procedures during decommissioning.

Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in occupational hazard issues that are different from those found at other nuclear reactor facilities.

4.3.10.4 Conclusions

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, on the potential impacts of decommissioning activities on occupational issues. This information indicates that the impacts on occupational issues are not detectable or destabilizing. Therefore, the staff makes a generic conclusion that for all plants, the potential impacts on occupational issues are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

4.3.11 Cost

A decommissioning cost assessment is not a NEPA requirement. However, an accurate decommissioning cost estimate is necessary for a safe and timely plant decommissioning. Therefore, this Supplement includes a decommissioning cost evaluation, but the cost is not evaluated using the environmental significance levels nor identified as a generic or site-specific issue.

4.3.11.1 Regulations

The regulatory procedure for decommissioning a nuclear power facility is set out principally in NRC regulations in 10 CFR 50.75, 50.82, 51.53, and 51.95. The regulations to ensure the safe and timely decommissioning of nuclear power facilities and the availability of decommissioning funds were originally established by the NRC in 1988. These regulations, principally 10 CFR 50.75, specify the minimum amount of funds that a LWR licensee must have to demonstrate reasonable assurance of sufficient funds for decommissioning. The minimum decommissioning funds required by the NRC reflect only the efforts necessary to achieve termination of the 10 CFR Part 50 license. Costs associated with other activities related to facility deactivation and site closure, including operation of the spent fuel storage pool, construction, operation, and decommissioning of an ISFSI, demolition of uncontaminated or decontaminated structures that meet release criteria, and site restoration activities after sufficient residual radioactivity has been removed to meet NRC license termination requirements are not included in the minimum decommissioning fund requirement.

The regulations in 10 CFR 50.75 also require that licensees submit, at least once every 2 years, a report on the status of its decommissioning fund, including specifying the amount of funds accumulated, and a schedule for accumulating the remainder to be collected. This report is to be submitted annually for plants that are within 5 years of the end of licensed operations. 10 CFR 50.75 (f)(i) also requires that each power reactor licensee shall report the status of its decommissioning trust fund annually if the facility has already closed (before the end of its licensed life).

In addition to the financial assurance requirements for decommissioning in 10 CFR 50.75, other requirements in 10 CFR 50.75 and 50.82 specify requirements for submitting cost estimates for decommissioning to the NRC:

- 10 CFR 50.75(f)(2) requires that a licensee shall, at or about 5 years prior to the projected end of operations, submit a preliminary decommissioning cost estimate.

- 10 CFR 50.82(a)(4)(i) requires a licensee to provide an estimate of expected costs for the activities being proposed in the PSDAR.

- 10 CFR 50 82(a)(8)(iii) requires a licensee to provide a site-specific decommissioning cost estimate within 2 years following permanent cessation of operations.

- 10 CFR 50.82(a)(9)(ii)(F) requires a licensee to provide an updated site-specific estimate of remaining decommissioning costs as part of its LTP.

The regulations in 10 CFR 50.82 also specify the criteria that a licensee must meet before they can withdraw funds from the decommissioning fund for decommissioning activities.

4.3.11.2 Potential Impacts of Decommissioning Activities on Cost

As indicated in Table E-3 in Appendix E, all aspects of decommissioning will have an impact on decommissioning costs. The potential impacts of decommissioning activities on cost vary due to the cost of waste management and disposal of the LLW generated during decommissioning and to the uncertainty associated with regulatory requirements.

The variability in waste management and disposal arises because the Barnwell Low-Level Radioactive Waste Management Disposal Facility, the last remaining facility that is available to dispose of all classifications of LLW generated by all but two nuclear power facilities located throughout the United States, is scheduled to stop accepting waste from all NRC licensees except those located in the Atlantic Compact by 2009 (see NUREG-1307, Rev. 9, *Report on Waste Burial Charges* [NRC 2000]). However, decommissioning of most of the nuclear power facilities in the United States is not expected to occur until sometime after 2009. This cost uncertainty is generally applicable to most of the nuclear power facilities that are currently being decommissioned and those that will be decommissioned in the future. This cost uncertainty, however, is somewhat mitigated by the availability of the Envirocare disposal facility in Utah. Envirocare can accept most Class A LLW for disposal from any generator in the United States. (More than 95 percent of LLW generated during nuclear power facility decommissioning is Class A.) Other LLW storage and disposal sites are also currently being proposed.

The uncertainty associated with regulatory requirements is a reflection of the different requirements and standards for cleanup applied by different States and localities. While NRC cleanup requirements for terminating a license are well defined, these other external requirements may significantly influence the cost of decommissioning. For example, local jurisdictions might impose additional requirements than those imposed by the NRC. The cost of the extra cleanup is not reflected in the decommissioning fund required by the NRC.

4.3.11.3 Evaluation

The estimated cost of decommissioning all of the nuclear power facilities that have been built and operated in the United States is provided in Table 4-3 (in January 2001 dollars). The costs provided in the table are those estimated by the owners of the individual plants and reported to the NRC.

Shown in the table are the actual costs to complete the decommissioning and terminate the 10 CFR Part 50 licenses for each of those facilities that have reached this milestone of their life-cycle. Facility-specific estimates are also provided for each plant that has been permanently shut down and is either actively undergoing decommissioning or is in safe storage awaiting active decontamination and dismantlement. The costs shown are estimates developed by the licensee and reported in their PSDARs, site-specific cost estimate reports, LTPs, etc. These estimates are adjusted to January 2001 dollars.

Table 4-3 provides the range of costs estimated by utilities to decommission all of the nuclear power facilities that are currently operating or have not indicated an intent to permanently shut down. Cost ranges, rather than facility-specific cost estimates, are provided for these plants, reflecting the fact that these estimates are not as well developed as for those plants that have already permanently shut down. These cost ranges were developed from licensee-provided estimates in the March 1999 biennial decommissioning reports adjusted to January 2001 dollars.

Finally, Table 4-3 provides a range of decommissioning cost estimates for the ENTOMB options. These options have not been used or considered by any U.S. nuclear power facility licensee to date. Cost estimation methods for the ENTOMB options are, thus, not as well developed as for the DECON and SAFSTOR methods. The values quoted in the table were developed from an analysis of the two entombment scenarios described in Chapter 3 for a “reference” (i.e., typical) PWR and BWR. The reference PWR was assumed to be the Trojan Plant in Oregon; the reference BWR was assumed to be the Columbia Generating Station in Washington.

The cost of decommissioning results in impacts on the price of electricity paid by ratepayers. These impacts generally occur over the life of the facility as the decommissioning fund is being collected. However, for those nuclear reactor facilities that shut down prematurely (as is the case for the majority of the facilities identified in Table 4-3), the impact may also occur for a number of years after permanent shutdown while the under-collected portion of the fund continues to be collected.

This analysis assesses the impact of cost by evaluating the total cost to decommission a nuclear power facility and terminate its Part 50 license. This impact is summarized in Table 4-4. As can be seen, the cost to decommission a large (>200 MWe) nuclear power facility is estimated to range from $150 million to $700 million and is highly dependent on the factors discussed previously.

4.3.11.4 Conclusions

The staff has reviewed these data, recognizing that an evaluation of decommissioning cost is not a NEPA requirement. This information is presented here as a summary of actual and predicted decommissioning costs based on recently available data.

4.3.12 Socioeconomics

There are two primary pathways through which nuclear power plant activities create socioeconomic impacts on the area surrounding the plant. The first is through expenditures in the local community by the plant work force, and direct purchases of goods and services required for plant activities. The second pathway for socioeconomic impact is through the effects on local government tax revenues and services. When a nuclear power plant is closed and decommissioned, most of the important socioeconomic impacts will be associated with the plant closure rather than with the decommissioning process.

4.3.12.1 Regulations

There are no Federal or State regulations pertaining to any particular level of socioeconomic impacts, as there are for some environmental effects. Socioeconomic impacts are an element of NEPA documentation that must be addressed and mitigated, if warranted.

4.3.12.2 Potential Impacts of Decommissioning Activities on Socioeconomics

As indicated in Table E-3 in Appendix E, all of the socioeconomic impacts of decommissioning are related to organizational or staffing changes. The impacts of decommissioning were assessed recognizing that the potentially large impacts of plant closure may occur simultaneously with those of the actual decommissioning activities. However, as indicated in Section 1.3, impacts related to the decision to permanently cease operations are outside the scope of this Supplement.

Socioeconomic changes related to direct expenditures in the local community are considered not detectable if there is little or no impact on housing values, education and other public services, and local government finances, are not distinguishable from normal background variation due to other causes. Impacts on housing are considered not detectable when no discernable change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and little or no housing construction or conversion

Table 4-3. Cost Impacts of Decommissioning (in January 2001 Dollars)

Nuclear Plant	Electric Power Generation Rating	Reactor Type	Decommissioning Option	Estimated Decommissioning Cost, $ million
Decommissioning Completed				
Fort St. Vrain	330 MWe	HTGR	DECON	230 (189 [1996])[(a)]
Pathfinder	59 MWe	BWR	SAFSTOR	20 (13 [1992])[(a)]
Shoreham	809 MWe	BWR	DECON	258 (182 [1994])[(a)]
Currently Being Decommissioned				
Big Rock Point	67 MWe	BWR	DECON	364
Dresden, Unit 1	200 MWe	BWR	SAFSTOR	340
Fermi, Unit 1	61MWe	FBR	SAFSTOR	36
GE-VBWR	13 MWe	BWR	SAFSTOR	10
Haddam Neck	619 MWe	PWR	DECON	404
Humboldt Bay, Unit 3	65 MWe	BWR	SAFSTOR	284
Indian Point, Unit 1	257 MWe	PWR	SAFSTOR	259
La Crosse	50 MWe	BWR	SAFSTOR	111
Maine Yankee	860 MWe	PWR	DECON	400
Millstone, Unit 1	660 MWe	BWR	SAFSTOR	563
Peach Bottom, Unit 1	40 MWe	HTGR	SAFSTOR	65
Rancho Seco	913 MWe	PWR	SAFSTOR	394
San Onofre, Unit 1	410 MWe	PWR	SAFSTOR	427
Saxton	NA	PWR	SAFSTOR	44
Three Mile Island, Unit 2	792 MWe	PWR	SAFSTOR	502
Trojan	1130 MWe	PWR	DECON	250
Yankee Rowe	167 MWe	PWR	DECON	244
Zion, Unit 1	1085 MWe	PWR	SAFSTOR	386
Zion, Unit 2	1085 MWe	PWR	SAFSTOR	495
Currently Operating				
69 PWR Reactors	486 - 1270 MWe	PWR	DECON/SAFSTOR	264 - 695
35 BWR Reactors	514 - 1265 MWe	BWR	DECON/SAFSTOR	152 - 663
“Reference PWR”	1130 MWe	PWR	ENTOMB1/ ENTOMB2	290 - 400
“Reference BWR”	1100 MWe	BWR	ENTOMB1/ ENTOMB2	410 - 750

(a) Actual cost to complete the decommissioning and the year the license was terminated.

Table 4-4. Summary of Cost Impacts by Decommissioning Option and Reactor Type and Size (January 2001 Dollars)

	Decommissioning Cost Range, $million					
Decommissioning Option	**PWR < 200 MWe**	**PWR ≥ 200 MWe**	**BWR < 200 MWe**	**BWR ≥ 200 MWe**	**HTGR**	**FBR**
DECON	244	250 - 404	364	>182[(a)]	189	--
SAFSTOR	44	259 - 597	13 - 284	340 - 563	65	36
DECON/SAFSTOR (currently operating reactors)	--	264 - 695	--	152 - 663	--	--
ENTOMB1/ENTOMB2	--	290 - 400	--	410 - 750	--	--

(a) Cost data from the Shoreham plant, which only generated one effective full power day. There was little or no contamination to many plant systems. Not representative of other large BWRs.

occurs. Detectable impacts result when there is a discernable increase or reduction in housing availability, rental rates and housing values exceed the inflation rate elsewhere in the State, or more than minor housing conversions and additions or abandonments occur. Destabilizing impacts occur when project-related demand results in a very large excess of housing or very limited housing availability, where there are considerable increases or decreases in rental rates and housing values, or when substantial conversion or abandonment of housing units occurs.

Socioeconomic changes related to tax revenues and services (education, transportation, public safety, social services, public utilities, and tourism and recreation) are considered not detectable if the existing infrastructure (facilities, programs, and staff) could accommodate changes in demand related to plant closure and decommissioning without a noticeable effect on the level of service. Detectable impacts arise when the changes in demand for service or use of the infrastructure is sizeable and would noticeably decrease the level of service or require additional resources to maintain the level of service. Destabilizing impacts would result when new local government programs, upgraded or new facilities, or substantial numbers of additional staff and unsupportable levels of resources are required because of facility-related demand.

4.3.12.3 Evaluation

The size of the work force varies considerably among operating U.S. nuclear power facilities, with the onsite staff generally consisting of 600 to 800 personnel per reactor unit. The average permanent staff size at a nuclear power facility ranges from 600 to 2400 people, depending on the number of operating reactors at the site. In rural or low-population communities, this number of permanent jobs can provide employment for a substantial portion of the local work

force. In addition to the work force needed for normal operations, many temporary personnel are required for various tasks that occur during outages. Between 200 and 900 additional workers may be employed during these outages to perform the normal outage maintenance work. These are work force personnel who may be in the local community only a short time, but during these periods of extensive maintenance activities, the additional personnel could have a substantial effect on the locality. If, as expected, the decommissioning process requires a smaller work force than the onsite operating staff (typically 100 to 200 staff) and if the local economy is stable or declining, the result of the reduction in work force related to plant closure could be economic hardships, including declining property values and business activity, and problems for local government as it adjusts to lower levels of tax revenues. However, even the small decommissioning work force will tend to mitigate temporarily the full adverse socioeconomic effects of terminating operations.

If there is a net reduction in the community work force but the economy is growing, the adverse impacts of this ongoing growth (e.g., housing shortages and school overcrowding) could be reduced.

If the decommissioning work force were substantially larger than the operating work force, the result could be increased demand for housing and public services but also increased tax revenues and higher real estate values. If the economy is characterized by decline, then decommissioning could temporarily reverse the adverse economic effects.

In a stable economy, a net increase in the community work force could lead to some shortages in housing and public services, as well as to the higher tax revenues and real estate values mentioned previously. In a growing economy, decommissioning could act as an exacerbating factor to the ongoing shortages that already might exist.

Changes in work force and population: Changes of over 3 percent to local population in a single year are expected to have detectable effects, while changes of over 5 percent are expected to result in destabilizing impacts. These negative impacts include reduction of school system enrollments, weakened housing markets, and loss of demand for goods and services provided by local businesses. The size of the work force required during decommissioning, relative to that during operations, is an important determinant of population growth or decline.

The impact from facility closure depends on the rate and amount of population change. If decommissioning begins shortly after shutdown with a large work force, then the impact of facility closure is mitigated. Facilities where layoffs are sudden and there is a long delay before active decommissioning begins are more likely to experience negative population-related socioeconomic impacts. Thus, large plants located in rural areas that permanently shut down early and choose the SAFSTOR option are the likeliest to have negative impacts. Considering all variables such as plant size and community size as the same, plants that go into immediate

DECON have less immediate negative impacts; the impacts from the ENTOMB option, assuming those preparations were made immediately after shutdown, would be less significant than those of SAFSTOR.

Data on changes in work force were collected at facilities that are being decommissioned where information on operational and decommissioning work force is available. This information is presented in Appendix J, Table J-1. The table also shows total population in the host county at the time of plant shutdown, to indicate the potential importance of the facility closure.

In order to identify any unusual downward trends in county population around the time of a facility shutdown, data were collected showing the range of percentage changes in population that have occurred at facilities currently being decommissioned. U.S. Census population data for the counties that house the decommissioning facility are used to assess changes in population around the time of shutdown by comparing percentage changes in the county population with State population changes during the same time period. This information is provided in Appendix J, Table J-2.

In only two cases did the corresponding county populations decline around the time of the closure (Indian Point, Unit 1, in Westchester, New York, and Millstone, Unit 1, in New London, Connecticut). However, during the same time period that the host counties experienced population declines, the hosting States also experienced population declines. This suggests that the decline in the county population was part of an overall State population trend. Observing population trends over a decade may not capture small population declines or reductions in the rate of growth from one year to the next; however, longer trends should indicate whether or not the county had any large destablizing population or housing impacts from the facility closure.

In 18 out of the 20 facility case studies where populations grew, the populations of the counties where the facilities are located increased more rapidly or at the same rate as the State population. The two cases where the populations of the counties grew at a slower rate include relatively rural counties in California (Humboldt and Alameda) during time periods when the State of California experienced very high urban population growth. In general, experience of decommissioning facilities to date does not show any impacts from population change, either because the closure-related changes were small relative to the population base or because they were offset by other growth in the area.

Local tax revenues: Changes in tax revenues of less than 10 percent are considered not detectable, i.e., they result in little or no change in local property tax rates and the provision of public services. Losses between 10 percent and 20 percent result in detectable impacts, with increased property tax levies (where State statutes permit) and decreased services by local municipalities. Changes over 20 percent have destabilizing impacts on the governments involved. Tax levies must usually be increased or services cut substantially, and the payment of debt for any substantial infrastructure improvements made in the past becomes problematic.

Borrowing costs for local jurisdictions may also increase because bond rate agencies downgrade their credit rating. However, it is important to remember that these rules of thumb are based on uncompensated changes. For example, if a local taxing jurisdiction lost a nuclear facility that amounted to 35 percent of its tax base, but 30 percentage points of this loss were made up by the opening of a new manufacturing facility, the net impact would be 5 percent or not detectable. Small, rural areas are more likely to be affected than more urban areas having a wider variety of economic opportunities and more sources of tax revenue. Impacts depend on the type of plant, size of plant, and whether or not there are multiple units at a site, all of which help determine the net loss in employment at plant closure as well as the loss of tax base.

More information is available for facilities that have recently closed than for facilities closed more than 10 years ago (see Appendix J, Table J-3). The findings from this body of evidence confirm the findings discussed above. The primary taxing authorities for most of the decommissioning plants are the county and city in which the facility is sited. Tax information is typically provided by local taxing authorities (assessor's office) or from town planners familiar with the tax revenues generated by the facility.

The tax revenue impacts on the local communities of facility closure range from zero impact (tax-exempt plants) to loss of 90 percent of the community tax base. The magnitude of tax-related impacts varies primarily by the size of the taxing jurisdiction and the taxing structure of the State in which the plant is sited, as well as certain plant characteristics. Hence, the smaller the taxing community (less economically diverse), the greater the tax revenue impact when the nuclear facility closes down.

In communities where the revenues from the facility made up over 50 percent of the tax revenue base (with the remaining tax revenues made up primarily of private residential real estate), there were significant increases in the tax rates on the remaining real estate as well as cut-backs in services provided by property-tax revenues. The manner in which a State calculates the value of the plant also affects both the amount and timing of tax losses when a nuclear power facility closes and how much such a closure disrupts the tax revenue stream in a given community:

- At one plant, the assessed value of the plant was calculated as a proportional share of the value of the parent corporation, where the percentage is based on the book value of assets in the State (or sub-State taxing jurisdiction) compared with the book value of the assets of the entire corporation. This approach kept the plant at full assessed value for 7 years after its permanent closure until it was dropped from the books of the parent corporation as an asset. Several other approaches are discussed in Appendix J.

- Tax rules may or may not permit gradual phase-out. In some cases, the taxable asset value of the plants was allowed to phase out over a period of time (3 to 5 years). In other cases, the plants were simply taken off the tax roles in 1 year.

- The State may or may not share the burden with local government. In one State, school districts' lost property-tax collections were offset by equalization methods at the State level, which reduced the impact due to plant closures. In another State, the small neighboring township was the sole recipient of all property-tax revenues generated by the plant. Thus, the community's tax revenues were significantly reduced when the revenue source shut down.

- Utility ratepayers in some jurisdictions are entitled to share in funds recovered from sale of plant components and commodities and unspent decommissioning funds. These are not taxes but are available to general fund revenues.

In addition to characteristics specific to the taxing jurisdiction, the size, age, and ownership of the facilities play a role in how much the facilities affect tax revenues. Generally, the larger the facility (MWt), the larger the tax revenue impact. In addition, aging of the facility depreciates its book value and its assessed value over time. Usually, the falling assessed value of an aging facility will have reduced the tax revenue of the facility before closure, thus lessening the change in tax revenues generated by the facility after closure. A facility that closes suddenly, well before the end of its license expiration, will have a greater impact on the community tax base. Finally, if a facility is owned by a public entity, there is no effect on the tax base from closure because the facility was never taxable.

The choice of the decommissioning option appears to have had no bearing on the loss of tax receipts. The impact has to do with the size and suddenness of the loss of tax revenue (size and age of facility) related to plant closure only. The length of delay between shutdown and decommissioning does not appear to affect the size of the impact on tax revenue losses. No commercial nuclear power reactor has used the ENTOMB options, but there is no reason to expect ENTOMB to have any different impact on tax revenue losses than SAFSTOR or DECON.

Public services: The impacts of decommissioning on public services are generally much smaller than the impacts of plant closure. Impacts of closure are closely related to the tax-related impacts on the community and are affected by the same characteristics of the plant (size and age, tax treatment, and dependence of the local community on plant-related revenues), but not on the choice of decommissioning option or the amount of time between shutdown and active decommissioning. Inquiries were made to local governments in the vicinity of closed plants about public service impacts during and after shutdown and decommissioning. Their assessments are discussed in Appendix J and data are shown in Table J-4. Analysis was also conducted in the course of preparing NUREG-1437 (NRC 1996). Based on that experience, the following generalizations can be made.

Detectable impacts on housing result when there is a discernable increase or reduction in housing availability, when rental rates and housing values exceed the inflation rate elsewhere in the State, or when minor housing conversions and additions or abandonments occur.

Destabilizing impacts occur when project-related demand results in a very large excess of housing or very limited housing availability, where there are considerable increases or decreases in rental rates and housing values, and when there is substantial conversion or abandonment of housing units. The prevailing belief of realtors and planners in communities surrounding the case study facilities is that closing the facilities has had a range of effects on the marketability or value of homes in the vicinity. Housing choices of local residents are rarely affected by the presence of the facility, but people may move into the area in response to (temporarily) softer housing prices and commute to a nearby urban area. However, the decommissioning process itself does not appear to have produced any detectable impacts on housing.

The impacts to the following public services may occur as a result of plant closure: education, transportation, public safety, social services, public utilities, and tourism and recreation.

In general, detectable impacts arise when the demand for service or use of the infrastructure is sizeable. Impacts would noticeably decrease the level of service or require additional resources to maintain the level of service. Destabilizing impacts would result when new programs, upgraded or new facilities, or substantial additional resources and staff are required because of facility-related demand. Specific information for each of the areas of public service for closed plants is provided in Appendix J.

In general, the communities that suffered the most from the tax-related impacts of plant closure also experienced the greatest impacts on public services. To some extent, the communities themselves control the amount of impact by how they allocate property taxes to local budgets before shutdown, and how they prioritize these services post-shutdown. For example, one community channeled a great deal of the surplus revenues into building extensive social services for the elderly and for local youth in its community. After the plant ceased operations, the tax revenues decreased, all of the social services were downsized, and many will have to be eliminated because they are not considered priority programs (relative to public safety and education). In a second case, the county provided relatively few social services. Thus, the impact on social services after the shutdown was minor, although several other categories of public service experienced larger impacts. For example, education was largely funded by plant tax revenues and the responsible school district has recently indicated that it may have to file for bankruptcy, so the impact there was substantial[(a)]. However, all of these impacts were related to plant closure; in no case did the decommissioning process itself result in detectable impacts on public services.

(a) The size of impact can be significantly influenced by the mechanism that the State uses for funding, e.g., if the State makes up the difference between what the local school districts can fund from the local property tax and what the State has decided is the appropriate level of per-student expenditures.

Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in impacts on socioeconomics that are different from those found at other nuclear facilities.

Summary: The impacts of plant closure are those that are observed by the community, rather than the impacts from decommissioning activities because they occur at about the same time. The impacts occur either through changing employment levels and local demands for housing and infrastructure, or through decline of the local tax base and the ability of local government entities to provide public services. The effects of employment changes on population growth are expected to be not detectable if population changes (reductions or increases) are less than 3 percent per year, detectable but not destabilizing if the population change is between 3 percent and 5 percent, and destabilizing if the population change is greater than 5 percent per year. Experience so far has shown that in most cases, reductions in employment related to plant closure even at fairly large sites do not generally produce local population changes greater than 3 percent, regardless of the type of plant and decommissioning option selected. The impacts of the decommissioning work force are even smaller.

The effect on the local tax base and public services related to closure depends on the size of the plant-related tax base relative to the overall tax base of local government, as well as on the rate at which the tax base is lost. Changes in annual tax revenues less than about 10 percent are considered nondetectable, i.e., they result in little or no change in local property tax rates and the provision of public services. Losses between 10 percent and 20 percent result in detectable but not destabilizing impacts, with increased property tax levies (where State statutes permit) and decreased services by local municipalities. Changes over 20 percent have destabilizing impacts on the governments involved. Experience has shown that publicly owned tax-exempt plants will not have an impact through this mechanism. In addition, fully depreciated plants, or a plant that is located in an urban or urbanizing area with a large or rapidly growing tax base will also not be impacted by this mechanism. A large, newer, relatively undepreciated plant, located in a small, isolated community, is much more likely to exceed the 20-percent criterion. If the plant tax base is phased out slowly after closure in these circumstances, the impact is more likely to be mitigated. Neither the type of reactor nor the method chosen for decommissioning matters.

Decommissioning itself has no impact on the tax base and no detectable impact on the demand for public services.

4.3.12.4 Conclusions

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, on the potential impacts of decommissioning on socioeconomics. This information indicates that the impacts of decommissioning on socioeconomics are neither detectable nor destabilizing. Therefore, the staff makes the generic conclusion that the impacts on socioeconomics are SMALL. The staff has considered mitigation and concludes

that no additional measures are likely to be sufficiently beneficial to be warranted.

4.3.13 Environmental Justice

An evaluation of environmental justice is performed to determine if minority and/or low-income groups bear a disproportionate share of negative environmental consequences. Executive Order 12898, dated February 16, 1994 (59 FR 7629), directs Federal executive agencies to consider environmental justice under NEPA. The Executive Order does not create whole new categories of impacts that need to be considered; nor does it create any right, benefit, or trust responsibility, substantive or procedural, that can be enforced by law or equity. It is designed to improve internal management of agencies to ensure that low-income and minority populations do not experience disproportionately high and adverse human health or environmental effects because of Federal actions.

Environmental justice has not been evaluated previously for decommissioning activities at reactor facilities.

4.3.13.1 Regulations

The CEQ has provided *Environmental Justice: Guidance Under the National Environmental Policy Act* (CEQ 1997). Although NRC is an independent agency, the Commission has committed to undertake environmental justice reviews, and has provided specific information in Office Instruction LIC-203, Nuclear Reactor Regulation (NRR), *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 2001a). The CEQ guidance and NRR instructions provide several key definitions and the framework for analysis.

Low-income population: Low-income populations in an environmental impact area should be identified where census block groups within the environmental impact area have (1) more than 50 percent low-income persons or (2) the percentage of persons in households below the poverty level is significantly greater (typically, at least 20 percentage points) than in the geographical area chosen for comparative analysis. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another or a set of individuals (e.g., migrant workers or American Indians[(a)]), where either type of group experiences common conditions of environmental exposure or effect.

Minority: Individuals who are members of the following population groups: American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; Black or African

(a) For consistency, the term “American Indian” is used throughout this document to conform to the definition of “minority population.”

American, not of Hispanic or Latino origin; or some other race and Hispanic or Latino (of any race).[(a)]

Minority population: According to the CEQ, minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. In identifying minority communities, agencies may consider as a community either a group of individuals living in geographic proximity to one another or a geographically dispersed/transient set of individuals (e.g., migrant workers or American Indians), where either type of group experiences common conditions of environmental exposure or effect. The selection of the appropriate unit of geographic analysis may be a governing body's jurisdiction, a neighborhood, census tract, or other similar unit that is to be chosen so as not to artificially dilute or inflate the affected minority population. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds. NRR adopted a standard of 20 percentage points as "meaningfully greater."

Disproportionately high and adverse human health effects: When determining whether human health effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable: (a) whether the health effects, which may be measured in risks and rates, are significant (as used by NEPA), or above generally accepted norms (adverse health effects may include bodily impairment, infirmity, illness, or death); (b) whether the risk or rate of hazard exposure by a minority or low-income population, to an environmental hazard is significant (as used by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group; and (c) whether health effects occur in a minority or low-income population, affected by cumulative or multiple adverse exposures from environmental hazards.

Disproportionately high and adverse environmental effects: When determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable: (a) whether there is or will be an impact on the natural or physical environment that significantly (as used by NEPA) and adversely affects a minority or low-income population (such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or American Indian tribes when those impacts are interrelated to impacts on the natural or physical environment); (b) whether environmental effects are significant (as used by NEPA) and are or may be having an adverse impact on minority populations, low-income populations, or

(a) "Other" may be considered a separate minority category. In addition, the 2000 Census included multi-racial data. Multi-racial individuals should be considered in a separate minority, in addition to the aggregate minority category.

American Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group; and (c) whether the environmental effects occur or would occur in a minority or low-income population, affected by cumulative or multiple adverse exposures from environmental hazards.

4.3.13.2 Potential Impacts of Decommissioning Activities on Environmental Justice

As indicated in Table E-3 in Appendix E, decommissioning activities that may affect environmental justice are related to organizational or staffing changes and offsite transportation issues. However, the assessment of environmental justice is related to most of the other specific issues discussed throughout this Supplement. Any decommissioning activity that results in a disproportionate share of negative environmental consequences to minority or low-income groups has the potential to be an adverse environmental justice impact.

Detectability and destabilization, as they relate to environmental justice, must be defined in proportion to the minority and low-income populations that reside in the area of the power plant. Proportionment must be determined at each site at the time of decommissioning.

4.3.13.3 Evaluation

Most of the environmental justice impacts relate to land use, environmental and human health, and socioeconomics. Impacts due to onsite land disturbance are likely to be not detectable because the amounts of land disturbance are generally very small and usually occur in areas of the site previously disturbed by construction or operation of the facility. Impacts from disturbances to offsite land will generally not occur because offsite land generally is not disturbed as a result of decommissioning. If offsite land disturbance is required (e.g., if a new offsite road or rail spur is needed to transport large components or waste from decommissioning), the impact on environmental justice is site-specific because it will depend on the location of the new route relative to low-income populations or other affected resources on which they may depend. Some minority and low-income populations normally live along rail lines and truck routes. Previous transportation analyses have found that the impacts would be small from normal operations or from accidents. Thus, no disproportionately high and adverse effects are expected for any particular segment of the population, including minority and low-income populations, that may live along proposed rail and truck routes. Siting and construction of these offsite transportation upgrades would include an evaluation of cultural and other resources in the disturbed areas. Usually, offsite physical environmental impacts of decommissioning will be not be detectable because offsite environmental impacts from decommissioning are generally not detectable.

Socioeconomic impacts on minority and low-income populations due to plant closure could range from nondetectable to destabilizing, depending on the distribution of job impacts within the community and the effects of plant closure on local tax revenues and public services; however, the impact of decommissioning would generally not be detectable. More generic

information on overall socioeconomic impacts can be obtained by observing demographic statistics. In the 21 decommissioning case studies observed, it was concluded that facility closure would not have a detectable socioeconomic impact on low-income and minority populations. In other words, there appears to be no indication that minority or low-income populations would suffer disproportionately high and adverse impacts from the closure of the facilities. Because decommissioning has even smaller effects, its impact also would have been not detectable. The environmental justice conclusions are based on demographic information, i.e., the overall impact of the facility on the community. Discussions were also held with community members at some sites.

In addition, information provided by local government and social service providers helps determine the socioeconomic impacts on low-income and minority populations. In many of these case studies, the nuclear facilities are located in primarily white communities and tend to be located near bodies of water where upper-income real estate is built. Those that are employed by the facility tend to fall into the upper-income bracket within the communities where the facilities are located. Selected socioeconomic indicators are found in Appendix J, Table J-5, for the closed nuclear power plants studied.

The determination of whether the minority or low-income populations are disproportionately highly and adversely impacted by facility decommissioning activities needs to be made on a site-by-site basis because their presence and their socioeconomic circumstances will be site-specific. Data indicate there is no reason to expect adverse socioeconomic impacts to be correlated with type of plant (see Table J-5). However, adverse socioeconomic impacts are correlated with large facility size, early shutdown, and small, isolated host communities. If minority and low-income populations are present, adverse impacts from facility closure would be somewhat more likely in small, isolated communities than in larger urban areas. It is not clear whether these effects would be disproportionately high and adverse.

Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in environmental justice considerations that are different from those found at other nuclear facilities.

4.3.13.4 Conclusions

The staff has considered available information on the potential impacts of decommissioning on environmental justice, including comments received on the draft of Supplement 1 of NUREG-0586. Based on this information, the staff has concluded that the adverse impacts and associated significance of the impacts must be determined on a site-specific basis. Executive Order 12898 (59 FR 7629), dated February 16, 1994, directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act 1969 (NEPA). Although the NRC is an independent agency, the Commission has committed to undertake environmental justice reviews. Subsequent to the submittal of the PSDAR, the NRC staff will consider the impacts related to environmental justice from decommissioning activities.

4.3.14 Cultural, Historic, and Archeological Resources

Cultural resources include any prehistoric or historic archeological site or historic property, site, or district listed in or eligible for inclusion in the National Register of Historic Places or otherwise having significant local importance. The Federal agency (in this case the NRC) is responsible for the evaluations through consultations with the State Historic Preservation Officer (SHPO), or if appropriate, the Tribal Historic Preservation Officer (THPO), that is responsible for determining which sites or properties are of significant historic or archeological importance. The NRC is also responsible for including other interested parties and affected American Indian tribes. Disagreements between the parties are resolved by the Advisory Council on Historic Preservation.

Evaluation of the potential presence of cultural resources should not rely solely on a query of the SHPO database, but should be based on field surveys and evaluations of the site. Although these evaluations may have been performed as part of the initial environmental evaluation for the sites or as part of another licensing action (e.g., license renewal), the coverage and adequacy of earlier survey efforts needs to be re-evaluated in cases where an impact may occur. Earlier field surveys and methods may not conform to current standards.

4.3.14.1 Regulations

The Federal statute that is most directly applicable to cultural resource issues during the decommissioning process is the National Historic Preservation Act (NHPA) of 1966 as amended (16 USC 470 et seq.). This Act created the National Register of Historic Places (National Register) and requires the heads of all Federal agencies to consider the impacts of the undertakings on any cultural properties that are listed on the National Register or that are eligible for listing. Section 106 of the NHPA requires each Federal agency to identify, evaluate, and determine the effects of an undertaking on any cultural resource site that may be within the area impacted by that undertaking. This section also requires consultation to resolve adverse effects of an undertaking and establishes mechanisms to obtain and incorporate comments from consulting parties. Federal agencies are directed by 36 CFR Part 800 to comply with the stipulations of NHPA as well as pertinent cultural, historical, and archeological protection provisions of NEPA, the Historic Sites Act of 1935, and the Antiquities Act of 1906 and their implementing regulations. The Historic Sites Act of 1935 (16 USC 461-467) declared a national policy of preserving for the public historic sites, buildings, and objects of national significance. It also led to the establishment of the Historic Sites Survey, the Historic American Buildings Survey, and the Historic American Engineering Record within the National Park Service.

Most other cultural, historical, and archeological protection regulations are primarily directed at resource protection on Federal lands, but in some cases these statutes may be applicable to the decommissioning of commercial power reactors. Several commercial nuclear power reactors are located on Federal lands. The Antiquities Act of 1906 (16 USC 431-433) prohibits destruction of vertebrate fossils and archeological sites on Federal lands and regulates their

removal under a permitting procedure. These regulations were further strengthened by the Archeological Resources Protection Act of 1979 (16 USC 470aa-47011), which prohibits the willful or knowing destruction and unauthorized collection of archeological sites and objects located on Federal lands. It also establishes a permitting system for archeological investigations and requires consultation with concerned tribes prior to permit issue. The Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001 et seq.) protects graves on Federal lands and establishes tribal ownership of human remains and/or associated funerary objects taken from Federal lands and requires the inventory and repatriation to the tribes of any remains or funerary objects held by Federal agencies. Certain more recent Executive Orders regarding consultation with American Indian tribes and protection of religious sites and values could also be relevant.

Many of the States also have statutes that protect cultural, historical, and archeological resources on State lands. Some States also have burial and cemetery statutes that apply to private land as well. These State-level statutes are usually administered through the appropriate SHPO.

4.3.14.2 Potential Impacts of Decommissioning Activities on Cultural, Historic, and Archeological Resources

As indicated in Table E-3 in Appendix E, decommissioning activities that have a potential to adversely impact cultural resources include stabilization, decontamination and dismantlement, and large component removal. These activities adversely impact cultural resources primarily via land disturbance, which could damage or destroy the resource, or alter the contextual setting of the resource. In addition to the direct effects of land clearing, indirect effects such as erosion and siltation may adversely affect some cultural resources. Decommissioning activities also may alter the site access and administrative protection of the resources.

In a few situations, the nuclear facility itself could be potentially eligible for inclusion in the National Register of Historic Places, especially if it is older than 50 years and represents a significant historic or engineering achievement. In this case, appropriate mitigation would be developed in consultation with the SHPO. Even for buildings that are less than 50 years old, the processes and engineering that were employed may be of interest and may be eligible for the Historic American Engineering Record.

Impacts to cultural, historical, or archeological resources are considered detectable if the activity has a potential to have a discernable adverse affect on the resources. The impacts are destabilizing if the activity would degrade the resource to the point that it would be of significantly reduced value to the future generations, such as physically damaging structures or artifacts or destroying the physical context of the resource in its environment.

4.3.14.3 Evaluation

In most cases, the amount of land required to support the decommissioning process is relatively small and is a small portion of the overall plant site. Usually, the areas disturbed or utilized to support decommissioning are within the operational areas of the site and typically are within the protected area. Usually, there is sufficient room within the operational areas to function as temporary storage, laydown, and staging sites. In most cases, management, engineering, and administrative staff would be assigned space in existing support or administration buildings. In some cases, the licensees have installed trailers or temporary buildings to house engineering and administrative staff or to otherwise support decommissioning. In most cases examined, the licensees expect to restrict decommissioning activities to highly disturbed operational areas but a few do expect to use lands beyond the operational areas. The licensees typically anticipate utilizing an area of between 0.4 ha (1 ac) to approximately 10.5 ha (26 ac) to support the decommissioning process. One facility (Big Rock Point) required a new transmission line right of way (ROW) to provide electrical power to the plant site during decommissioning (this line will also provide power to the onsite independent spent fuel storage installation [ISFSI] after decommissioning is completed). However, construction of a new transmission line ROW is considered an unusual situation. It is expected that some sites will require the reconstruction or installation of new transportation links, such as railroad spurs, road upgrades, or barge slips. Activities conducted within the operational areas are not expected to have a detectable effect on important cultural resources because these areas have normally been highly degraded during facility construction and operation. Activities conducted outside of the operational areas may have detectable impacts, depending on the size and type of impact, and the cultural resources potentially affected.

The potential for adverse impacts is probably not affected by the type of facility (BWR, PWR, HGTR, or FBR) or the decommissioning option selected. However, the different decommissioning options are likely to alter the timing of the impact to cultural resources more than the magnitude of the impacts. DECON may require slightly more land area to support a larger number of activities occurring at the same time. ENTOMB2 would probably have the least likelihood of adverse impacts because some large components may be left in place, reducing the land requirements needed for large construction equipment, as well as waste storage and barge or rail loading areas. The potential impacts of SAFSTOR may be smaller than DECON or ENTOMB1, depending on the time period over which activities are performed. If dismantling and decontamination occur slowly over many years (incremental decontamination and dismantlement), the same storage and staging areas can be reused for sequential activities; however, if many activities are performed over a short time period at the end of the SAFSTOR period, the impacts may be as large as DECON.

4.3.14.4 Conclusions

The staff has considered available information on the potential impacts of decommissioning on cultural, historic, and archeological resources, including comments received on the draft of

Supplement 1 of NUREG-0586. For plants where the disturbance of lands beyond the operational areas is not anticipated, the impacts on cultural, historic, and archeological resources are not considered to be detectable or destabilizing. Therefore, the staff makes a generic conclusion that for such plants, the potential impacts to cultural, historic, and archeological resources are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

If disturbance beyond the operational areas is anticipated, the impacts may or may not be detectable or destabilizing, depending on site-specific conditions, and cannot be predicted generically. Therefore, the staff concludes that if disturbance beyond the operation areas is anticipated, the potential impacts may be SMALL, MODERATE, or LARGE and must be determined through site-specific analysis. Before the licensee conducts any decommissioning activity that might result in the disturbance of historic properties or archeological resources outside the site operational area, the NRC will, in accordance with the National Historic Preservation Act of 1966 as amended (16 USC 470 et seq.), consult with the appropriate SHPO or THPO to evaluate potential impacts.

4.3.15 Aesthetic Issues

Aesthetics is the study or theory of beauty and the psychological responses to it. Aesthetic resources include natural and man-made landscapes and the way the two are integrated. In this evaluation, aesthetic resources are considered to be primarily visual and relate the structures and the visual attributes of the decommissioning site.

4.3.15.1 Regulations

There are no regulations that relate specifically to the degree to which aesthetics may be impacted by a Federal project. The Bureau of Land Management (BLM), however, has developed a Visual Resource Management (VRM) system,[(a)] which involves cataloging scenic values, establishing management objectives for those values through the resource-management planning process, and evaluating proposed activities to determine whether they conform with the management objectives. This system provides tools for identifying the visual resources of an area and assigning them to inventory classes. It also provides tools for determining whether the potential visual impacts from proposed activities or developments meet the management objectives established for an area or whether design adjustments will be required. This tool was designed to meet the BLM's responsibilities for maintaining scenic values of public lands. However, it does not directly apply to a decommissioning facility, where the landscape has already been altered by the facility's structure.

(a) VRM System (http://www.blm.gov/nstc/VRM/vrmsys.html), accessed July 7, 2001.

4.3.15.2 Potential Impacts of Decommissioning Activities on Aesthetics

Table E-3 in Appendix E indicates that structure dismantlement and entombment are activities that may have aesthetic impacts. Nuclear power facilities generally contain four main buildings or structures, as described in Chapter 3: the containment or reactor building, the turbine building, auxiliary building, and cooling towers (if any). Cooling towers and stacks may be clearly visible from a distance. Sites also contain a number of storage tanks, a large switchyard, and various administrative and security buildings. Decommissioning may include demolition or dismantlement of any of these structures. The switchyard may be left in place after the termination of the license because it is an integral part of the power distribution grid.

Levels of impacts for aesthetic resources are defined largely by the impact of the proposed changes as perceived by the public, not merely the magnitude of the changes themselves. The potential for significance arises with the introduction (or continued presence) of an intrusion into an environmental context, resulting in measurable changes to the community (e.g., population declines, property value losses, increased political activism, tourism losses).

Decommissioning activities and the changes that they bring are considered to have a nondetectable impact on the host communities' aesthetic resources if there are (1) no complaints from the affected public about a changed sense of place or a diminution in the enjoyment of the physical environment and (2) no measurable impact on socioeconomic institutions and processes. They are considered to have detectable but not destablizing impacts on the host communities' aesthetic resources if there are (1) some complaints from the affected public about a changed sense of place or a diminution in the enjoyment of the physical environment and (2) measurable impacts that do not alter the continued functioning of socioeconomic institutions and processes. The activities are considered to have detectable and destabilizing impacts on the host community's aesthetic resources if there are (1) continuing and widely shared opposition to the activities or the changes the activities bring based solely on a perceived degradation of the area's sense of place or a diminution in the enjoyment of the physical environment and (2) measurable social impacts that perturb the continued functioning of community institutions and processes.

4.3.15.3 Evaluation

The aesthetic impacts of decommissioning fall into two sets: (a) impacts, such as noise, associated with decommissioning activities that are temporary and cease when decommissioning is complete and (b) the changed appearance of the site when decommissioning is complete.

Typically, nuclear power facilities are located in flat-to-rolling countryside in wooded or agricultural areas. In some cases, the facility structures are visible for many miles. In other cases, there are only a few views of the facility from the land, although it is more obvious from the water (lake, ocean, or bay).

Aesthetic issues related to construction and operation of facility structures were addressed in many (but not all) of the Final EISs prepared in response to applications for construction permits and operating licenses. In most cases, the visual impacts of the plant were said to have been mitigated to some extent by the surrounding topography or vegetation. In other cases, visible structures (such as cooling towers) were said to be "highly visible" but "the staff does not consider such an impact to be unacceptable." For decommissioning, the issue related to aesthetics is not one of placing another facility or building on a site, but one of removing buildings or structures.

The issues evaluated in this section concern the impacts of decommissioning activities on aesthetic resources at and around all types of nuclear power facilities (PWRs, BWRs, HTGR, or FBR). During the decommissioning period, the appearance of the facility will be slowly altered if the buildings are dismantled.

During decommissioning, the impact of activities on aesthetic resources would be temporary. The impacts would be limited both in terms of land disturbance and the duration of activity and would have characteristics similar to those encountered during industrial construction: dust and mud around the construction site, traffic and noise of trucks, and construction disarray on the site itself. In most cases, these impacts would not easily be visible offsite. Aesthetic impacts could improve fairly rapidly in the case of an immediate DECON if the licensee chooses to dismantle the facility, remove the structures, and regrade and revegetate the site before license termination. Impacts could also remain the same or similar in the case where the licensee maintains the structures throughout the decommissioning period and leaves them standing even after license termination (either after decontamination of the structures or possibly along with entombment of the reactor building) or throughout a long SAFSTOR period or ENTOMB. In these latter cases, the aesthetic impacts of the plant would be similar to those that occurred during the operational period.

The removal of structures is generally considered beneficial to the aesthetic impacts of the site. In a few cases, where facilities have been located on the Great Lakes or ocean coast, the facility may have been used by boaters as a landmark. However, it is highly unlikely that this would become an issue that would preclude dismantlement of the facility structures.

The retention of the structures during a SAFSTOR period or the retention of structures onsite at the time the license is terminated is likewise not an increased visual impact, but instead a continuation of the visual impact analyzed in the facility construction or operations FES. The staff has not identified any mechanism that would result in a greater negative aesthetic impact than had previously been considered during the development of the construction FES.

Decommissioning activities will be conducted onsite, both inside and outside existing buildings (in the case of dismantlement or shipping activities). Any visual intrusion (such as the

dismantlement of buildings or structures) would be temporary and would serve to reduce the aesthetic impact of the site. At a minimum, the aesthetic impact of the site would not be improved but would remain that of an industrial site as evaluated in the facility's original FES.

Licensees are expected to use best-management practices (BMPs) to control many of the potentially adverse impacts of decommissioning activities on aesthetics (e.g., dust and noise), as discussed in other sections.

4.3.15.4 Conclusions

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, on the potential impacts of decommissioning activities and the changes in plant appearance on aesthetics. This information indicates that the impacts on aesthetics are not detectable or destabilizing. Therefore, the staff makes a generic conclusion that for all plants, the potential impacts on aesthetics are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

4.3.16 Noise

Noise is a "direct effect," as defined by Section 1508 of the CEQ Regulations for Implementing NEPA, i.e., effects caused by an action that occur at the same time and place as that action. For NRC licensees, the implementing regulations for NEPA are given in 10 CFR Part 51.

Noise is usually defined as sound that is undesirable because it interferes with speech, communication, or hearing; is intense enough to damage hearing, or is otherwise annoying. Noise levels often change with time. To compare levels over different time periods, several descriptors were developed that take into account this time-varying nature. These descriptors are used to assess and correlate the various effects of noise, including land-use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects:

- A-weighted sound levels (dBA) - typically used to account for the response of the human ear

- C-weighted scale (dBC) - generally used to measure impulsive noise such as air blasts from explosions, sonic booms, and gunfire

- day-night average sound level (DNL) - used to evaluate the total community noise environment. The DNL is the average A-weighted sound level during a 24-hour period with 10 dB added to nighttime levels (between 10 p.m. and 7 a.m) to account for the increased human sensitivity to night-time noise events.

The discussions in this section relate to noise and related impacts that may be heard offsite. The impacts from noise to workers is addressed in Section 4.3.10.

4.3.16.1 Regulations

The EPA was given the jurisdiction in the Noise Control Act of 1972 (42 USC 4901 et seq.) to promulgate and enforce the regulations that were issued under the Act. Funding for EPA to perform this function was eliminated in early 1981. However, Congress did not repeal the Noise Control Act. The DNL was endorsed by the EPA and is mandated by the U.S. Department of Housing and Urban Development (HUD), the Federal Aviation Administration (FAA), and the Department of Defense (DoD) for land-use assessments. The EPA has determined that no significant effects on public health and welfare occur for the most sensitive portion of the population (within an adequate margin of safety) if the prevailing DNL is less than 55 dB (NAS 1977). The FAA bases its noise guidelines on land use. For residential uses, sound levels up to 65 dB are acceptable. Certain residential areas with sound-blocking features can handle up to 75 dB. For livestock farming and breeding, compatibility is considered to exist up to 75 dBA. These guidelines are advisory in nature and are not mandatory (14 CFR Part 150).

The Federal Housing Administration (FHA), under HUD, established noise assessment guidelines under 24 CFR 51B (1979; amended April 25, 1996). The FHA/HUD site acceptability levels are summarized as follows:

- Acceptable (DNL is 65 dBA or less) - Typical building materials and construction will make any impacts to indoor noise minimal. Outdoor recreation and activities would not be impacted. No approval requirements or abatement measures are needed under this condition.

- Normally unacceptable (DNL is 65 to 75 dBA) - Noise exposure will impact outdoor use of the area and indoor use may be affected. Walls or other barriers may be needed to reduce outdoor noise levels. Indoor noise levels may need to be reduced using special construction methods.

- Unacceptable (DNL above 75 dBA) - The noise conditions in this situation are unacceptable and activities need to be approved on a case-by-case basis.

Local and State regulations may also exist regarding noise restrictions and abatement decisions. Many States prohibit only nuisance noise and have not established specific numerical environmental noise standards, while others have very specific requirements. For example, the State of Maine has sound-level limitations for construction that are a function of time of day, area characteristics, and duration of the noise.

4.3.16.2 Potential Impacts from Noise of Decommissioning Activities

Table E-3 in Appendix E indicates that structure dismantlement is an activity that may have noise impacts. During the decommissioning process, the sounds that might be heard at offsite locations include noise from construction, vehicles, grinders, saws, pneumatic drills, compressors, and loudspeakers. Noise levels from these sources have to be compared to current noise levels of the operating facility and background noise present at the site to determine potential impacts. Table 4-5 lists predicted noise ranges for significant sources of noise during decommissioning.

Noise level increases larger than 10 dBA to the DNL at the site boundary during the day might be expected to lead to interference with outdoor speech communication, particularly in rural areas or low-population areas where the day-night background noise level is in the range of 45 to 55 dBA.

The noise impacts of decommissioning activities are considered detectable if sound levels are sufficiently high to disrupt normal human activities on a regular basis. The noise impacts of decommissioning activities are considered destabilizing if sound levels are sufficiently high that the affected area is essentially unsuitable for normal human activities, or if the behavior or breeding of a threatened or endangered species is affected.

Table 4-5. Predicted Noise Ranges from Significant Decontamination and Dismantlement Sources (INEEL 1999)

			Predicted Noise Level Ranges (dBA) at Various Distances from the Reference Distance			
Source	**Source Strength dBA**	**Reference Distance, m**	**150 m (500 ft)**	**300 m (1000 ft)**	**0.8 km (0.5 mi)**	**1.6 km (1 mi)**
Construction Equipment	85-90	15[(a)]	65-75	59-69	51-61	45-55
Truck	85-90	15	65-75	59-69	51-61	45-55
Rail Engine	86-96	30[(b)]	76-86	71-81	64-74	58-68
Rail Car, 64 km/h (40 mph)	80-86	30	68-74	62-68	53-59	48-54

(a) 15 m ≈ 50 ft.
(b) 30 m ≈ 100 ft.

4.3.16.3 Evaluation

When noise levels are below those that result in hearing loss, impacts are judged primarily in terms of adverse public reactions to the noise. Generally, surveys around major sources of noise such as large highways and airports find that, when the DNL increases above 60 to 65 dBA, noise complaints increase significantly (FICN 1992). FHA/HUD uses a DNL of 65 dBA as the primary criterion for impact on residential properties and nearby populations. The staff believes that noise levels below 60 to 65 dBA are considered to be insignificant. Business and institutional properties may be less sensitive to changes in noise levels, but all populations of concern should be considered when estimating the noise impact of decommissioning activities.

Typically, operating reactor facilities do not result in offsite sound levels greater than 10 dBA above background. However, at some sites, sound levels at and above this level have been calculated at critical receptor locations. The principal sources of noise from facility operations are natural-draft and mechanical-draft cooling towers, transformers, and loudspeakers. Other occasional noise sources may include auxiliary equipment, such as pumps to supply cooling water from a remote reservoir. Generally, noise from these sources is not heard by a large number of people offsite. Of these sources, only loudspeakers would be anticipated to continue during the decommissioning period. The staff assumes that decommissioning activities will be scheduled to minimize high noise levels during the night and during critical periods for important animal species.

In most cases, during decommissioning the sources of noise would be sufficiently distant from critical receptors outside the plant boundaries that the noise would be attenuated to nearly ambient levels and would be scarcely noticeable, as in the case for operating plants. However, in some cases, such as the use of equipment to demolish concrete, the noise levels offsite could be sufficiently loud (60 to 65 dBA at the nearest receptor site) that activities may need to be curtailed during early morning and evening hours. It is highly unlikely, based on past decommissioning experience, that the offsite noise level from a plant during decommissioning would be sufficient to cause hearing loss. However, in one case, noises at a facility being decommissioned have been reported at levels of up to 107 dB (dropping to 50 dB less than 1.6 km [1 mi] away) as a result of the spent fuel pool cooling system. Nearby residents complained to the plant staff about these noise levels; engineering changes were made in the fans that were causing the noise and the issue was resolved.

The timing of the noise impacts and the duration or intensity will vary depending on the decommissioning option and the procedures that are used. More noise will occur during active dismantlement than during the storage period of SAFSTOR. Some demolition activities could increase noise levels temporarily. In addition to mitigation of noise levels based on engineering design, noise abatement procedures can be considered in decommissioning plans to reduce noise, particularly at night.

No differences are expected between the noise levels of future decommissioning activities at operating plants and the noise levels observed at facilities undergoing decommissioning. It is anticipated that most decommissioning activities will not represent an audible intrusion on the community for any type of nuclear power facility (BWR, PWR, HGTR, or FBR).

4.3.16.4 Conclusions

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, on the potential noise impacts of decommissioning activities. This information indicates that the noise impacts are not detectable or destabilizing. Therefore, the staff makes a generic conclusion that for all facilities, the potential noise impacts are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

4.3.17 Transportation

In considering activities for decommissioning, transportation can be considered both an activity and an issue. Transportation of equipment, material, and waste is an activity that is performed throughout the entire decommissioning process. However, it is treated as an issue in this Supplement and is given its own section.

This section addresses impacts related to transporting equipment and materials (radiological and nonradiological) offsite. Materials transported to offsite disposal facilities include nonhazardous waste, LLW, hazardous waste, and mixed waste. As discussed in Chapter 1, the shipment of spent nuclear fuel is not within the scope of this Supplement. Radiological impacts include exposure of transport workers and the general public along transportation routes. Nonradiological impacts include additional traffic volume, additional wear and tear on roadways, and potential traffic accidents.

4.3.17.1 Regulations

Regulations that apply to the transportation of hazardous, mixed waste, and radioactive material promulgated by the U.S. Department of Transportation (DOT) are contained in 49 CFR Parts 171-177. NRC regulations related to transportation of LLW are contained in 10 CFR Part 71, “Packaging and transportation of radioactive material.” These regulations contain requirements for transport vehicles, maximum radiation levels for packages and vehicles, special packaging requirements, driver training, vehicle and packaging inspections, marking and labeling of packages, placarding of vehicles, and training of emergency personnel to respond to mishaps. Highway routing restrictions for certain shipments of LLW are also included in DOT regulations. NRC regulations contain performance requirements for certain

types of transportation packages of radioactive material. In addition, Federal and State regulations govern the size and weights of trucks. The staff assumes that equipment, materials, and waste transportation are conducted within applicable regulations.

4.3.17.2 Potential Decommissioning Impacts from Transportation

Table E-3 in Appendix E indicates that transportation-related activities may impact the transportation infrastructure and public health and safety. The types of transportation impacts for decommissioning nuclear power facilities and operating plants are similar. The factors that determine the magnitude of transportation impacts of decommissioning include:

- changes in waste production due to decontamination and dismantlement activities that increase the amount of waste shipped offsite
- changes in the transportation methods (rail, truck, or barge) related either to the increased amount to be shipped offsite or to the type of material to be shipped.
- changes in the mix of types of waste categories shipped offsite.

The public health impacts result from exposures of transport workers and the general public along transportation routes during normal shipments and from material released as a result of transportation accidents, as well as from transportation accidents that do not involve the release of radioactive material. The radiological impacts to public health and safety are considered detectable if the dose rates from shipping containers exceed regulatory limits. They are considered destabilizing if material is shipped in unapproved containers. The nonradiological impacts of transportation of radioactive waste are considered detectable or destabilizing if the vehicles are maintained or driven in a manner that would result in a significantly greater accident rate than experienced by the trucking industry.

The nonradiological, infrastructure impacts are increases in traffic density, wear and tear on roadways and railways, and transportation accidents. The impacts of decommissioning activities on the transportation infrastructure are considered detectable if the increased traffic causes a decrease in level of service or measurable deterioration of affected roads that can be directly tied to activities at the plant. The impacts of decommissioning activities are considered destabilizing if the level of service becomes unacceptable or roads become unusable because of activities at the plant.

4.3.17.3 Evaluation

The transportation impacts are dependent on the number of shipments to and from the facility, the type of shipments, the distance that material is shipped, and the nonradiological waste/fixed waste quantities and disposal plans. The distance that the waste travels depends on the plant's proximity to a disposal site. One decommissioning facility, located in Oregon, ships LLW 480

km (300 mi) to the U.S. Ecology burial site on the Hanford Reservation in Richland, Washington. Another decommissioning facility located in California ships LLW 4300 km (2700 mi) to the Barnwell facility in South Carolina.

The number of shipments and volume of waste shipped during the decontamination and dismantlement phases of decommissioning are greater than during operations. Information on shipments, which was received from nine plants, is shown in Appendix K. Because data on the waste volume of shipments were received from only seven plants, estimates of waste volume and shipment numbers in several cases (as footnoted in the table) reflect only a single facility and may be significantly higher or lower than for the average facility in that grouping. The impacts from FBRs and HTGRs would be encompassed by those for the PWRs and BWRs since the distance shipped is less and the plant sizes are generally smaller.

Nonradioactive material from the site for general disposal will likely be shipped to landfills. However, because licensees cannot release material with detectable amounts of radioactive material, a number of sites may ship much of their solid waste to vendors specializing in the management of LLW or to LLW sites such as that at Clive, Utah.

A generic analysis was conducted to estimate human health impacts associated with transporting decontamination and dismantlement wastes from reactor sites to LLW burial grounds. The RADTRAN 4 computer code (Neushauser and Kanipe 1992), which is commonly used for transportation impact calculations in support of environmental documentation, was used for the analysis. RADTRAN 5 (Neushauser and Kanipe 1996) is the latest version of the code, originally developed by Sandia National Laboratories to support the NUREG-0170 environmental impact analysis (NRC 1977). It uses the same basic methods for calculating impacts but does the calculations in a probabilistic framework.

Based on information from Trojan and Maine Yankee, LLW was categorized as one of three types--high activity, low activity, and very low activity--and a typical volume and activity were estimated for each type of LLW. The impacts of transporting each type of LLW were estimated. There are likely to be additional nonradiological impacts on public health and safety from transportation accidents associated with transportation of uncontaminated material.

Radiological impacts: For this Supplement, the public health and safety impacts of transportation of radioactive waste are evaluated on the basis of compliance with applicable regulations. The Commission has taken the position (46 FR 21619) that its "...regulations are adequate to protect the public against unreasonable risk from the transportation of radioactive materials." This evaluation was based, in part, on the findings of NUREG-0170 (NRC 1977). A recent re-evaluation of transportation risks, using updated information and assessment tools (Sprung et al. 2000), found that risks are lower than estimated in NUREG-0170. Licensees are expected to comply with all applicable regulations when shipping radioactive waste from decommissioning. Therefore, the effects of transportation of radioactive waste on public health and safety are considered to be neither detectable nor destabilizing.

Nevertheless, the staff performed an evaluation of the likely magnitude of these impacts using available data. Radiological impacts are divided into those for "routine" or incident-free shipments (i.e., the shipment reaches its destination without incident) and those for shipments that involve an accident with a subsequent radiological release. In each case, the impact is expressed in cumulative dose for the transport workers and public. The results of the calculations are shown in Table 4-6. The details of the assumptions made in the analysis are discussed in Appendix K. In order to bound the impacts, a distance of 4800 km (3000 mi) was selected. Dose rates for incident-free shipment of high-activity LLW were assumed to be at the regulatory limits, and dose rates for incident-free shipment of low-activity LLW were assumed to be at one-tenth of regulatory limits. Radiological impacts of shipment of very low-level activity LLW were assumed to be negligible compared to shipments of high-level and low-level activity LLW. However, shipment of very low-level activity waste was considered in evaluating nonradiological transportation of LLW. With these assumptions and the additional assumptions listed in Appendix K, the results of the analysis should bound the transportation impacts for all decommissioning options for PWRs and BWRs.

Ramsdell et al. (2001) indicate that shipment of spent fuel by rail reduces the radiological impacts significantly (more than a factor of 10 for shipments from the northeast to Nevada). Similar reductions would be expected in the radiological impacts of the shipment of LLW from decommissioning if shipments were made by rail rather than by truck. Barge shipments of the high-activity waste could reduce the radiological impacts even further.

Nonradiological impacts: Nonradiological impacts of transportation of LLW include increased traffic and wear and tear on roadways. Decommissioning experience has been that the number of LLW shipments from a site averages much less than 1 per day. This number of shipments per day is not nearly large enough to have a detectable or destabilizing effect on traffic flow or road wear.

Nonradiological impacts of transportation accidents are typically expressed in terms of fatalities. RADTRAN estimates fatalities caused by traffic accidents using the distance traveled and average fatality rates per unit distance. Traffic accidents are not related to radioactivity; therefore, the impacts of transportation accidents should be based on the round-trip distance between the decommissioning site and the waste facility. For consistency, a 9600-km (6000-mi) round-trip distance is assumed for the fatality estimates shown in Table 4-6. Again, these numbers reflect the entire decommissioning period. The fatality estimates would be the same for shipments of any other commodity.

The following values may provide some perspective for evaluating the values in Table 4-6. A recent publication (Saricks and Tompkins 1999) gives average accident rates on interstate highways. The average accident rates for trucks are 3.15×10^{-7}, 3.66×10^{-7} and 6.54×10^{-7} per kilometer (5.07×10^{-7}, 5.89×10^{-7}, and 1.05×10^{-6} per mile) for highways in rural, suburban, and urban areas, respectively. The national average fatality rate for trucks is 5.5×10^{-9} fatalities per

Table 4-6. Impacts of Transportation of LLW from Decommissioning

	High-Activity Waste	Low-Activity Waste	Very Low-Activity Waste	Total
Number of Shipments during Decommissioning	227	84	360	671[a]
Incident-Free Transportation Impacts -- Cumulative Dose, person-Sv (person-rem)				
Crew	0.496 (49.6)	0.184 (18.4)	--	0.680 (68.0)
Public along route	0.129 (12.9)	0.020 (2.00)	--	0.149 (14.9)
Onlookers	0.123 (12.3)	0.019 (1.90)	--	0.142 (14.2)
Total	0.748 (74.8)	0.223 (22.3)	--	0.971 (97.1)
Incident-Free Transportation Impacts -- Latent Cancer Fatalities (LCF)				
Crew[b]	0.0198	0.00736	--	0.0272
Public along route[c]	0.0065	0.00100	--	0.00744
Onlookers[c]	0.0062	0.00096	--	0.00711
Total	0.0324	0.00931	--	0.0417
Accident Impacts				
Cumulative Dose, person-Sv (person-rem)	5.39×10^{-5} (5.39×10^{-3})	1.28×10^{-4} (1.28×10^{-2})	--	1.82×10^{-4} (1.82×10^{-2})
Nonradiological Fatalities	0.0120[d]	0.00465[d]	0.019[d]	0.0356[d,e]
Total				
Cumulative Dose, person-Sv (person-rem)	0.748 (74.8)	0.223 (22.3)	--	0.971 (97.1)
Fatalities	0.0419	0.0136	0.0190	0.0745[e]

(a) The total number of shipments during decommissioning may be significantly increased if State or local government agencies require removal of all structures and concrete from the site. However, the additional shipments would be uncontaminated material.
(b) Assuming 4.0×10^{-2} LCF/person-Sv (4.0×10^{-4} LCF/person-rem) for crew.
(c) Assuming 5.0×10^{-2} LCF/person-Sv (5.0×10^{-4} LCF/person-rem) for general public.
(d) Based on fatal accident rate of 5.5×10^{-9} per km (8.8×10^{-9} per mi).
(e) The number of fatalities will increase if there are additional shipments of uncontaminated material in proportion to the number of miles driven.

kilometer (8.8×10^{-9} fatalities per mile). Historically, the accident rate for activities at nuclear facilities has been lower than the national average for similar activities because of the industry emphasis on training and adherence to established procedures.

It is not likely that the actual nonradiological impacts of transportation accidents would be as high as indicated or that they would be either detectable or destabilizing.

The number of shipments into the decommissioning facility would be much smaller than the number of shipments from the facility. The concrete used to entomb a plant would be manufactured at a batch plant onsite, or the licensee would use local sources for the materials needed for entombing a facility. Shipments of materials into the facility during decommissioning or following the preparation for entombment of the facility would be minimal. It is anticipated that many of the shipments to the facility undergoing decommissioning, including shipments of equipment and heavy machinery, would come from local sources and, thus, the distance traveled would be minimal. Therefore, the staff concludes that transporting the materials to the site would not significantly impact the overall traffic volume or compromise the safety of the public,

Previous or anticipated decommissioning activities at the FBR or HTGR have not and are not expected to result in impacts on transportation that are different from those found at other nuclear facilities.

4.3.17.4 Conclusions

The staff has considered available information, including comments received on the draft of Supplement 1 of NUREG-0586, on the potential transportation impacts of decommissioning activities. This information indicates that the transportation impacts are not detectable or destabilizing. Therefore, the staff makes a generic conclusion that for all plants, the potential transportation impacts are SMALL. The staff has considered mitigation measures and concludes that no additional mitigation measures are likely to be sufficiently beneficial to be warranted.

4.3.18 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments are commitments of resources that cannot be recovered, and irretrievable commitments of resources are those that are lost only for a period of time. The irreversible and irretrievable commitments of resources that are anticipated during the decommissioning process are similar to those that were considered in the FESs for facility construction permits and operating licenses. The FESs for plant operation cite uranium as the principal natural resource irretrievably consumed in facility operation. However, following permanent cessation of operations, uranium is no longer consumed. As discussed in Chapter 1, disposal of uranium as part of spent nuclear fuel is not within the scope of this Supplement. Other resources considered in some FESs include land, water, human resources, cultural, and threatened and endangered species.

4.3.18.1 Regulations

CEQ regulations at 40 CFR 1502.13 and NRC regulations at 10 CFR 51, Appendix A to Subpart A, state that an environmental impact statement include a discussion of any irreversible or irretrievable commitments of resources. In addition, there are regulations that deal with the use of land (addressed in Section 4.3.1, “Onsite/Offsite Land Use”), water use and quality (Sections 4.3.2 and 4.3.3), and air quality (Section 4.3.4). Disposal of uranium is not within the

scope of this document. Land devoted to LLW disposal sites or in industrial landfills is also not within the scope of this document and is addressed in the licensing documents for the disposal site.

4.3.18.2 Potential Impacts of Decommissioning Activities on Irretrievable Resources

Table E-3 in Appendix E indicates that decommissioning activities with the potential to impact irreversible and irretrievable commitment of resources include structural dismantlement; LLW packaging, storage, and disposal; and transportation.

An irreversible commitment of resources is defined as a loss that is detectable and destabilizing, such as when a species becomes extinct, or, in the case of mining, when ore is removed. Irretrievable commitments can be considered as a tradeoff. If a transportation corridor is constructed, the land uses are not available for as long as the corridor remains. The destabilizing impacts are those that adversely impact the resources discussed in this Supplement (Sections 4.3.1 through 4.3.17).

4.3.18.3 Evaluation

Although most FESs addressed primarily uranium fuel, other resources were discussed in some of the FESs. This included land used for plant buildings, components such as large underground concrete foundations, and certain other equipment considered irretrievable due to practical aspects of reclamation and/or radioactive decontamination. The use of the environment (air, water, and land) by the facilities was not deemed to represent significant irreversible or irretrievable resource commitments but rather a relatively short-term investment.

Whether land is considered to be an irretrievable resource depends largely on the decisions at the time of license termination. If the license is terminated for unrestricted use, then the land will be available for other uses, whether or not the decommissioning process returned the land to a “Greenfield” site or to an industrial complex. If ENTOMB1 is selected, license termination could still allow unrestricted access after 30 to 60 years. However, if the ENTOMB2 option is selected, the land under the facility will not be available for alternative uses and would be considered irretrievable.

The only other irretrievable resources that would occur during the decommissioning process would be materials used to decontaminate the facility (e.g., rags, solvents, gases, and tools), and fuel used for construction machinery and for transportation of materials to and from the site. However, these resources are minor.

Although the use of land, water, air, and fuel oil during decommissioning is minimal or nonexistent, the disposal of radioactive waste and nonradioactive waste would be considerable for some options, such as DECON to a “Greenfield” (nonindustrial) site. Even though the disposal of radioactive waste is outside the scope of this document, the volume of land required for radioactive waste disposal is estimated in Table 4-7 for the SAFSTOR and DECON options, based on data obtained from six plants. The quantities of waste shown in Table 4-7 for the two

ENTOMB options were estimated based on the scenarios described in Chapter 3. The greatest estimated volume of radwaste is from a facility that is being decommissioned to "Greenfield" (no structures remaining onsite). It is located in a State that does not allow disposal of the industrial waste within an in-state industrial waste site.

Table 4-7. Volumes of Land Required for LLW Disposal[(a)]

Decommissioning Option	Reactor Type	Volume of Land Required for LLW Disposal, m^3 (ft^3)	Plant Size (Electrical Capacity, MWe)
DECON	PWR	8000 - 10,000 (282,500 - 353,000)	1130 to 1825
	BWR	2000 (71,000)	240
SAFSTOR	PWR	600 - 45,000 (21,000 -1.5 million)	23 to 1437
	BWR	18,000 (636,000)	660
ENTOMB1	Either	<5000 (<177,000)	Variable
ENTOMB2	Either	<500 (<17,700)	Variable

(a) Data were available from a limited number of facilities and based on actual estimates provided by the licensees.

4.3.18.4 Conclusions

The staff has considered available information on the potential impacts of decommissioning on irreversible and irretrievable commitments of resources, including comments received on the draft of Supplement 1 of NUREG-0586. This information indicates that the impacts of decommissioning on irreversible and irretrievable commitments are neither detectable nor destabilizing. Therefore, the staff makes the generic conclusion that the impacts on irreversible and irretrievable commitments are SMALL. The staff has considered mitigation and concludes that no additional measures are likely to be sufficiently beneficial to be warranted.

4.4 References

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic licensing of production and utilization facilities."

10 CFR 51. Code of Federal Regulations. Title 10, Energy, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR 71. Code of Federal Regulations, Title 10, *Energy*, Part 71, "Packaging and

transportation of radioactive material."

10 CFR 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor site criteria."

14 CFR 150. Code of Federal Regulations, Title 14, *Aeronautic and Space*, Part 150, "Airport noise compatibility planning."

24 CFR 51B. Code of Federal Regulations, Title 24, *Housing and Urban Development*, Part 51B, "Environmental criteria and standards."

29 CFR 1902. Code of Federal Regulations, Title 29, *Labor*, Part 1902, "State plans for the development and enforcement of State standards."

29 CFR 1910. Code of Federal Regulations, Title 29, *Labor*, Part 1910, "Occupational safety and health standards."

29 CFR 1926. Code of Federal Regulations, Title 29, *Labor*, Part 1926, "Safety and health regulations for construction."

29 CFR 1952. Code of Federal Regulations, Title 29, *Labor*, Part 1952, "Approved State plans for enforcement of State standards."

36 CFR 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of historic properties."

40 CFR 50. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 50, "National primary and secondary ambient air quality standards."

40 CFR 51. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 51, "Requirements for preparation, adoption, and submittal of implementation plans."

40 CFR 61. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 61, "National emission standards for hazardous air pollutants; regulation of radionuclides."

40 CFR 81. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 81, "Designation of areas for air quality planning purposes."

40 CFR 82. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 82, "Protection of stratospheric ozone."

40 CFR 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, "Environmental radiation protection standards for nuclear power operations."

40 CFR 1502. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1502, "Environmental Impact Statement."

40 CFR 1508. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1508, "Terminology and index."

49 CFR 171 - 177. Code of Federal Regulations, Title 49, *Transportation*, Parts 171-177, "General information, regulations, and definitions"; "Hazardous materials table, special provisions, hazardous materials, communications, emergency response information, and training requirements"; "Shippers--general requirements for shipments and packagings"; "Carriage by rail"; "Carriage by aircraft"; "Carriage by vessel"; "Carriage by public highway."

46 FR 21619. "Radioactive Material; Packaging and Transportation by Air." *Federal Register*, April 13, 1981.

54 FR 39767. "10 CFR Part 51 Waste Confidence Decision Review." *Federal Register*, September 28, 1989.

61 FR 39278. "Decommissioning of Nuclear Power Reactors. Final Rule." *Federal Register*. July 29, 1996.

64 FR 68005. "Waste Confidence Decision Review." *Federal Register*. December 6, 1999.

Antiquities Act of 1906, 16 USC 431 et seq.

Archaeological Resources Protection Act of 1979, 16 USC 470aa et seq.

Clean Air Act, as amended, 42 USC 7401 et seq.

Council on Environmental Quality (CEQ). 1997. *Environmental Justice: Guidance under the National Environmental Policy Act*. CEQ, Executive Office of the President, Washington, D.C.

Endangered Species Act of 1973, as amended, 16 USC 1531 et seq.

Executive Order 12898. 1994. "Environmental Effects of Federal Programs on Minority and Low-Income Populations." 59 FR 7629, February 16, 1994.

Executive Order 13186. 2001. "Responsibilities of Federal Agencies to Protect Migratory Birds." 66 FR 3853, January 10, 2001.

Federal Interagency Committee on Noise (FICN). 1992. *Federal Agency Review of Selected Airport Noise Issues*. FICN, Washington, D.C.

Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act, 33 USC 1251 et seq.

Fish and Wildlife Coordination Act, 16 USC 661 et seq.

Hazardous Air Pollutants, 42 USC 7412.

Historic Sites Act of 1935, 16 USC 461 et seq.

Idaho National Environmental and Engineering Laboratory (INEEL). 1999. "Environmental Impact Statement for the Advanced Mixed Waste Treatment Project." Available URL: http://nepa.eh.doe.gov/eis/eis0290/Ch_5/5_10/5_10Noise.HTML

International Commission on Radiological Protection (ICRP). 1991. *Recommendations of the International Commission on Radiological Protection*. Publication 60, Oxford Press, Oxford.

Krupa, K. M., and R. J. Serne. 1988. *Effects on Radionuclide Concentrations by Cement/Ground-Water Interactions in Support of Performance Assessment of Low-Level Radioactive Waste Disposal Activities*. NUREG/CR-6377, NRC, Washington, D.C.

Migratory Bird Treaty Act, 16 USC 703 et seq.

National Academy of Sciences (NAS). 1977. *Guidelines for Preparing Environmental Impact Statements on Noise*. Report of Working Group 69 on Evaluation of Environmental Impact of Noise, NAS, Washington, D.C.

National Council on Radiation Protection and Measurements (NCRP). 1991. *Effects of Ionizing Radiation on Aquatic Organisms*. NCRP Report No. 109, NCRP, Bethesda, Maryland.

National Environmental Policy Act (NEPA) of 1969, as amended, 42 USC 4321 et seq.

National Historic Preservation Act of 1966, as amended, 16 USC 470 et seq.

Native American Graves Protection and Repatriation Act of 1990, 25 USC 3001 et seq.

National Primary and Secondary Ambient Air Quality Standards, 42 USC 7409.

Neushauser, K. S., and F. L. Kanipe. 1996. *RADTRAN 5–A Computer Code for Transportation Risk Analysis*. SAND91-2600C, Sandia National Laboratories, Albuquerque, New Mexico.

Neuhauser, K. S., and F. L. Kanipe. 1992. RADTRAN 4 – Volume 3:User's Guide. SAND89-2370. Sandia National Laboratories, Albuquerque, New Mexico.

Noise Control Act of 1972, as amended, 42 USC 4901 et seq.

Occupational Safety and Health Act of 1970, as amended, 29 USC 651 et seq.

Plog, B., ed. 1988. *Fundamentals of Industrial Hygiene*. 3rd ed., National Safety Council, Washington, D.C.

Ramsdell, J. V., Jr., C. E. Beyer, D. D. Lanning, U. P. Jenquin, R. A. Schwarz, D. L. Strenge, P. M. Daling, and R. T. Dahowski. 2001. *Environmental Effects of Extending Fuel Burnup Above 60 GWd/MTU*. NUREG/CR-6703 (PNNL-13257), NRC, Washington, D.C.

Resource Conservation and Recovery Act (RCRA) of 1976, as amended by the Hazardous and Solid Waste Amendments Act of 1984, 42 USC 6901 et seq.

Sackschewsky, M. R. 1997. *Threatened and Endangered Species Evaluation for 75 Licensed Commercial Nuclear Power Generating Plants*. PNNL-11524, Pacific Northwest National Laboratory, Richland, Washington.

Saricks, C. L., and M. M. Tompkins. 1999. *State-Level Accident Rates of Surface Freight Transportation: A Reexamination*. ANL/ESD/TM-150, Argonne National Laboratory, Argonne, Illinois.

Sprung, J. L., D. J. Ammerman, N. L. Breivik, R. J. Dukhart, F. L. Kanipe, J. A. Koski, G. S. Mills, K. S. Neushauser, H. D. Radloff, R. F. Weiner, and H. R. Yoshimura. 2000. *Reexamination of Spent Fuel Shipment Risk Estimates*. NUREG/CR-6672 (SAND2000-0234), U.S. Nuclear Regulatory Commission, Washington, D.C.

Tennessee Valley Authority (TVA). 1978a. (Yellow Creek Nuclear Plant Units 1 and 2), LBP-78-7, 7 NRC 215.

Tennessee Valley Authority (TVA). 1978b. (Yellow Creek Nuclear Plant Units 1 and 2), LAB-515, 8 NRC 702.

U.S. Environmental Protection Agency (EPA). 1971. "Noise from Construction Equipment and Operations." *Building Equipment and Home Appliances*. PB 206717, EPA, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1991. *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*. 400-R-92-001, EPA, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1977. *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes*. NUREG-0170, Vol. 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997. *Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities*. NUREG-1496, Vol. 1, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Report on Waste Burial Charges*. NUREG-1307, Rev. 9, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001a. *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues*. Office Instruction LIC-203, Nuclear Reactor Regulation, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001b. *Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants*. NUREG-1738, NRC, Washington, D.C.

4.5 Related Documents

Big Rock Point (BRP). 1998. "Big Rock Point Performance Indicators."

Big Rock Point (BRP). 1999. "Big Rock Point Performance Indicators."

Big Rock Point (BRP). 2000. "Big Rock Point Performance Indicators."

Haddam Neck Plant (HNP). 2000. "Haddam Neck Plant License Termination Plan," Rev. 0.

Humboldt Bay Plant (HBP). 1997. "Humboldt Bay Unit 3 Caisson In-leakage Repair Project Summary."

http://www.blm.gov/nstc/VRM/vrmsys.html.

http://nepa.eh.doe.gov/eis/eis0290/Ch_5/5_10/5_10Noise.html.

5.0 No-Action Decommissioning Alternative

The action discussed in this Supplement and in the *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (1988 GEIS; NRC 1988) is decommissioning. The only alternative to the action of decommissioning is not to decommission the facility. The option to restart the reactor is not considered to be an alternative to decommissioning because the regulations do not allow the licensee to reload fuel and restart the facility after submitting a certification that the fuel has been removed from the reactor vessel.

The alternative to decommissioning at the end of the licensing period is a "no action" alternative, implying that a licensee would simply abandon or leave a facility after ceasing operations. Once the facility permanently ceases operation, if the licensee does not conduct decommissioning activities to an extent that meets the license termination criteria in 10 CFR 20 Subpart E, then the license will not be terminated (although the licensee will not be authorized to operate the reactor). The licensee will be required to comply with the necessary requirements for the operating license. As a result, the environmental impacts for maintaining the nuclear reactor facility will be considered to be in the bounds of the appropriate, previously issued Environmental Impact Statements.

The objective of decommissioning is to restore a radiologically contaminated facility to a condition such that there is no unreasonable risk from the decommissioned facility to the public health and safety. The U.S. Nuclear Regulatory Commission (NRC) regulations do not allow the option of not decommissioning. Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for additional 20-year periods if NRC requirements are met. However, at the end of the term of the license (whether it has been extended or not), the regulations require that the facility be decommissioned.

5.1 Reference

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities.* NUREG-0586, NRC, Washington, D.C.

No-Action Alternative

6.0 Summary of Findings and Conclusions

6.1 Summary of Findings

This chapter summarizes the findings and conclusions from the evaluation of environmental impacts related to decommissioning of permanently shutdown commercial nuclear power reactors. Table 6-1 presents each environmental issue that was evaluated and identifies whether the issue is considered generic or site-specific. Of the environmental issues assessed (see Table 6-1), most of the impacts are generic and SMALL for all plants regardless of the decommissioning activity and identified variables (see Appendix E for a list of the variables).

Two issues were identified that require a site-specific analysis: threatened and endangered species and environmental justice.

In accordance with the Endangered Species Act of 1973 (16 USC 1531 et seq.), the appropriate Federal agency (either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service) must be consulted about the presence of threatened or endangered species. Informal consultation will be initiated by the U.S. Nuclear Regulatory Commission (NRC) staff with the appropriate service after the licensee announces permanent cessation of operations. It is expected that any formal or informal consultation will be completed prior to the licensee beginning major decommissioning activities, which can occur 90 days after the submission of the post-shutdown decommissioning activities report (PSDAR). At that time, it will be determined whether such species could be affected by decommissioning activities and whether formal consultation will be required to address the impacts. Each State should also be consulted about its own procedure for considering impacts to State-listed species.

Executive Order 12898 (59 FR 7629), dated February 16, 1994, directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). Although the NRC is an independent agency, the Commission has committed to undertake environmental justice reviews. Subsequent to the submittal of the PSDAR, the NRC staff will consider the impacts related to environmental justice from decommissioning activities.

Four issues were determined to be, depending on the circumstances, either generic or site-specific: land use, aquatic ecology, terrestrial ecology, and cultural and historic resources. Impacts resulting from onsite land use, impacts to aquatic and terrestrial resources resulting from activities occurring within the facility's operational areas, and impacts to cultural or historic resources resulting from activities within the facility operational area were determined to be generic and SMALL.

Table 6-1. Summary of the Environmental Impacts from Decommissioning Nuclear Power Facilities

Issue	Generic	Impact
Onsite/Offsite Land Use		
- Onsite land use activities	Yes	SMALL
- Offsite land use activities	No	Site-specific
Water Use	Yes	SMALL
Water Quality		
- Surface water	Yes	SMALL
- Groundwater	Yes	SMALL
Air Quality	Yes	SMALL
Aquatic Ecology		
- Activities within the operational area	Yes	SMALL
- Activities beyond the operational area	No	Site-specific
Terrestrial Ecology		
- Activities within the operational area	Yes	SMALL
- Activities beyond the operational area	No	Site-specific
Threatened and Endangered Species	No	Site-specific
Radiological		
- Activities resulting in occupational dose to workers	Yes	SMALL
- Activities resulting in dose to the public	Yes	SMALL
Radiological Accidents	Yes	SMALL
Occupational Issues	Yes	SMALL
Cost	NA[(a)]	NA
Socioeconomic	Yes	SMALL
Environmental Justice	No	Site-specific
Cultural and Historic Resource Impacts		
- Activities within the operational areas	Yes	SMALL
- Activities beyond the operational areas	No	Site-specific
Aesthetics	Yes	SMALL
Noise	Yes	SMALL
Transportation	Yes	SMALL
Irretrievable Resources	Yes	SMALL

(a) A decommissioning cost assessment is not a specific National Environmental Policy Act (NEPA) requirement. However, an accurate decommissioning cost estimate is necessary for a safe and timely plant decommissioning. Therefore, this Supplement includes a decommissioning cost evaluation, but the cost is not evaluated using the environmental significance levels nor identified as a generic or site-specific issue.

Impacts resulting from offsite land use to support decommissioning activities, impacts to aquatic and terrestrial resources resulting from activities occurring outside the facility's operational areas, and impacts to cultural, historic or archeological resources resulting from activities beyond the operational areas cannot be evaluated generically and would require a site-specific analysis before undertaking the activity. These are termed conditionally site-specific.

Before a licensee conducts any decommissioning activity that might result in the disturbance of historic properties or archeological resources outside the site operational area, the NRC will, in accordance with the National Historic Preservation Act of 1966, as amended (16 USC 470 et seq.), consult with the appropriate State (or Tribal) Historic Preservation Officer to evaluate potential impacts.

The issue of cost was addressed in this Supplement but was not evaluated.

The staff also determined that the issue of long-term radiological aspects of Rubblization or onsite disposal of slightly contaminated material could not be evaluated generically and would require a site-specific analysis. The site-specific analysis would be conducted at the time the license termination plan (LTP) for the site is submitted.

For the 19 reactors listed in Table F-1 that have permanently ceased operation during the period 1963 through 1997, the staff has determined that no issue or activity must be re-evaluated immediately, provided that the licensee does not change the decommissioning option previously chosen. The NRC staff conducted a detailed environmental review on a number of these facilities prior to 1996 as part of the decommissioning plan review. Licensees for several of these reactors have submitted LTPs for NRC review and approval, and the staff has evaluated or is evaluating site-specific environmental impacts as part of that review. Therefore, for many of the 19 facilities, a site-specific assessment has been performed. Because decommissioning is substantially underway at all 19 reactors, the impacts for the issue of environmental justice have already occurred and an evaluation at the present time would provide little value and opportunity for mitigation. Impacts on threatened and endangered species are considered on an ongoing basis and the issuance of this Supplement would not accelerate a review of the issue solely because the issue is one that cannot be evaluated generically. The staff will continue to conduct site-specific consultations with the appropriate resource agency, as the need arises.

Therefore, the NRC has determined that it is not necessary at this time to conduct an evaluation of the environmental justice or impacts on threatened and endangered species at the 19 permanently shutdown reactors listed in Table F-1. However, should a licensee choose a different decommissioning option from its current choice (e.g., SAFSTOR rather than DECON),

then the site-specific issues would need to be considered prior to undertaking a decommissioning activity not previously evaluated.

For the 19 facilities listed in Table F-1 that have initiated decommissioning, as well as for any facilities that permanently cease operation in the future, any planned decommissioning activity would require a site-specific analysis prior to undertaking the proposed activity (see Section 1.5) if the activity:

- results in an impact outside the range of impacts postulated by this Supplement or
- raises environmental issues that were not considered in this Supplement or
- involves an issue determined to be site specific or conditionally site-specific as described above in this Supplement or
- involves a combination of the above.

6.2 Conclusions

A licensee undergoing or planning decommissioning of a nuclear reactor facility may use this Supplement in its evaluation of the environmental consequences from decommissioning activities. The impacts identified in this Supplement are designed to span the range of impacts for all commercial power reactor facilities that have permanently shut down as well as for the reactor facilities that are currently operating, including the facilities that have, or may, renew their operating license beyond the original 40-year license.

For those issues that have been determined to be generic, licensees may proceed with the decommissioning activity without further analysis provided that the impacts resulting from those activities fall within the range of impacts as described in Chapter 4. However, if the impacts of an activity fall outside the range predicted in Chapter 4, or if the activity results in impacts to environmental issues not considered in this Supplement, or if the impact involves an environmental issue determined to be conditionally site-specific as defined above, then the activity cannot be performed until a further site-specific analysis is completed along with a license-amendment request and NRC has approved the license amendment (the license-amendment request will provide an opportunity for a public hearing).

6.3 References

Endangered Species Act of 1973, as amended, 16 USC 1531 et seq.

Executive Order 12898. 1994. "Environmental Effects of Federal Programs on Minority and Low-Income Populations." 59 FR 7629, February 16, 1994.

National Environmental Policy Act (NEPA) of 1969, as amended, 42 USC 4321 et seq.

National Historic Preservation of 1966, as amended, 16 USC 470 et seq.

Appendix A

Appendixes A and B have been moved and redesignated as Appendixes N and O. All comments and responses, whether written or oral, are now contained in Appendixes N, O, and P, which comprise Volume 2 of this Supplement.

Appendix B

Appendixes A and B have been moved and redesignated as Appendixes N and O. All comments and responses, whether written or oral, are now contained in Appendixes N, O, and P, which comprise Volume 2 of this Supplement.

Appendix C

Contributors

Appendix C

Contributors

The overall responsibility for the preparation of this Supplement to the Generic Environmental Impact Statement (GEIS) on Decommissioning was assigned to the Office of Nuclear Reactor Regulation (NRR), U.S. Nuclear Regulatory Commission (NRC). This Supplement was prepared by members of the NRR with assistance from other NRC organizations and the Pacific Northwest National Laboratory.

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Appendix D

Further Discussion of Out-of-Scope Activities

Appendix D

Further Discussion of Out-of-Scope Activities

Various activities that are performed during decommissioning may seem intuitively to be part of the decommissioning process. However, they are not considered within the scope of this Supplement because these activities have already received an environmental review during the promulgation of the U.S. Nuclear Regulatory Commission (NRC) regulations governing such activities. They are reviewed and regulated by the NRC under other regulations. These activities include the following:

- Independent Spent Fuel Storage Installation (ISFSI): construction/maintenance/ decommissioning: An ISFSI is a facility designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage. The ISFSI may be located at the same site as the nuclear power facility or at another location. ISFSIs are used by operating plants that require increased spent fuel storage capacity because their spent fuel pools have reached their capacity and the U.S. Department of Energy (DOE) facility for disposing of spent fuel and high-level nuclear waste is not yet available. Decommissioning facilities may use ISFSIs as an alternative to leaving the fuel in the spent fuel pool while waiting for DOE to take ownership of the spent fuel. Licensees that remove the spent fuel from their pools and place it in an ISFSI can then complete the decommissioning process on the power-generation facilities and subsequently terminate the facility license. In some instances, the license for the nuclear power reactor can be terminated while the ISFSI, which has a separate license and is located on the facility site, would continue to be regulated by the NRC.

  An ISFSI can be operated either under the same license that is used for the operating or decommissioning facility (called a “Part 50 license,” referring to 10 CFR Part 50), or under a site-specific license (called a “Part 72 license,” referring to 10 CFR Part 72). Regulations for the licensing and operation of an ISFSI, including quality assurance and quality control requirements, are found in 10 CFR Part 72. If a licensee chose to operate the ISFSI under a Part 50 license, they could, by way of a license-amendment request, change the ISFSI to a Part 72 license, thus allowing termination of the Part 50 license at the end of the reactor facility decommissioning process.

The decommissioning of the ISFSI is also handled separately from the decommissioning of the nuclear power facility. The 1988 Generic Environmental Impact Statement (GEIS) (NRC 1988) contained a section on decommissioning of ISFSIs, which is not updated in this Supplement.

- Spent fuel storage and maintenance: The Commission has independently, in a separate proceeding, the "Waste Confidence Proceeding," made a finding that there is:

  > reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised license) of that reactor at its spent fuel storage basin, or at either onsite or offsite independent spent fuel storage installations. (54 FR 39767)

  The Commission has committed to review this finding at least every 10 years. In its most recent review, the Commission concluded that experience and developments since 1990 were not such that a comprehensive review of the Waste Confidence Decision was necessary at that time (64 FR 68005). Accordingly, the Commission reaffirmed its finding of insignificant environmental impacts cited above. This finding is codified in the Commission's regulations at 10 CFR 51.23(a). The operation of a spent fuel pool or an ISFSI is not uniquely linked to decommissioning. All operating nuclear power facilities have spent fuel pools and some (with the number anticipated to increase) have ISFSIs generally located adjacent or near to the power reactor facility.

- Spent fuel transport and disposal away from the reactor location: The temporary storage or future permanent disposal of spent fuel at a site other than the reactor site is not within the scope of this Supplement. Licensees are prohibited from shipping spent fuel from one reactor's spent fuel pool to another's without NRC approval. Amendment of one or both of the facilities' licenses would be required before fuel transfer.

  Transportation of spent fuel and other high-level nuclear wastes is governed by regulations in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material." Disposal of spent fuel and high-level wastes (HLW) are governed by the Nuclear Waste Policy Act (NWPA) of 1982, as amended, which defined the goals and structure of a program for permanent, deep geologic repositories for the disposal of high-level radioactive waste and non-reprocessed spent fuel. Under this Act, the DOE is responsible for developing permanent disposal capacity for spent fuel and other high-level nuclear wastes. On July 9, 2002, the U.S. Congress approved Yucca Mountain as the first long-term geologic repository for spent nuclear fuel and high-level radioactive waste. A HLW repository will be built and operated by DOE and licensed by the NRC. Title 10 CFR Part 61 contains rules

governing the licensing to receive and possess source, special nuclear, and by-product material at a geological repository operations area that is sited, constructed, or operated in accordance with the NWPA (1982). However, the Commission proposes to supersede the generic criteria in Part 60 for disposal at a waste repository with specific criteria in a new 10 CFR Part 63 issued on February 22, 1999 (64 FR 8640).

- Interim storage of Greater-than-Class-C (GTCC) Waste: The NRC regulations at 10 CFR 61.55 define three classes of low-level waste (LLW) (A, B, and C) that are suitable for near-surface disposal. Class C waste is required to meet the most rigorous disposal requirements. The LLW that exceeds the concentration limits set for Class C waste is referred to as GTCC waste. Typically, GTCC waste is composed of activated metal components and process wastes.

  On October 11, 2001 the NRC amended its regulations (in 66 FR 51823), to permit interim storage of GTCC waste used or generated by commercial power reactors within an ISFSI or monitored retrievable storage (MRS) facility. This change permits the co-locating of spent fuel and solid reactor-related GTCC waste in different casks and containers within the ISFSI or MRS. Commingling of spent fuel and GTCC waste in the same storage cask is not permitted, except on a case-by-case basis. Ultimately, GTCC waste must be disposed of in a geologic repository.

- LLW disposal at a licensed LLW site or treatment of LLW at compactor facilities: The disposal of LLW is not within the scope of this Supplement. LLW is defined as any radioactive waste that is not classified as HLW, spent nuclear fuel, transuranic waste,[(a)] or uranium or thorium mill tailings. LLW often contains small amounts of radioactivity dispersed in large amounts of material, but may also have activity levels requiring shielding and remote handling. LLW that is generated during decommissioning is usually composed of the following material contaminated with radionuclides: rags, papers, filters, solidified liquids, ion-exchange resins, tools, equipment, discarded protective clothing, dirt, construction rubble, concrete, and piping.

  Regulations related to LLW disposal are in 10 CFR Part 61 and 10 CFR Part 20, Subpart K. A final GEIS supporting the regulations in 10 CFR Part 61, was published in 1982 as “Final Generic Environmental Impact Statement for 10 CFR Part 61," NUREG-0945 (NRC 1982). A license for the LLW disposal site is not issued until the applicant provides an environmental report (ER) indicating that the applicant’s proposed disposal site, design,

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(a) Transuranic waste contains man-made elements heavier than uranium that decay by emitting alpha particles. Such waste is produced during reactor fuel assembly, weapons fabrication, and chemical processing operations.

operations, site closure, and post-closure institutional controls are adequate to protect public health and safety. The licensee for the LLW site must show that there is reasonable assurance that (1) the general population will be protected from releases of radioactivity, (2) that individual inadvertent intruders are protected, (3) that standards for radiation protection in 10 CFR Part 20 are met, and (4) that the long-term stability of the disposed waste and the disposal site will be achieved and will eliminate, to the extent practical, the need for ongoing active maintenance of the disposal site following closure. The ER will be reviewed by the NRC and the impacts of LLW disposal evaluated in an Environmental Impact Statement (EIS) that is written for the specific LLW site. The technical requirements for land-disposal facilities are covered in Subpart D of 10 CFR Part 61. The financial assurance requirements are covered in Subpart E of 10 CFR Part 61.

- Activities related to the ENTOMBMENT Period:

  On October 16, 2001, the Commission issued an advance notice of proposed rulemaking (ANPR) inviting input from stakeholders on “Entombment options for Power Reactors” (66 FR 52551). Consistent with the environmental evaluation of the DECON and SAFSTOR decommissioning options, the staff has limited its environmental evaluation of ENTOMB to those issues related to activities necessary to prepare the facility for entombment.

  Issues and resulting impacts related to the ENTOMB option after the facility begins entombment, such as NRC oversight and monitoring requirements, durability of institutional controls and engineered barriers, indefinite retention onsite of radioactive materials, and other long-term site-specific issues are outside the scope of this Supplement.

  A future environmental assessment in support of NRC rulemaking related to the entombment options may address these issues depending on the proposed changes to the regulations.

- Activities following license termination under restricted use conditions: Licensees are allowed by regulations in 10 CFR Part 20, Subpart E, “Radiological Criteria for License Termination,” to release the site for restricted use. The impacts following a restricted release license termination will not be considered by this Supplement because the licensee is required to conduct a site-specific analysis to support development of an NRC site-specific EIS.

- Activities and impacts from living or working on the site after license termination: Analysis of radiological impacts from unrestricted use after decommissioning and license termination are presented in NUREG-1496, *Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities* (NRC 1997). This GEIS analyzed regulatory

alternatives for establishing radiological criteria for decommissioning structures and lands of licensed facilities. The scope included both radiological and nonradiological impacts on human health and safety, including radiation exposure resulting from occupancy of site buildings and residence on site lands following decommissioning and license termination.

D.1 References

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic licensing of production and initialization facilities."

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR 61. Code of Federal Regulations, Title 10, *Energy*, Part 61, "Licensing requirements for land disposal of radioactive waste."

10 CFR 63. Code of Federal Regulations, Title 10, *Energy*, Part 63, "Disposal of high-level radioactive wastes in a geologic repository at Yucca Mountain, Nevada."

10 CFR 71. Code of Federal Regulations, Title 10, *Energy*, Part 71, "Packaging and transportation of radioactive material."

10 CFR 72. Code of Federal Regulations, Title 10, *Energy*, Part 72, "Licensing requirements for the independent storage of spent nuclear fuel and high-level radioactive waste."

54 FR 39767. "10 CFR Part 51 Waste Confidence Decision Review." *Federal Register*. September 28, 1989.

64 FR 8640. "10 CFR Parts 2, 19, 20, 21, 30, 40, 51, 60, 61, and 63 Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada." *Federal Register*. February 22, 1999.

64 FR 68005. "Waste Confidence Decision Review." *Federal Register*. December 6, 1999.

66 FR 51823. "Interim Storage for Greater Than Class C Waste 10 CFR Parts 30, 70, 72, and 150." *Federal Register*. October 11, 2001.

66 FR 52551. "Entombment Options for Power Reactors." *Federal Register*. October 16, 2001.

Nuclear Waste Policy Act of 1982, as amended, 42 USC 10.101 et seq.

U.S. Nuclear Regulatory Commission (NRC). 1982. *Final Generic Environmental Impact Statement for 10 CFR Part 61*. NUREG-0945, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997. *Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities*. NUREG-1496, Vol. 1, NRC, Washington, D.C.

Appendix E

Evaluation Process for Identifying the Environmental Impacts of Decommissioning Activities

Appendix E

Evaluation Process for Identifying the Environmental Impacts of Decommissioning Activities

This appendix describes the process that the staff used to determine the environmental impacts from decommissioning nuclear power facilities. Figure E-1 is a flowchart showing the evaluation process. The staff first created an initial list of environmental issues and decommissioning activities that this Supplement should address (Table E-1). The initial list of environmental issues was developed from the issues identified in the 1988 GEIS and the list specified in 10 CFR Part 51, Subpart A, Appendix B, for license renewal. The initial list of decommissioning activities was based on experience and the literature discussed in Section 3.2 of this Supplement. The staff used these initial lists of environmental issues and decommissioning activities for discussions during the scoping process (Section 1.3). At the conclusion of the scoping process and after conducting visits to six sites, the staff refined these two lists, based on comments from the public, the industry, the specific sites visited, the States, and other Federal agencies. During the scoping process, the staff visited the sites listed in Table E-2 and gathered information about the sites' decommissioning experiences. The sites were chosen to represent a variety of types of sites in various stages of decommissioning.

The staff designed a two-tier matrix system to document the evaluation process. In the Tier 1 (Table E-3) matrix, the environmental issues are listed on the horizontal axis and the decommissioning activities are listed on the vertical axis. Each activity in the list is grouped into broad categories designed to include a variety of specific activities. The list of activities is comprehensive and includes new technologies that were considered in this Supplement. Other innovative decommissioning options or activities not included in this document are expected to be developed by licensees in the future. Such options or activities do not fall under the conclusions of this Supplement and would need to be analyzed on a site-specific basis.

After compiling the environmental issue and decommissioning activity lists, the staff assessed which activities might have environmental impacts for each of the issues. The Tier 1 matrix (Table E-3) also shows the result of this evaluation. The Tier 1 matrix identifies impacts that occur for issues related to specific activities during the decommissioning process. In developing the Tier 1 matrix, the staff resolved whether the issue applies to the activity and whether there were potential environmental impacts. If the answer was "yes," the impacts in the matrix were marked with an "X" to designate the need for an analysis in the Supplement. For example, the transfer of the fuel from the reactor vessel to the spent fuel pool (an activity that occurs inside

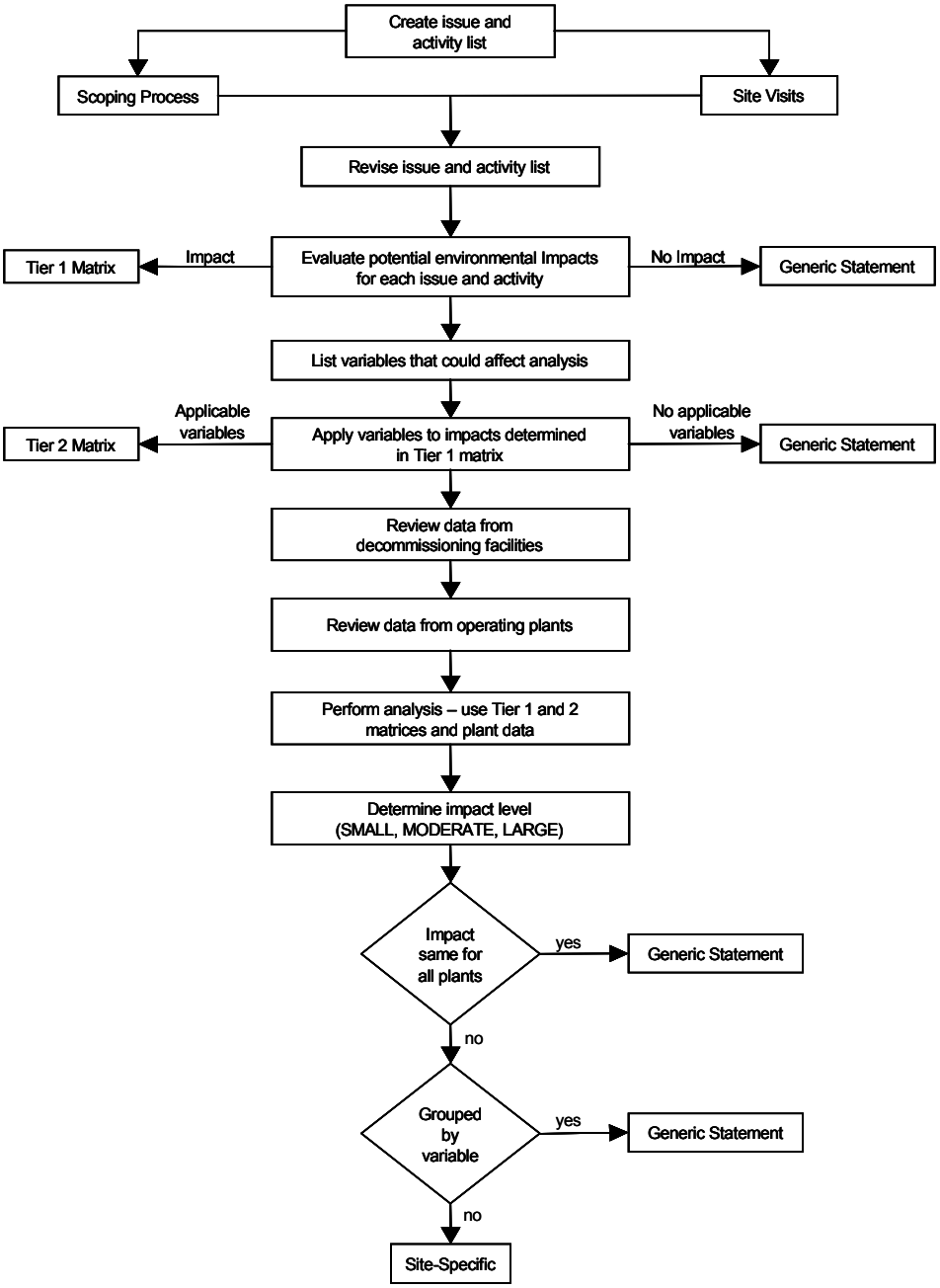

Figure E-1. Environmental Impact Evaluation Process

Table E-1. First- and Second-Tier Matrices Issues and Activities

Issues
Onsite/offsite land use
Water use
Water quality
Air quality
Aquatic ecology
Terrestrial ecology
Threatened and Endangered Species
Radiological
Radiological accidents
Occupational issues
Cost
Socioeconomics
Environmental justice
Cultural impacts
Aesthetic issues
Noise

Activities
Remove fuel
Organizational changes
Stabilization
Post-shutdown surveys
Create nuclear island
Chemical decontamination of primary loop
Large component removal
Storage preparation activities for SAFSTOR
Storage (SAFSTOR)
Decontamination and Dismantlement phases of DECON, SAFSTOR, and ENTOMB1
System dismantlement
Structure dismantlement
Entombment
Low-level waste packaging and storage
Transportation
License termination activities

Table E-2. Site Visits

Nuclear Plant	Description	Plant Type	Thermal Power	Decommissioning Method
Big Rock Point	Single nuclear unit	BWR[(a)]	240 MW	DECON
Humboldt Bay, Unit 3	Single nuclear plant at multi-unit fossil fuel facility	BWR	200 MW	SAFSTOR
Maine Yankee	Single nuclear unit	PWR[(b)]	2700 MW	DECON
Rancho Seco	Single nuclear unit	PWR	2772 MW	SAFSTOR
Trojan	Single nuclear unit	PWR	3411 MW	DECON
Zion, Units 1 and 2	Multiple nuclear units	PWR	3250 MW	SAFSTOR

(a) boiling water reactor.
(b) pressurized water reactor.

the facility) would not result in aesthetic or noise issues. On the other hand, this activity would result in a radiation dose to the workers (radiological) and could potentially cause a radiological accident. In some cases, correlation between the activity and the issue was not evident. In these cases, the matrix was marked conservatively to ensure further analysis of the impact. This is the case with the issues of water use for the activity of transferring fuel to the spent fuel pool. The water that is used in this process is very small compared to the amount of water used to cool the reactor during operations. However, the matrix was marked to ensure that the water-use issue was addressed completely in this Supplement.

Typically, environmental impact statements would consider transportation as an issue and not as an activity. However, the staff determined that in the case of decommissioning nuclear power reactors, transportation is an activity, not an issue. Because there are several transportation-based impacts related to decommissioning nuclear power facilities, transportation was addressed in its own section (4.3.17) in this Supplement.

After completing the Tier 1 matrix, the next step was to identify the variables that might affect the environmental impact for a specific issue. These variables include some of the obvious differences between reactor facilities, such as whether the facility is a pressurized water reactor, boiling water reactor, or other type of reactor, whether it is a multi-unit site and what type of cooling system is used. The staff also considered variables that would impact a licensee's decision concerning types of activities or how an activity would be conducted. For example, the proximity of the facility to a barge slip or railroad might affect a licensee's decision to remove the steam generator or other large components intact and ship them to a waste site. If the barge slip needs additional dredging or an additional railroad line needs to be installed, then the environmental impacts may change. Table E-4 lists the variables, their abbreviations as they appear in the Tier 2 matrix (Table E-5), and the characteristics, if appropriate, for each variable.

The staff then considered each of the impact areas identified in the Tier 1 matrix, and determined if the variables influenced the environmental impacts. If no change would occur, then the "X" in the box was retained to signify that the variables do not change the analysis. If a change would occur, then the staff needs a second determination as to which variables could significantly change the impact. Variables that could significantly change the impact were listed by their abbreviation in the appropriate box in the matrix (see Table E-3 for the abbreviations). By resolving these questions, the staff developed the Tier 2 matrix shown in Table E-5. The staff used the Tier 2 matrix as the starting point for the analysis of the environmental impacts of the decommissioning activities for each of the applicable issues and variables.

The analyses that are presented in the following sections were based on the information in the Tier 2 matrix. The data used in the analyses was obtained from several sources:

- documents such as post-shutdown decommissioning activity reports, final environmental statements, environmental reports, and license termination plans for permanently shutdown and decommissioning facilities

- site visits

- information gathered from permanently shutdown and decommissioning facilities with the assistance of the Nuclear Energy Institute

- currently operating facilities (primarily from NUREG-1437 [NRC 1996]).

The analyses in this Supplement include data from both operating and decommissioning facilities in order to appropriately span the range of impacts so that future decommissioning facilities could consider using this Supplement. The data from the decommissioning facilities was used to determine whether an activity and associated issue could be considered generic. The reason for including the operating facilities is that they will eventually decommission. Also, many of the plants that have decommissioned were the smaller, older facilities.

E.1 References

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, “Environmental protection regulations for domestic licensing and related regulatory functions.”

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, NRC, Washington, D.C.

Table E-3. Tier 1 Matrix - Decommissioning Activities and Issues

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Radiological Accidents	Occupational	Cost	Socioeconomic	Environmental Justice	Cultural Impacts	Aesthetic issues	Noise	Irretrievable Resources
1. Remove Fuel																	
- Transfer fuel to spent fuel pool		X	X					X	X	X							
- Drain primary system			X					X	X	X	X						
- Process liquid			X					X	X	X	X						
2. Organizational Changes																	
- Reduce staff		X						X			X	X	X				
- Employ contractor or other additional staff		X		X				X			X	X	X				
- Adjust site training								X	X	X	X						
- Changes to licensing basis - site-specific											X						
3. Stabilization																	
- Drain and flush system			X	X				X	X	X	X						
- Isolate systems, structures, and components that are no longer required				X				X		X	X						
- Rewiring of site to eliminate unneeded electrical circuits						X	X	X		X	X			X			
4. Post-Shutdown Surveys																	
- Baseline surveys for the decontamination work								X			X						
- Continual surveys								X			X						
5. Create Nuclear Island																	
- Install electrical power supply to spent fuel pool								X		X	X						
- Reduce the security area to just that around the fuel											X						
- Change security function											X						

"X" indicates where there may be am impact from decommissioning activities.

Table E-3. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Radiological Accidents	Occupational	Cost	Socioeconomic	Environmental Justice	Cultural Impacts	Aesthetic issues	Noise	Irretrievable Resources
- Install or modify chemistry controls										X							
- Move old or install new security-related equipment								X		X	X						
6. Chemical Decontamination of primary loop																	
- Cutting, chemicals in, chemicals out, cleanup/decon								X	X	X	X						
7. Large Component Removal																	
- Remove reactor vessel and internals intact or cut up	X	X				X	X	X	X	X	X			X			
- Steam generator and other large components removed intact or cut up	X					X	X	X	X	X	X			X			
8. Storage Preparation Activities for SAFSTOR																	
- Establish a reactor coolant system vent pathway				X				X		X	X						
- Establish containment vent pathway				X				X		X	X						
- De-energize systems, put in monitors where they are needed								X		X	X						
- Perform a radiological assessment								X			X						
9. Storage (SAFSTOR)																	
- Monitor systems and radiation levels etc.								X			X						
- Do preventive and corrective maintenance on SSCs								X		X	X						
- Maintain the security system											X						

"X" indicates where there may be an impact from decommissioning activities.

Table E-3. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Radiological Accidents	Occupational	Cost	Socioeconomic	Environmental Justice	Cultural Impacts	Aesthetic issues	Noise	Irretrievable Resources
- Maintain effluent and environmental monitoring programs				X							X						
10. Decontamination and Dismantlement phases of DECON, SAFSTOR, and ENTOMB 1																	
- Chemical decontamination (surface/specific components)								X	X	X	X						
- Decontamination of piping inside walls								X	X	X	X						
- High-pressure water sprays of surface		X	X					X	X	X	X						
- Remove contaminated soil from specific areas						X	X	X		X	X			X			
- Do preventive and corrective maintenance on SSCs								X		X	X						
- Maintain the security system											X						
- Maintain effluent and environmental monitoring programs				X							X						
11. System Dismantlement																	
- Cut out radioactive piping								X	X	X	X						X
- Remove large and small tanks or other radioactive components from the facility								X	X	X	X						X
12. Structure Dismantlement																	
- Rubblization	X	X	X	X				X		X	X				X	X	X
- Remove structures that were necessary for plant operation	X	X		X	X	X	X	X	X	X	X				X	X	X

"X" indicates where there may be an impact from decommissioning activities.

Table E-3. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Radiological Accidents	Occupational	Cost	Socioeconomic	Environmental Justice	Cultural Impacts	Aesthetic issues	Noise	Irretrievable Resources
13. Entombment																	
- Install engineered barriers				X				X		X	X				X	X	
- Disconnect operational systems (e.g. electrical and fire protection)								X		X	X						
- Remove all radioactive material that is outside of containment								X		X	X					X	
- Place material inside containment								X		X	X						
- Lower containment ceiling (optional)		X		X				X	X	X	X						
- Entomb facility in concrete		X		X						X	X				X	X	
14. LLW packaging and storage	X							X	X	X	X						X
15. Transportation																	
- Large components				X				X	X	X	X		X				X
- LLW				X				X	X	X	X		X				X
- Equipment into site				X							X						
- Backfill trucked into site				X							X						X
- Nonradioactive waste				X							X						X
16. License Termination Activities																	
- Complete final radiation survey								X		X	X						
- Partial site release								X			X						

"X" indicates where there may be an impact from decommissioning activities.

Table E-4. Tier 2 Matrix Variables

Variable Abbreviation	Variable	Variable Characteristics
Type	Type of plant	PWR, BWR, HTGR, FBR
Size	Size of plant	Based on the facility thermal power capability
Loc	Population characteristics	Rural, urban
Env	Environmental features	Coastal, desert, lake, river shoreline, other
Cool Sys	Cooling system type	Closed cycle, once-through cooling
Cool	Cooling water source	Reservoir, lake, river or creek, ocean, canal, bay, pond, canal, sewage treatment plant
Grdwater	Groundwater usage/proximity to groundwater	
Fuel Loc	Fuel location - as a function of time	Spent fuel pool, ISFSI, away from reactor
Ops	Off-normal radiological operational events	Failed or leaking fuel, contaminated soil
Interim Time	Time between last shutdown and initiation of decommissioning	
Decom Opt	Decommissioning option	SAFSTOR, DECON, ENTOMB
Store Time	Duration of storage period for plants in deferred DECON/SAFSTOR	
Struct	Disposition of structures during decommissioning	Remain onsite, sent to a LLW site or vendor, entombed, landfill, rubblized
LLW	Distance traveled for disposal of LLW	
Gas Emissions	Method used to control gaseous radioactive effluents	
Land Mass	Land mass (footprint) of the site	
Culture	Cultural resources	Known/unknown, present/absent
Multi-Unit	Single unit versus multi-unit sites with other operating units	
Trans Prox	Proximity of barge/train transportation	

Table E-5. Tier 2 Matrix - Decommissioning Activities, Issues, and Variables

Activities	Issues																
	Onsite/Offsite Land Use	**Water Use**	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occupational Issues	Cost	Socioeconomic	Environmental Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
1. Remove fuel																	
Transfer fuel to spent fuel pool		X	X					Ops; Interim Time	Ops; Interim Time	X							
Drain primary system			X					Ops; Interim Time; Decom Opt; Store Time	Ops; Interim Time; Decom Opt; Store Time	X	Interim Time; Decom Opt; Store Time						
Process liquid			X					Ops; Interim Time	Ops; Interim Time	X	Type; Size						
2. Organizational changes																	
Reduce staff		X						Type; Size			Type; Size; Decom Opt; Store Time	Size; Loc; Multi-Unit	Size; Loc; Multi-Unit				
Employ contractor or other additional staff		X		Size Loc; Decom Opt				Type; Size; Decom Opt; Store Time			Type; Size; Decom Opt; Store Time	Type; Size; Loc; Multi-Unit	Type; Size; Loc; Multi-Unit				

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
Adjust site training								Type; Size; Decom Opt; Store Time	X	X	Type; Size; Decom Opt; Store Time						
Changes to licensing basis - site-specific											Type; Size; Decom Opt; Store Time						
3. Stabilization																	
Drain and flush system			X	X				Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time						
"X" indicates that none of the variables change the analysis.																	

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
Isolate systems, structures, and components that are no longer required				X				Type; Size; Ops; Interim Time; Decom Opt; Store Time		Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time						
Rewiring of site to eliminate unneeded electrical circuits						Loc; Env; Land Mass	Loc; Env; Land Mass	Type; Size; Ops; Interim Time; Decom Opt; Store Time		Type; Size; Decom Opt	Type; Size; Ops; Interim Time; Decom Opt; Store Time			Loc; Land Mass			

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
4. Post-shutdown surveys																	
Baseline surveys for the decontamination work								Type; Size; Ops; Interim Time; Decom Opt; Land Mass			Type; Size; Ops; Interim Time; Decom Opt; Land Mass						
Continual surveys								Type; Size; Ops; Interim Time; Decom Opt; Store Time; Land Mass			Type; Size; Ops; Interim Time; Decom Opt; Land Mass						
5. Create nuclear island																	
Install electrical power supply to spent fuel pool								Ops; Interim Time		Size	X						
Reduce the security area to just that around the fuel											X						

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
Change security function											X						
Install or modify chemistry controls										Size							
Move old or install new security-related equipment								Ops; Interim Time		Size; Land Mass	X						
6. Chemical decontamination of primary loop																	
Cutting, chemicals in, chemicals out, cleanup/ decontamination								Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Decom Opt	Type; Size; Ops; Interim Time; Decom Opt; Store Time						

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
7. Large component removal																	
Remove reactor vessel and internals intact or cut up	Env; Land Mass	X				Trans Prox	Trans Prox	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Decom Opt	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Trans Prox			Trans Prox			
Steam generator and other large components removed intact or cut up	Env; Land Mass					Trans Prox	Trans Prox	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Decom Opt	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Trans Prox			Trans Prox			

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
8. Storage preparation activities for SAFSTOR																	
Establish a reactor coolant system vent pathway				Gas Emissions				Type; Size; Ops; Interim Time; Store Time		Type; Size; Ops; Interim Time; Store Time	Type; Size; Ops; Interim Time; Store Time						
Establish containment vent pathway				Gas Emissions				Type; Size; Ops; Interim Time; Store Time		Type; Size; Ops; Interim Time; Store Time	Type; Size; Ops; Interim Time; Store Time						
De-energize systems, put in monitors where they are needed								Type; Size; Ops; Interim Time; Store Time		Type; Size	Type; Size; Ops; Interim Time; Store Time						

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

	Issues																
Activities	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
Perform a radiological asessment								Type; Size; Ops; Interim Time; Store Time			Type; Size; Ops; Interim Time; Store Time						
9. Storage (SAFSTOR)																	
Monitor systems and radiation levels, etc.								Type; Size; Interim Time; Store Time		Type; Size; Store Time	Type; Size; Store Time						
Do preventive and corrective maintenance on SSCs								Type; Size; Interim Time; Store Time			Type; Size; Store Time						
Maintain the security system											Store Time; Multi-Unit						

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
Maintain effluent and environmental monitoring programs				Gas Emissions							Store Time; Multi-Unit						
10. Decontamination and Dismantlement phases of DECON, SAFSTOR, and ENTOMB1																	
Chemical decontamination (surface/specific components)								Type; Size; Ops; Interim Time; Store Time	Type; Size; Ops; Interim Time; Store Time	Type; Size	Type; Size; Ops; Interim Time; Store Time						
Decontamination of piping inside walls								Type; Size; Ops; Interim Time; Store Time	Type; Size; Ops; Interim Time; Store Time	Type; Size	Type; Size; Ops; Interim Time; Store Time						
High-pressure water sprays of surface		X	X					Type; Size; Ops; Interim Time; Store Time	Type; Size; Ops; Interim Time; Store Time		Type; Size; Ops; Interim Time; Store Time						

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

	Issues																
Activities	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
Remove contaminated soil from specific areas						Loc; Env; Land Mass	Loc; Env; Land Mass	Type; Size; Ops; Interim Time; Store Time		Type; Size	Type; Size; Ops; Interim Time; Store Time			Loc; Land Mass			
Do preventive and corrective maintenance on SSCs								Type; Size; Ops; Interim Time; Store Time		Type; Size	Type; Size; Ops; Interim Time; Store Time						
Maintain the security system											Type; Multi-Unit						
Maintain effluent and environmental monitoring programs				Gas Emissions							Type; Multi-Unit						

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

	Issues																
Activities	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
11. System dismantlement																	
Cut out radioactive piping								Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct						
Remove large and small tanks or other radioactive components from the facility								Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct	Type; Size; Ops; Interim Time; Decom Opt; Store Time; Struct						

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

	Issues																
Activities	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
12. Structure Dismantlement																	
Rubblization	Size	Size	Grd-water	Size; Loc; Land Mass				Type; Size; Loc; Ops; Interim Time; Decom Opt; Store Time		X	Size				X	X	X
Remove structures that are necessary for plant operation	Size; Loc; Land Mass	Size; Struct		Type; Size; Struct	Size; Loc	Size; Loc	Size; Loc	Type; Size; Loc; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Loc; Ops; Interim Time; Decom Opt; Store Time	Size; Decom Opt; Land Mass	Type; Size; Loc; Ops; Interim Time; Decom Opt; Store Time				Size; Loc	Size; Loc	Size; Decom Opt

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
13. Entombment																	
Install engineered barriers				Size				Size		X	Size				X	X	
Disconnect operational systems (e.g., electrical and fire protection)								Size		X	Size						
Remove all radioactive material that is outside of containment								Type; Size		X	Type; Size					Type; Size; Land Mass	
Place material inside containment										X	Size						
Lower containment ceiling (optional)		X		Type; Size				Type; Size; Ops; Interim Time	Type; Size; Ops; Interim Time	X	Size						
ENTOMB facility in concrete		X		Type; Size				Type; Size; Ops; Interim Time		X	Size				X	X	

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

	Issues																
Activities	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
14. LLW packaging and storage and disposal	X							Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time	Type; Size; Ops; Interim Time; Decom Opt; Store Time						Type; Size; Ops; Interim Time; Decom Opt; Store Time
15. Transportation																	
Large components				Size; Loc; Env; Decom Opt				LLW; Trans Prox	LLW; Trans Prox	X	LLW; Trans Prox		LLW; Trans Prox				X
LLW				Trans Prox; Size; Loc; Env; Decom Opt; LLW				LLW	LLW	X	LLW		Size; Loc; Env				X

"X" indicates that none of the variables change the analysis.

Table E-5. (contd)

Activities	Issues																
	Onsite/Offsite Land Use	Water Use	Water Quality	Air Quality	Aquatic Ecology	Terrestrial Ecology	Threatened and Endangered Species	Radiological	Rad Accidents	Occ Issues	Cost	Socioeconomic	Env Justice	Cultural Impacts	Aesthetic Issues	Noise	Irretrievable Resources
Equipment into site				Decom Opt; Trans Prox							Trans Prox						
Backfill trucked into site				Size; Decom Opt							Size; Decom Opt; Land Mass; Trans Prox						X
Nonradioactive waste				Size; Loc; Env; Struct; Decom Opt; Trans Prox							Type; Size; Decom Opt						X

Table E-5. (contd)

16. License Termination Activities																	
Complete final radiation survey								X		X	Size; Type; Decom Opt; Land Mass						
Partial site release								X			Loc; Env; Struct; Land Mass; Culture						

"X" indicates that none of the variables change the analysis.

Appendix F

Summary Table of Permanently Shutdown and Currently Operating Commercial Nuclear Reactors

Table F-1. Permanently Shutdown Commercial Nuclear Plants

Nuclear Plant	Location	Reactor Type	Thermal Power	Decommissioning Option[a]	Total Site Area (ac)	Cooling System [b]	Cooling Water Source	Fuel Location	Operating License	Shutdown Date[c]
Reactors that are Currently in the Process of Decommissioning										
Big Rock Point	Michigan	BWR	240 MW	DECON	593	OT	Lake Michigan	Fuel in pool	05/01/1964	08/30/1997
Dresden, Unit 1	Illinois	BWR	700 MW	SAFSTOR	953+1274 cooling pond	Cooling lake and spray system	Kankakee River	Fuel in onsite ISFSI	09/28/1959	10/31/1978
Fermi, Unit 1	Michigan	FBR	200 MW	SAFSTOR	900[d]	OT	Lake Erie	No fuel onsite	05/01/1963	09/22/1972
GE-VBWR	California	BWR	50 MW	SAFSTOR	~1[e]	MDCI	Onsite cooling pond	No fuel onsite	05/14/1956	12/09/1963
Haddam Neck	Connecticut	PWR	1825 MW	DECON	524	OT	Connecticut River	Fuel in pool	12/27/1974	07/22/1996
Humboldt Bay, Unit 3	California	BWR	200 MW	SAFSTOR	143	OT	Humboldt Bay	Fuel in pool	08/28/1962	07/02/1976
Indian Point, Unit 1	New York	PWR	615 MW	SAFSTOR	239	OT	Hudson River	Fuel in pool	03/26/1962	10/31/1974
La Crosse	Wisconsin	BWR	165 MW	SAFSTOR	163[f]	FCDC	Mississippi River	Fuel in pool	07/03/1967	04/30/1987
Maine Yankee	Maine	PWR	2700 MW	DECON	820	OT	Montsweag Bay	Fuel in pool	06/29/1973	12/06/1996
Millstone, Unit 1	Connecticut	BWR	2011 MW	SAFSTOR	500	OT	Long Island Sound	Fuel in pool	10/07/1970	11/04/1995
Peach Bottom, Unit 1	Pennsylvania	HTGR	115 MW	SAFSTOR	620[g]	OT	NA	No fuel onsite	06/01/1967	10/31/1974

Table F-1. (contd)

Nuclear Plant	Location	Reactor Type	Thermal Power	Decommissioning Option[a]	Total Site Area (ac)	Cooling System[b]	Cooling Water Source	Fuel Location	Operating License	Shutdown Date[c]
Reactors that are Currently in the Process of Decommissioning (contd)										
Rancho Seco	California	PWR	2772 MW	SAFSTOR/ incremental decom	2480	NDCT	Folsom Canal	Fuel in onsite ISFSI/ DECON proposed in 1997	08/16/1974	06/07/1989
San Onofre, Unit 1	California	PWR	1347 MW	SAFSTOR	84	OT	Pacific Ocean	Fuel in pool	03/27/1967	11/30/1992
Saxton	Pennsylvania	PWR	28 MW	SAFSTOR	~1.1[h]	OT[i]	Juniata River	No fuel onsite/ currently in DECON	11/15/1961	05/01/1972
Three Mile Island, Unit 2	Pennsylvania	PWR	2772 MW	Accident cleanup followed by storage	472	NDCT	Susquehanna River	Approx 900 kg fuel onsite/ Post-Defueling Monitored Storage	02/08/1978	03/28/1979
Trojan	Oregon	PWR	3411 MW	DECON	635	NDCT	Columbia River	Fuel in pool	11/21/1975	11/09/1992
Yankee Rowe	Massachusetts	PWR	600 MW	DECON	1997	OT	Deerfield River	Fuel in pool[j]	12/24/1963	10/01/1991
Zion, Unit 1	Illinois	PWR	3250 MW	SAFSTOR	250	OT	Lake Michigan	Fuel in pool	10/19/1973	02/21/1997
Zion, Unit 2	Illinois	PWR	3250 MW	SAFSTOR	250	OT	Lake Michigan	Fuel in pool	11/14/1973	09/19/1996

Table F-1. (contd)

Nuclear Plant	Location	Reactor Type	Thermal Power	Decommissioning Option[a]	Total Site Area (ac)	Cooling System [b]	Cooling Water Source	Fuel Location	Operating License	Shutdown Date[c]
Reactors that have had their Licenses Terminated										
Fort St. Vrain	Colorado	HTGR	842 MW	DECON	2798	OT	NA	Fuel in ISFSI/ License terminated in 1997	12/01/1976	08/18/19891
Pathfinder	South Dakota	BWR	190 MW	SAFSTOR	1200	MDCT	Big Sioux River	No fuel onsite/ License terminated in 1992	01/01/1964	09/16/1967
Shoreham	New York	BWR	2436 MW	DECON	499	OT	Long Island Sound	No fuel onsite/ License terminated in 1995	06/01/1985	06/28/1989

(a) The option shown in the table for each plant is the option that has been officially provided to NRC. Plants in DECON may have had a short (1 to 4 yr) SAFSTOR period. Likewise, plants in SAFSTOR may have performed some DECON activities or may have transitioned from the storage phase into the decontamination and dismantlement phase of SAFSTOR.
(b) OT = once through; NDCT = natural draft cooling tower; FCDC = forced-circulation, direct cycle; MDCT - Mechanical Draft Cooling Tower; NA = not applicable.
(c) The shutdown date corresponds to the date of the last criticality.
(d) Originally licensed site area for Fermi, Unit 1. Currently, the facility occupies an area of less than 1.6 ha (4 ac) on the Fermi, Unit 2, site.
(e) The reactor building and associated structures occupy approximately 0.4 ha (1 ac) in the approximately 640 ha (1600 ac) Vallicitos Nuclear Center.
(f) The La Crosse site area is approximately 1.2 ha (3 ac) with the total utility-owned area being 66 ha (163 ac).
(g) Peach Bottom site area includes all units (1, 2, and 3).
(h) Originally licensed site area for the Saxton Plant was 0.4 ha (1.1 ac), wholly contained in a utility-owned property of approximately 61 ha (150 ac).
(i) Once-through cooling combined with a fossil steam electric generating facility also using spray pond during periods of high ambient temperatures.
(j) License is in process of transferring fuel to dry storage in onsite ISFSI.

Table F-2. Currently Operating Commercial Nuclear Plants

Nuclear Plant	Unit	Location	Reactor Type	Thermal Power[a]	Total Site Area, acres	Cooling System[b]	Cooling Water Source	Operating License	License Expiration[c]
Arkansas Nuclear One	1	Arkansas	PWR	2568 MW	1160	OT	Dardanelle Reservoir	05/21/1974	05/20/2034[d]
Arkansas Nuclear One	2	Arkansas	PWR	2815 MW	1160	NDCT	Dardanelle Reservoir	09/01/1978	07/17/2018
Beaver Valley	1	Pennsylvania	PWR	2652 MW	501	NDCT	Ohio River	07/02/1976	01/29/2016
Beaver Valley	2	Pennsylvania	PWR	2652 MW	501	NDCT	Ohio River	08/14/1987	05/27/2027
Braidwood	1	Illinois	PWR	3411 MW	4457	CCCP	Kankakee River	07/02/1987	10/17/2026
Braidwood	2	Illinois	PWR	3411 MW	4457	CCCP	Kankakee River	05/20/1988	12/18/2027
Browns Ferry	1	Alabama	BWR	3293 MW	840	OT with towers	Tennessee River	12/20/1973	12/20/2013
Browns Ferry	2	Alabama	BWR	3293 MW	840	OT with towers	Tennessee River	08/02/1974	06/28/2014
Browns Ferry	3	Alabama	BWR	3293 MW	840	OT with towers	Tennessee River	08/18/1976	07/02/2016
Brunswick	1	North Carolina	BWR	2558 MW	1210	OT	Cape Fear River	11/12/1976	09/08/2016
Brunswick	2	North Carolina	BWR	2436 MW	1210	OT	Cape Fear River	12/27/1974	12/27/2014
Byron	1	Illinois	PWR	3411 MW	1398	NDCT	Rock River	02/14/1985	10/31/2024
Byron	2	Illinois	PWR	3411 MW	1398	NDCT	Rock River	01/30/1987	11/06/2026
Callaway		Missouri	PWR	3565 MW	3188	NDCT	Missouri River	10/18/1984	10/18/2024
Calvert Cliffs	1	Maryland	PWR	2700 MW	1135	OT	Chesapeake Bay	07/31/1974	07/31/2034[d]
Calvert Cliffs	2	Maryland	PWR	2700 MW	1135	OT	Chesapeake Bay	11/30/1976	08/31/2036[d]
Catawba	1	South Carolina	PWR	3411 MW	391	MDCT	Lake Wylie	01/17/1985	12/06/2024
Catawba	2	South Carolina	PWR	3411 MW	391	MDCT	Lake Wylie	05/15/1986	02/24/2026
Clinton		Illinois	BWR	2894 MW	14090	OT	Salt Creek	04/17/1987	09/29/2026
Columbia Generating Station		Washington	BWR	3486 MW	DOE, Hanford Reservation	MDCT	Columbia River	04/13/1984	12/20/2023
Comanche Peak	1	Texas	PWR	3411 MW	7669	OT	Squaw Creek Reservoir	04/17/1990	02/08/2030
Comanche Peak	2	Texas	PWR	3411 MW	7669	OT	Squaw Creek Reservoir	04/06/1993	02/02/2033
Cooper		Nebraska	BWR	2381 MW	1090	OT	Missouri River	01/18/1974	01/18/2014
Crystal River	3	Florida	PWR	2544 MW	4738	OT	Gulf of Mexico	01/28/1977	12/03/2016
Davis Besse		Ohio	PWR	2772 MW	954	NDCT	Lake Erie	04/22/1977	04/22/2017
Diablo Canyon	1	California	PWR	3338 MW	741	OT	Pacific Ocean	11/02/1984	09/22/2021
Diablo Canyon	2	California	PWR	3411 MW	741	OT	Pacific Ocean	08/26/1985	04/26/2025
Donald C. Cook	1	Michigan	PWR	3250 MW	642	OT	Lake Michigan	10/25/1974	10/25/2014
Donald C. Cook	2	Michigan	PWR	3411 MW	642	OT	Lake Michigan	12/23/1977	12/23/2017
Dresden	2	Illinois	BWR	2527 MW	953+1274 Cooling pond	Cooling lake and spray canal	Kankakee	02/20/1991	01/10/2006
Dresden	3	Illinois	BWR	2527 MW	953+1274 Cooling pond	Cooling lake and spray canal	Kankakee	03/02/1971	01/12/2011
Edwin I Hatch	1	Georgia	BWR	2558 MW	2244	MDCT	Altamaha River	10/13/1974	08/06/2034
Edwin I Hatch	2	Georgia	BWR	2558 MW	2244	MDCT	Altamaha River	06/13/1978	06/13/2038
Fermi	2	Michigan	BWR	3430 MW	1120	NDCT	Lake Erie	07/15/1985	03/20/2025
Fort Calhoun	1	Nebraska	PWR	1500 MW	667	OT	Missouri River	08/09/1973	08/09/2013
Ginna	1	New York	PWR	1520 MW	338	OT	Lake Ontario	12/10/1984	09/18/2009
Grand Gulf	1	Mississippi	BWR	3833 MW	2100	NDCT	Mississippi River	11/01/1984	06/16/2022

Table F-2. (contd)

Nuclear Plant	Unit	Location	Reactor Type	Thermal Power[a]	Total Site Area, acres	Cooling System[b]	Cooling Water Source	Operating License	License Expiration[c]
H.B. Robinson	2	South Carolina	PWR	2300 MW	4942	OT	Lake Robinson	09/23/1970	07/31/2010
Hope Creek	1	Delaware	BWR	3293 MW	740	NDCT	Delaware River	07/25/1986	04/11/2026
Indian Point	2	New York	PWR	3071 MW	239	OT	Hudson River	09/28/1973	09/28/2013
Indian Point	3	New York	PWR	3025 MW	239	OT	Hudson River	04/05/1976	12/15/2015
James A. Fitzpatrick		New York	BWR	2536 MW	702	OT	Lake Ontario	10/17/1974	10/17/2014
Joseph M. Farley	1	Alabama	PWR	2775 MW	1850	MDCT	Chattahochee River	06/25/1977	06/25/2017
Joseph M. Farley	2	Alabama	PWR	2775 MW	1850	MDCT	Chattahochee River	03/31/1981	03/31/2021
Kewaunee		Wisconsin	PWR	1650 MW	908	OT	Lake Michigan	12/21/1973	12/21/2013
La Salle	1	Illinois	BWR	3323 MW	3064	Cooling pond	Illinois River	08/13/1982	05/17/2022
La Salle	2	Illinois	BWR	3323 MW	3064	Cooling pond	Illinois River	03/23/1984	12/16/2023
Limerick	1	Pennsylvania	BWR	3458 MW	595	NDCT	Schuylkill River	08/08/1985	10/26/2024
Limerick	2	Pennsylvania	BWR	3458 MW	595	NDCT	Schuylkill River	08/25/1989	06/22/2029
McGuire	1	North Carolina	PWR	3411 MW	577	OT	Lake Norman	07/08/1981	06/12/2021
McGuire	2	North Carolina	PWR	3411 MW	577	OT	Lake Norman	05/27/1983	03/03/2023
Millstone	2	Connecticut	PWR	2700 MW	494	OT	Long Island Sound	09/26/1975	07/31/2015
Millstone	3	Connecticut	PWR	3411 MW	494	OT	Long Island Sound	01/31/1986	11/25/2025
Monticello		Minnesota	BWR	1670 MW	2125	OT with towers	Mississippi River	01/09/1981	09/08/2010
Nine Mile Point	1	New York	BWR	1850 MW	890	OT	Lake Ontario	12/26/1974	08/22/2009
Nine Mile Point	2	New York	BWR	3467 MW	890	NDCT	Lake Ontario	07/02/1987	10/31/2026
North Anna	1	Virginia	PWR	2893 MW	1043	OT	Lake Anna	04/01/1978	04/01/2018
North Anna	2	Virginia	PWR	2893 MW	1043	OT	Lake Anna	08/21/1980	08/21/2020
Oconee	1	South Carolina	PWR	2568 MW	519	OT	Lake Keowee	02/06/1973	02/06/2033[d]
Oconee	2	South Carolina	PWR	2568 MW	519	OT	Lake Keowee	10/06/1973	10/06/2033[d]
Oconee	3	South Carolina	PWR	2568 MW	519	OT	Lake Keowee	07/19/1974	07/19/2034[d]
Oyster Creek	1	New Jersey	BWR	1930 MW	1416	OT	Barnegat Bay	04/09/1969	12/15/2009
Palisades	1	Michigan	PWR	2530 MW	487	MDCT	Lake Michigan	03/24/1971	03/14/2007
Palo Verde	1	Arizona	PWR	3800 MW	4050	MDCT	Phoenix City Sewage and Treatment Plant	06/01/1985	12/31/2024
Palo Verde	2	Arizona	PWR	3876 MW	4050	MDCT	Phoenix City Sewage and Treatment Plant	04/24/1986	12/09/2025
Palo Verde	3	Arizona	PWR	3876 MW	4050	MDCT	Phoenix City Sewage and Treatment Plant	11/25/1987	03/25/2027
Peach Bottom	2	Pennsylvania	BWR	3458 MW	620	OT with towers	Conowingo Pond	12/14/1973	08/08/2013
Peach Bottom	3	Pennsylvania	BWR	3458 MW	620	OT with towers	Conowingo Pond	07/02/1974	07/02/2014
Perry	1	Ohio	BWR	3579 MW	1112	NDCT	Lake Erie	11/13/1986	03/18/2026
Pilgrim	1	Massachusetts	BWR	1998 MW	517	OT	Cape Cod Bay	09/15/1972	06/08/2012
Point Beach	1	Wisconsin	PWR	1519 MW	2065	OT	Lake Michigan	10/05/1970	10/05/2010
Point Beach	2	Wisconsin	PWR	1519 MW	2065	OT	Lake Michigan	03/08/1973	03/08/2013
Prairie Island	1	Minnesota	PWR	1650 MW	568	MDCT or OT	Mississippi River	04/05/1974	08/09/2013
Prairie Island	2	Minnesota	PWR	1650 MW	568	MDCT or OT	Mississippi River	10/29/1974	10/29/2014

Table F-2. (contd)

Nuclear Plant	Unit	Location	Reactor Type	Thermal Power[a]	Total Site Area, acres	Cooling System[b]	Cooling Water Source	Operating License	License Expiration[c]
Quad Cities	1	Illinois	BWR	2511 MW	784	OT	Mississippi River	12/14/1972	12/14/2012
Quad Cities	2	Illinois	BWR	2511 MW	784	OT	Mississippi River	12/14/1972	12/14/2012
River Bend	1	Louisiana	BWR	2894 MW	3342	MDCT	Mississippi River	11/20/1985	08/29/2025
Salem	1	New Jersey	PWR	3411 MW	691	OT	Delaware River	12/01/1976	08/13/2016
Salem	2	New Jersey	PWR	3411 MW	691	OT	Delaware River	05/20/1981	04/18/2020
San Onofre	2	California	PWR	3390 MW	84	OT	Pacific Ocean	09/07/1982	10/18/2013
San Onofre	3	California	PWR	3390 MW	84	OT	Pacific Ocean	09/16/1983	10/18/2013
Seabrook	1	New Hampshire	PWR	3411 MW	896	OT	Atlantic Ocean	03/15/1990	10/17/2026
Sequoyah	1	Tennessee	PWR	3411 MW	525	OT and/or NDCT	Chickamauga Lake	09/17/1980	09/17/2020
Sequoyah	2	Tennessee	PWR	3411 MW	525	OT and/or NDCT	Chickamauga Lake	09/15/1981	09/15/2021
Shearon Harris	1	North Carolina	PWR	2775 MW	10744	NDCT	Buckhorn Creek	01/12/1987	10/24/2026
South Texas	1	Texas	PWR	3800 MW	12350	CCCP	Colorado River	03/22/1988	08/20/2027
South Texas	2	Texas	PWR	3800 MW	12350	CCCP	Colorado River	03/28/1989	12/15/2028
St. Lucie	1	Florida	PWR	2700 MW	1132	OT	Atlantic Ocean	03/01/1976	03/01/2016
St. Lucie	2	Florida	PWR	2700 MW	1132	OT	Atlantic Ocean	06/10/1983	04/06/2023
Summer	1	South Carolina	PWR	2900 MW	2200	OT	Lake Monticello	11/12/1982	08/06/2022
Surry	1	Virginia	PWR	2546 MW	840	OT	James River	05/25/1972	05/25/2012
Surry	2	Virginia	PWR	2546 MW	840	OT	James River	01/29/1973	01/29/2013
Susquehanna	1	Pennsylvania	BWR	3441 MW	1075	NDCT	Susquehanna River	11/12/1982	07/17/2022
Susquehanna	2	Pennsylvania	BWR	3441 MW	1075	NDCT	Susquehanna River	06/27/1984	03/23/2024
Three Mile Island	1	Pennsylvania	PWR	2568 MW	472	NDCT	Susquehanna River	04/19/1974	04/19/2014
Turkey Point	3	Florida	PWR	2300 MW	23970	Closed cycle canal	Biscane Bay	07/19/1972	07/19/2032
Turkey Point	4	Florida	PWR	2300 MW	23970	Closed cycle canal	Biscane Bay	04/10/1973	04/10/2033
Vermont Yankee	1	Vermont	BWR	1593 MW	125	OT and towers	Connecticut River	02/28/1973	03/21/2012
Vogtle	1	Georgia	PWR	3565 MW	3169	NDCT	Savannah River	03/16/1987	01/16/2027
Vogtle	2	Georgia	PWR	3565 MW	3169	NDCT	Savannah River	03/31/1989	02/09/2029
Waterford	3	Louisiana	PWR	3390 MW	3561	OT	Mississippi	03/16/1985	12/18/2024
Watts Bar	1	Tennessee	PWR	3411 MW	1769	NDCT	Chickamauga Lake	02/07/1996	11/09/2035
Wolf Creek	1	Kansas	PWR	3565 MW	9818	CCCP	Wolf Creek	06/04/1985	03/11/2025

(a) Licensees may seek power uprates.
(b) OT = once-through; NDCT = natural draft cooling towers; CCCP = closed-cycle cooling pond; MDCT = mechanical draft cooling towers.
(c) Licensees may seek a renewal of the license.
(d) Includes 20-year license renewal period.

Appendix G

Radiation Protection Considerations for Nuclear Power Facility Decommissioning

Appendix G

Radiation Protection Considerations for Nuclear Power Facility Decommissioning

Radiological issues are associated with the process of decommissioning nuclear reactor facilities, including power reactors, at the end of their operating lives. Both occupational workers and members of the public will be affected by these processes as a result of direct exposures to sources of radiation and as a result of small releases of radioactive materials in gaseous and liquid effluents. This appendix is intended to provide pertinent background information for analyses in this Generic Environmental Impact Statement Supplement.

G.1 Radiation Protection Standards

The primary U.S. Nuclear Regulatory Commission (NRC) standards for protection of workers and members of the public are found in 10 CFR Part 20. These standards are consistent with guidance to Federal agencies prepared by interagency committees and issued by the President. The Federal guidance is based on recommendations published by national and international organizations, such as the National Council on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), and the United Nations Scientific Committee on the Effects of Atomic Radiation. Proposed changes to regulations are typically published in the Federal Register for public comment before enactment of the final rule. The most recent major revision to the NRC radiation protection regulations in 10 CFR Part 20 were enacted in 1991, with several amendments issued in the intervening years. Implementation of the regulations became mandatory for NRC licensees in 1994.

G.1.1 Concepts, Terminology, Quantities, and Units Used in Radiation Protection

Title 10 CFR Part 20 was first promulgated in 1957. In 1961, the regulation was amended to add an appendix containing maximum permissible concentrations and a new occupational dose limit structure for whole-body exposure to external radiation (1.25 rem/quarter, or 3 rem/quarter with 5 rem/yr average as a limit on the cumulative dose). The 1991 revision differs considerably from the previous regulations with respect to basic concepts, terminology, radiation dose quantities, and the associated dose units. This section is included to familiarize readers with these concepts.

G.1.1.1 Conventional Quantities and Units

In 10 CFR Part 20, the unit "rad" is usually used for the quantity "radiation absorbed dose" whenever early biological effects are the concern. When latent effects (e.g., cancer and genetic effects) are being considered, the unit "rem" is used for the dose equivalent (DE) quantity. The absorbed dose in rads is multiplied by an overall efficiency factor *Q* to obtain the DE in rem. Each type of radiation has its own value of *Q*, which in a very general way permits adding absorbed doses from different radiations to estimate the probability of stochastic effects. Values of Q in 10 CFR Part 20 are indicated in Table G-1.

Table G-1. Quality Factors and Absorbed Equivalents

Radiation	Absorbed Dose, rad	Q	Dose Equivalent, rem
x -, gamma or beta radiation	1	1	1
Alpha particles	1	20	20
Neutron (spectrum unknown)	1	10	10
Note: To convert rem to sievert, multiply by 0.01.			

These values of *Q* reflect the overall efficiency of a given type of radiation in causing latent effects and are not used for early effects such as acute radiation syndrome. The values were derived in consideration of the ability of the various radiations to ionize atoms in water as well as the relative biological effectiveness factors observed for specific effects.

G.1.1.2 International System of Units

The International System (SI) units of particular interest in radiation protection are the gray (Gy), sievert (Sv), and becquerel (Bq), as shown in Table G-2. The SI units are part of the metric system; however, they are not yet widely used in the United States.
Title 10 CFR 20.2101 requires the records to be reported in the units of curie, rad, and rem. The major concern of the NRC staff is that use of both the conventional and SI units would introduce confusion under emergency conditions.

Table G-2. Conventional and SI Units

Quantity	Conventional Unit	SI Unit	SI Unit Conversions
Absorbed dose	rad (100 ergs/gram)	gray (Gy) (10,000 ergs/gram)	100 rad = 1 Gy
Dose equivalent	rem (Q x rad)	sievert (Sv) (Q x gray)	100 rem = 1 Sv
Activity	curie (Ci) (3.7 x 10^{10} disintegrations per second)	becquerel (Bq) (1 disintegration per second)	1 Ci = 3.7 x $10^{(10)}$ Bq

G.1.1.3 Collective Dose

Previous revisions of 10 CFR Part 20 made no use of the collective DE (in person-rem). However, this quantity is used by the NRC in risk analyses and in its decision-making processes. The collective DE may be obtained as the sum of all individual doses or as the product of the average individual dose and the number of people exposed. The linear-nonthreshold hypothesis is accepted by the NRC for purposes of standards setting. Such acceptance means that standards based on the hypothesis, coupled with the “as low as reasonably achievable” (ALARA) concept, are believed to provide an adequate degree of protection.

G.1.1.4 Risks from Radiation Exposure

The current regulations in 10 CFR Part 20 are based on concepts first developed by the ICRP in Publication 26 (ICRP 1977). The ICRP system is based on the recognition of two basic types of radiation-induced health effects: stochastic and nonstochastic. Stochastic effects, such as cancer and hereditary effects, are considered to be probabilistic in nature. For stochastic effects, the probability of the effect, but not the severity, is dose-dependent (i.e., once a malignancy occurs). Its severity is no different if the dose that preceded it were 1 Sv (100 rem), 0.1 Sv (10 rem), or zero. The objective of radiation protection policies is to control the probability of these effects to acceptable levels. In contrast, the severity of nonstochastic effects, but not the probability of occurrence, depends on the radiation dose. Examples of radiation-induced nonstochastic effects include cataracts in the lens of the eye or burns on the skin surface. Nonstochastic effects typically do not occur unless the dose exceeds a threshold, which is specific to each type of effect. Once the threshold dose is exceeded, the effect occurs, and the severity of the effect depends on the dose received by the affected tissue or organ. For example, a radiation-induced cataract caused by a 4-Sv (400-rem) dose to the lens of the

eye would impair vision to a greater extent than one following a dose of 1 Sv (100 rem). Therefore, radiation protection for nonstochastic effects is designed to keep radiological exposures to sensitive tissues below the threshold levels at which the effects would begin to appear.

In January 1990, the National Research Council (NAS 1990) published a report on the health effects of exposure to low levels of ionizing radiation. This report was prepared by the Committee on Biological Effects of Ionizing Radiation (BEIR) known as the BEIR-V Committee, organized by the Council for this purpose. The BEIR-V report concluded that the risk of radiation exposure was greater than estimates published by previous committees (NAS 1972, NAS 1980). In light of this data, the ICRP requested comment from a number of organizations on a draft of its revised recommendations on radiation protection. In 1991, the ICRP issued Publication 60 (ICRP 1991) recommending lower limits for occupational exposures. With regard to this Supplement, the primary importance of these developments lies in the selection of the most appropriate radiation risk coefficients to use for evaluating health effects. For a more complete history of the development of radiological risk estimates, see NRC (1996), Appendix E.

G.1.1.4.1 Stochastic Effects

Stochastic effects refer to health effects, such as cancer and inheritable genetic effects, for which the probability of occurrence is related to radiation dose. Based on the BEIR-V study (1990), the risks were estimated as 4 to 5 excess cancer deaths among 10,000 people receiving 100 person-Sv (10,000 person-rem). The following statement appears in the executive summary of the BEIR-V report (NAS 1990, p. 6):

> On the basis of the available evidence, the population-weighted average lifetime excess risk of death from cancer following an acute dose equivalent to all body organs of 0.1 Sv [0.1 Gy of low-linear energy transfer (LET) radiation] is estimated to be 0.8 percent, although the lifetime risk varies considerably with age at the time of exposure. For low-LET radiation, accumulation of the same dose over weeks or months, however, is expected to reduce the lifetime risk appreciably, possibly by a factor of 2 or more.

The 0.8-percent estimate is equivalent to 800 excess cancer fatalities among 100,000 people, each exposed to 0.1 Sv (10 rem). It is important to note that the risk values tabulated in the report are for a population size of 100,000 and that the 0.8-percent estimate is applicable to instantaneous, uniform irradiation of all organs. With regard to the lower extreme of the dose range over which the estimate is applicable, the Committee observes elsewhere in the BEIR-V report that “in general, the estimates of risk derived in this way for doses of less than 0.1 Gy (10 rem) are too small to be detectable by direct observation in epidemiological studies.” The

report does not provide a risk estimate for instantaneous doses of fewer than 0.1 Sv (10 rem). The Committee's estimate is considered useful for estimating fatalities among large populations, including all ages, that are irradiated instantaneously and uniformly to individual external radiation doses of 0.1 Sv (10 rem) or more. Risk assessments based on the Japanese experience are subject to substantially greater uncertainty when applied to conditions typically encountered in environmental exposures from normal facility operations, where

- exposures are protracted
- the exposed population is small
- individual doses are much lower than 0.1Sv (10 rem)
- irradiation is caused by internally deposited radionuclides and is not uniform throughout the body
- the exposed population differs significantly from the atomic bomb survivor study group or
- some combination of these conditions exists.

For stochastic effects, the ICRP adopted the risk associated with 0.05 Sv (5 rem) in a year, delivered to every organ, as the basis for its dose-limitation system (ICRP 1977). Therefore, the stochastic annual limit on intake (ALI) for each radionuclide is the quantity that, if inhaled, would cause the same stochastic risk as a uniform, whole-body dose of 0.05 Sv (5 rem) delivered by external sources in 1 year. To establish these ALIs, the ICRP considered the possibility that a given radionuclide taken into the body eventually reaches the bloodstream and is then distributed selectively to the various organs and tissues, where DE is delivered over a time course determined by the retention capabilities of the organ or tissue and the physical characteristics of the radionuclide. Using a radiation risk coefficient specific for each organ or tissue and the 50-year integrated dose equivalent to the tissue, the risk associated with each is estimated. The total risk to the worker per quantity of this radionuclide inhaled is the sum of the individual organ or tissue risks. The intake that will produce the same overall stochastic risk as 0.05 Sv/yr (5 rem/yr) of uniform external radiation can then be readily calculated as the ALI. Of course, a worker may be exposed to several airborne radionuclides and to external radiation as well. In that case, the total risk is still limited to that associated with 0.05 Sv (5 rem) in a year from uniform external radiation. Compliance is achieved if the fraction of the external dose limit that is received, added to the fraction of ALI inhaled for each radionuclide, does not exceed unity.

The risk of hereditary effects is included in a special way that, in the view of the ICRP, renders it additive to the cancer fatality risk. The ICRP considered only detrimental effects that the worker is likely to experience personally, so that effects manifested after the second generation are not included in the genetic risk coefficient used. The coefficient is also limited to very serious genetic effects (i.e., those comparable in severity to premature death).

Although all organs and tissues receive the same DE under uniform exposure conditions, the cancer risks for a given dose in each organ are not the same. Each organ or tissue contributes to the overall risk based on the relative sensitivity of tissue to radiation-induced cancer. This fraction is called the weighting factor, and the sum of the weighting factors for all tissues is unity. The product of the weighting factor and the DE is the effective dose equivalent (EDE). This quantity is used for both external and internal irradiation and may be used for individual organs and tissues or for the sum of all organs and tissues. The unit used for either quantity is the same as for the DE, namely, the sievert (or rem). In the unique case of uniform irradiation of all organs and tissues, the sum of their EDEs is by definition equal to the whole-body DE. The EDE may be determined irrespective of the degree of uniformity among the organ or tissue doses. The sum of the EDEs is not allowed to exceed 0.05 Sv/yr (5 rem/yr).

The committed dose equivalent (CDE) is a quantity defined as the 50-year integrated DE to a specific organ or tissue following the inhalation of a radionuclide. This quantity is still used, but only in connection with nonstochastic effects. The committed effective dose equivalent (CEDE) is the same quantity as the CDE, with the exception that, in the case of the CEDE, each dose equivalent is multiplied by the tissue or organ weighting factor. The rem (or sievert) is also the unit for both of these quantities.

The mathematical weighting method used by the ICRP is shown in Table G-3. The first column lists the organs, and the second column lists the risk coefficients from ICRP Publication 26 (1977) and their sum, namely, 1.65×10^{-4}. This sum is the total annual risk to the exposed person, assuming exposure to these organs at 0.01 Gy/yr (1 rad/yr).[(a)] The fraction of this risk per rad for each organ can be obtained by dividing its risk coefficient by 1.65×10^{-4}. These fractions represent the relative sensitivity of the organs; they are the weighting factors and are designated by the symbol w_T, where T represents the organ or tissue. The weighting factors appear in column three of the table. If T is the dose equivalent to tissue T, then $w_T H_T$ is the

(a) Multiplication by 5 gives the annual risk at 0.05 Gy/yr (5 rad/yr) (i.e., 8.25×10^{-4}/yr). This risk value means that if groups of 10,000 workers were to receive the dose limit every year for their entire careers, data as of the mid-1970s indicate that an average of 8.25 fatal occupational radiation-induced cancers per year would occur within each group. Assuming the approximate worst case of 45 years of exposure, the toll theoretically would be about 370 deaths per group, or almost 4 percent.

weighted DE. For example, w_T for the lung is 0.12. If a weighted lung dose of H rem is set equal to a highly penetrating, uniform whole-body dose of 5 rem, then

$$0.12\ H = 0.05 \text{ Sv (5 rem) and}$$
$$H = 4.17 \text{ Sv (41.7 rem).}$$

By hypothesis and analogy, an annual DE of 0.417 Sv (41.7 rem) to only the lung would have the same effect as 0.05 Sv (5 rem) to all of the organs combined. For this reason, $w_T H_T$ is called the EDE.

Nonstochastic effects have thresholds, and they become more severe as the dose gets larger. The ICRP believes that none of the thresholds will be exceeded if the annual dose to any tissue or organ does not exceed 0.5 Gy (50 rad). This nonstochastic limit is reflected in Table G-3, where it is evident that nonstochastic effects are controlling for all but four organs that have the largest weighting factors, the most sensitive organs with respect to stochastic effects.

Table G-3. ICRP Publication 26 Risk Weighting System

Organs	Risk Coefficients, Effects per Organ-rem	Weighting Factors	Organ DE Causing Same Risk as 5 rem to Whole Body, rem	Annual DE Permitted, Exposure of One Organ, rem/yr
Gonads	4×10^{-5}	0.25	20	20
Breasts	2.5×10^{-5}	0.15	33-1/3	33-1/3
Lung	2×10^{-5}	0.12	41-2/3	41-2/3
Red marrow	2×10^{-5}	0.12	41-2/3	41-2/3
Bone	5×10^{-6}	0.03	166-2/3	50
Thyroid	5×10^{-6}	0.03	166-2/3	50
1st RO[(a)]	1×10^{-5}	0.06	83-1/3	50
2nd RO	1×10^{-5}	0.06	83-1/3	50
3rd RO	1×10^{-5}	0.06	83-1/3	50
4th RO	1×10^{-5}	0.06	83-1/3	50
5th RO	1×10^{-5}	0.06	83-1/3	50
Totals	1.65×10^{-4}	1.0		

(a) The remainder organs (ROs) are the five organs that receive, from a given radionuclide, the highest EDE, integrated over 50 years.
Note: To convert rem to sievert, multiply by 0.01.

G.1.1.4.2 Nonstochastic Effects

Nonstochastic effects refer to those, such as radiation-induced cataracts, for which the severity of the effect depends on radiation dose. They typically are not observed unless the radiation dose exceeds a minimum threshold, whereas the probability of stochastic effects is assumed to be greater than zero, although very small, even at very low doses. Therefore, radiological protection for nonstochastic effects is based on limiting exposures to levels that prevent the effect, rather than on controlling the probability of occurrence, as discussed previously for stochastic effects. For tissues such as the lens of the eye, the skin, and the extremities, radiation protection standards are intended primarily to control the dose from external sources. For internal organs, it is necessary to control the dose from internally deposited radionuclides as well. Because radiation can damage or kill cells if the dose is sufficiently high, a nonstochastic dose limit must be established for all tissues, including tissues other than those mentioned above.

ICRP Publication 41 (1983) provides the technical justification supporting the position that, with the exception of the lens of the eye, nonstochastic effects will not be observed among adults if the DE from external and internal radiation combined to every organ and tissue is less than 0.5 Sv/yr (50 rem/yr). The NRC is not aware of later radiobiological information indicating that this dose limit should be changed and notes that the ICRP retained this value in the 1990 revision of its recommendations (ICRP 1991).

G.1.1.4.3 Risk Coefficient Selection for This Supplement

The BEIR-V risk estimate can be arithmetically converted to the more familiar terminology of 8 cancer fatalities among 10,000 people exposed to 10 person-Sv (10,000 person-rem), leading to a convenient risk coefficient of 8×10^{-4} fatalities per person-rem. This coefficient is considered useful for estimating fatalities among large populations irradiated instantaneously and uniformly to individual external radiation doses of 0.1 Sv (10 rem) or more. However, since no dose or dose rate effectiveness factor (DDREF) is included in this risk factor, the fatality estimates become speculative as the individual doses and the size of the exposed population become progressively smaller. A DDREF of 2 has been recommended by the ICRP (1991) for doses below 0.2 Gy (20 rad) and dose rates below 0.1 Gy/h (10 rad/h), which corresponds to a risk coefficient 4.0×10^{-4} cancer fatalities per person-rem.

The risk coefficients for fatal cancer and hereditary effects (listed in Table G-4) are taken from ICRP (1991). The coefficients are consistent with the risk factors reported in BEIR-V if a DDREF of 2 is applied. The somewhat higher risk coefficients for the general population as compared to workers reflects the fact that individuals under age 18 at the time of exposure are more susceptible to radiation-induced cancer. A person must be 18 years or older to be

Table G-4. Nominal Probability Coefficients Used in this Supplement[(a)]

Health Effect	Occupational	Public
Fatal cancer	4	5
Hereditary	0.6	1

(a) Estimated number of excess effects among 10,000 people receiving 100 person-Sv (10,000 person-rem).
Source: ICRP Publication 60 (1991).

employed as a radiological worker. Excess hereditary effects are listed separately because radiation-induced effects of this type have not been observed in any human population, as opposed to excess malignancies that have been identified among people receiving instantaneous and near-uniform exposures of 0.1 Sv (10 rem) or more. As applied to low-level environmental and occupational exposures, risk factors for radiological health effects are subject to substantial uncertainty. The lower limit of the range for these risk coefficients is assumed to be zero because there may be biological mechanisms that can repair damage caused by radiation at low doses and/or dose rates.

G.1.2 Occupational Protection Standards

Occupational radiation protection standards have been in effect since 1947, and have generally been revised downward over the years, from 1.0 roentgen/wk (or about 50 roentgen/yr) in 1947 to the current 0.05 Sv/yr (5 rem/yr) total effective dose equivalent (TEDE). For an historical overview of development of these regulations, see NRC (1996), Appendix E. The current regulation implements the concept of TEDE, as developed by ICRP Publication 26 (1977). This methodology accounts for both exposure to radiation from external sources and intakes of radionuclides into the body in assessing compliance with the standards. Standards that were previously in effect applied only to external dose and did not account for dose from intakes of radionuclides by workers, which were assessed separately. In practice, radionuclide intakes account for a small fraction of the total dose received by workers at nuclear power facilities.

Historical dose data for nuclear power plant workers are presented in Section G.2. Table G-5 presents a summary of the occupational standards in the 1991 revision of 10 CFR Part 20. On an annual basis, the whole-body limit has decreased from 12 roentgen (3 roentgen per quarter) in 1957 (external radiation only) to 0.05-Sv (5-rem) TEDE (external plus internal).

Regulatory control over the intake of radioactive materials in the workplace has always been a complex issue. Beginning in 1991, the NRC adopted the method published by the ICRP in Publication 26 (ICRP 1977). Under the ICRP method, the dose to each significantly irradiated

organ is weighted according to its radiation sensitivity. The weighted doses are summed to produce an EDE that can be added to the dose from external sources.

The revised 10 CFR Part 20 provides additional flexibility for establishing more accurate dose controls. It allows the use of actual particle-size distribution and physiochemical characteristics of airborne particulates to define site-specific derived air concentration limits. With NRC approval, these modified concentration limits can be used in lieu of generic values provided in 10 CFR Part 20. Such adjustments result in more precise estimates that use actual exposure conditions, as compared to generic assumptions.

The 1991 revision to 10 CFR Part 20 codifies a requirement that licensees implement a program to maintain radiation doses ALARA. Compliance with the commitments is required through the licensing process in 10 CFR Part 50 and the technical specifications. Two Regulatory Guides have been issued to provide guidance on ALARA programs for nuclear power plants: one on ALARA philosophy in NRC Regulatory Guide 8.10, Rev. 1R (NRC 1977), and one on implementation in NRC Regulatory Guide 8.8, Rev. 3 (NRC 1978). Nuclear power plant licensees are required to maintain and implement adequate plant procedures that contain ALARA criteria. During plant licensing, applicants commit to implement ALARA programs consistent with Regulatory Guides 8.8 and 8.10.

Table G-5. Occupational Dose Limits for Adults in 10 CFR Part 20[(a)]

Tissue	External Radiation	Internal Plus External Radiation
Whole Body	0.05 Sv/y (5 rem/yr) total DE,[(b)] not to exceed 0.5 Sv/y (50 rem/yr) total DE to any individual organ or tissue other than the lens of the eye	0.05 Sv/yr (5 rem/year) TEDE,[(c)] not to exceed 0.5 Sv/yr (50 rem/yr) total DE to any individual organ or tissue other than the lens of the eye
Lens	0.15 Sv/yr (15 rem/yr)	
Extremities, Including Skin	0.5 Sv/yr (50 rem/yr)	
All Other Skin	0.5 Sv/yr (50 rem/yr)	

(a) These revised 10 CFR Part 20 standards became effective on January 1, 1994.
(b) The total DE is the sum of the EDE (at 1 cm [0.39 in] depth) and the CDE from nuclides deposited in the body.
(c) The TEDE is the sum of the EDE (at 1 cm depth [0.39 in]) and the CEDE from nuclides deposited in the body.

G.1.3 Public Radiation Protection Standards

For many years, the ICRP and NCRP recommended dose limits for the public that were 10 percent of those for workers. During the 1980s, both organizations adopted a more conservative value of 2 percent. In 1985, the ICRP released a statement that its principal limit for the whole body was 0.001 Sv/yr (0.1 rem/yr) EDE (ICRP 1985). However, a subsidiary limit of 0.005 Sv/yr (0.5 rem/yr) is authorized, provided that the average dose over a lifetime does not exceed 0.001 Sv/yr (0.1 rem/yr). The ICRP limit for the skin and lens of the eye is 0.05 Sv/yr (5 rem/yr). In 1987, the NCRP recommended limits of 0.001 Sv/yr (0.1 rem/yr) EDE for the whole body under conditions of continuous or frequent exposure and 0.005 Sv/yr (0.5/yr) for infrequent exposure (NCRP 1987). The NCRP limit for the lens of the eye, skin, and extremities is 0.05 Sv/yr (5 rem/yr).

The 1991 revision of 10 CFR Part 20 implements guidelines consistent with the recommended limit of 0.001 Sv/yr (0.1 rem/yr) EDE (see Table G-6). Provision is made for temporary increases to 0.005 Sv/yr (0.5 rem/yr) with prior authorization and justification. Hourly and annual dose rate limits for unrestricted areas are also included.

Licensees may also demonstrate compliance with the provisions of 10 CFR Part 20 by showing that annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of an unrestricted area do not exceed the values specified in 10 CFR Part 20, Appendix B, Table 2.

Table G-6. Dose Limits for an Individual Member of the Public under 10 CFR Part 20[a]

Applicability by Pathway	Dose Limits
Annual dose, all pathways[b]	1 mSv/yr (0.1 rem/yr) TEDE[c]
External dose rate, unrestricted areas	0.02 mSv/h (0.002 rem/h) or 0.5 mSv/yr (0.05 rem/yr)
Temporary Annual Dose, all pathways[d]	5 mSv/yr (0.5 rem/yr) TEDE[c]
ALARA dose constraint, air emissions[e]	0.1 mSv/yr (0.01 rem/yr) TEDE[c]

(a) These revised 10 CFR Part 20 standards became effective on January 1, 1994.
(b) Excludes contribution from materials disposed to sanitary sewers.
(c) The TEDE is the sum of the EDE (at 1 cm depth) and the CEDE from nuclides deposited in the body.
(d) Temporary increases in the public dose limit are subject to prior authorization from the NRC and other constraints to ensure the increase is justified and controlled to be ALARA.
(e) This is not a 10 CFR Part 20 dose limit, but is given to ensure consistency with air emissions standards for Federal facilities in 40 CFR Part 61.

The NRC has not established standards for radiological exposures to biota other than humans on the basis that limits established for the maximally exposed members of the public would provide adequate protection for other species. In contrast to the regulatory approach applied to human exposures, the fate of individual nonhuman organisms is of less concern than the maintenance of the endemic population (NCRP 1991). Experience has shown that population stability is crucial to survival of most species. However, in many ecosystems individual members of a species may suffer relatively high mortality rates from natural causes without creating detrimental effects to the population as a whole. The exception might be for threatened or endangered species where protection of the individual may be required in order to avoid detrimental effects on a relatively small population.

Evaluations of radiation exposures to nonhuman biota at nuclear power facilities have not identified exposures that could be considered significant in terms of harm to the species, or which approach the public exposure limits in 10 CFR Part 20. Limiting exposure in humans to 1 mSv/yr (100 mrem/yr) will lead to dose rates to plants in animals in the same area of less than 1 mGy per day (100 mrad per day). The International Atomic Energy Agency (IAEA) concludes that there is no convincing evidence from scientific literature that chronic radiation dose rates below 1 mGy per day (100 mrad per day) will harm plant or animal populations (IAEA 1992). Because of the relatively lower sensitivity of nonhuman species to radiation, and the lack of evidence that nonhuman populations or ecosystems would experience detrimental effects at radiation levels found in the environment around nuclear power stations, effects on these biota are not evaluated in detail for the purposes of this Supplement.

In addition to the basic standards mentioned above, 10 CFR 50.36(a) contains license conditions that are imposed on licensees in the form of technical specifications applicable to effluents from nuclear power reactors. These specifications ensure that releases of radioactive materials to unrestricted areas during normal operations, including expected operational occurrences, remain ALARA. Appendix I to 10 CFR Part 50 provides numerical guidance on dose-design objectives and limiting conditions for operation for light-water reactors (LWRs) to meet the ALARA requirements. As a part of the licensing process, all licensees have provided reasonable assurance that the design objectives will be met for all unrestricted areas even during the decommissioning process. Title 10 CFR Part 20 requires compliance with the U.S. Environmental Protection Agency regulation 40 CFR Part 190, which also contains ALARA limits. The dose constraints are summarized in Tables G-7 and G-8.

Specific radiological criteria for license termination were added to 10 CFR Part 20 in 1997, and the basis for public health and safety considerations is discussed in NUREG-1496 (NRC 1997). These criteria limit the dose to members of the public to 0.25 mSv/yr (25 mrem/yr) from all

Table G-7. 10 CFR Part 50, Appendix I, Design Objectives and Annual Limits on Radiation Doses to the General Public from Nuclear Power Facilities[(a)]

Tissue	Gaseous	Liquid
Total body	0.05 mSv (5 mrem)	0.03 mSv (3 mrem)
Any organ, all pathways	--	0.01 mSv (10 mrem)
Ground-level air dose	0.1 mGy (10 mrad) gamma and	--
	0.3 mGy (30 mrad) beta	--
Any organ,[(b)] all pathways	0.15 mSv (15 mrem)	--
Skin	0.15 mSv (15 mrem)	

(a) Calculated doses.
(b) Particulates, radioiodines.

Table G-8. 40 CFR 190, Subpart B, Annual Limits on Doses to the General Public from Nuclear Power Operations[(a)]

Tissue	Limit	Source
Total body	0.25 mSv (25 mrem)	All effluents and direct radiation from nuclear power operations
Thyroid	0.75 mSv (75 mrem)	"
Any other organ	0.25 mSv (25 mrem)	"

(a) Calculated doses.

pathways following unrestricted release of a property. In cases where unrestricted release is not feasible, the licensee must provide for institutional controls that would limit the dose to members of the public to 0.25 mSv/yr (25 mrem/yr) during the control period and to 1 mSv/yr (100 mrem/yr) after the end of institutional controls. These criteria will largely determine the types and extent of activities undertaken during the decommissioning process to reduce the radionuclide inventory remaining onsite.

G.2 Nuclear Power Plant Exposure Data

G.2.1 Occupational Dose Experience

Individual occupational doses are measured by NRC licensees as required by the basic NRC radiation protection standard, 10 CFR Part 20. The exposure pathway of primary interest is from sources that are external to the body. Measurements of the whole-body dose are normally derived from personal dosimeters worn by each worker, and they represent a relatively uniform

dose to all organs of the body. Since 1984, many of the nuclear power plants have provided dosimetry programs accredited by the National Bureau of Standards (NBS, now National Institute of Standards and Technology [NIST]). In 1988, NBS/NIST accreditation became an NRC requirement.

Whole-body dose data from NRC-licensed LWRs are shown in Table G-9 for the years 1973 through 1999 (NRC 2000). For each year, the number of reactors, the number of workers receiving measurable exposures, the average annual dose per worker, the collective dose for all reactors combined, and the number of individuals exceeding 0.05 Sv (5 rem) are listed. Until 1991, the limit for exposure to workers was 0.03 Sv per quarter (3 rem per quarter), or a maximum of 0.12 Sv/yr (12 rem/yr), with an average of 0.05 Sv/yr (5 rem/yr). The collective dose is the sum of doses to workers at all plants. The collective doses to nuclear plant workers decreased from a peak of over 55 person-Sv/yr) (55,000 person-rem/yr) in 1983-1984 to less than 15 person-Sv/yr (15,000 person-rem/yr) in 1998-1999, although there are currently about 25 percent more operating plants than in the mid-1980s. Average annual doses to workers have likewise decreased from just under 0.01 Sv/yr (1 rem/yr) in the early 1970s to less than 0.25 mSv/yr (0.25 rem/yr) after 1997. Whole-body doses exceeding 0.05 Sv/yr (5 rem/yr) have been infrequent since 1985, and no doses at that level have been reported since 1989. Nuclear power plant workers may also be exposed to airborne radioactive material, primarily fission and corrosion products, but such exposures have historically been small in comparison with external doses. A study of intake data indicated that for cobalt-58 and cobalt-60, the most prevalent radionuclides, very few of the workers had organ burdens of more than 1 percent of the maximum permissible (see Baker 1996).

These data indicate that occupational exposures within the nuclear power industry have been significantly reduced since 1973. Individual doses are characteristically far below the regulatory limit, and the annual average is less than 5 percent of the 5 rem per year limit that is now in effect. Effective implementation of the ALARA concept is largely responsible. The range of risks associated with these exposures are discussed in Section G.1.

Occupational doses at reactors that are undergoing decommissioning are typically lower than those accumulated at operating facilities, as indicated in the Table G-9 data for reactors that are no longer operating. Between 1995 and 1999, the collective dose from shutdown facilities typically amounted to a few hundred person-rem per year, and the annual average dose per worker was comparable to, or lower than, that for operating facilities. A comparison in Table G-10 of the occupational doses at 12 facilities before and after they were shutdown confirms that decommissioning would not be expected to increase occupational doses on average, although some phases of the process may result in temporarily higher collective doses depending on the activities in progress and the number of workers involved.

Table G-9. Occupational Dose at Light Water Reactors (LWRs) - Comparison of Operating Reactors to Reactors No Longer in Operation[a]

Year	Number of Workers with Measurable Exposure[b]	Collective Dose, person-rem[c]	Average Dose per Worker with Measurable Exposure, rem[c]	Total Number with Dose > 5 rem[d]	Number of Reactors	Average Collective Dose per Reactor-Year, person-rem[e]
Operating Reactors						
1973	14,780	13,962	0.945	--	24	582
1974	18,139	13,650	0.753	--	33	414
1975	28,234	20,901	0.740	--	44	475
1976	34,515	26,105	0.756	--	52	502
1977	38,985	32,521	0.834	351	57	571
1978	42,777	31,785	0.743	159	64	497
1979	60,299	39,908	0.662	180	67	596
1980	74,629	53,739	0.720	391	68	790
1981	76,772	54,163	0.706	210	70	774
1982	79,309	52,201	0.658	135	74	705
1983	79,709	56,484	0.709	169	75	753
1984	90,520	55,251	0.610	74	78	708
1985	86,926	43,048	0.495	1	82	525
1986	93,979	42,386	0.451	0	90	471
1987	96,231	40,406	0.420	0	96	421
1988	96,013	40,772	0.425	1	102	400
1989	100,084	35,931	0.359	0	107	336
1990	98,567	36,602	0.371	0	110	333
1991	91,086	28,519	0.313	0	111	257
1992	94,172	29,297	0.311	0	110	266
1993	86,193	26,364	0.306	0	108	244
1994	71,613	21,704	0.303	0	109	199
1995	70,821	21,688	0.306	0	109	199
1996	68,305	18,883	0.276	0	109	173
1997	68,372	17,149	0.251	0	109	157
1998	57,466	13,187	0.229	0	105	126
1999	59,216	13,666	0.231	0	104	131
Average 1973-1999	69,545	32,603	0.514	73		430
Average 1995-1999	64,836	16,915	0.259	0		157
Permanently Shutdown Reactors[f]						
1995	699	262	0.375	0	6	44
1996	974	165	0.169	0	8	21
1997	1144	136	0.119	0	7	19
1998	2178	430	0.197	0	11	39
1999	2856	430	0.151	0	13	33
Average 1995-1999	1,570	285	0.202			31

(a) Data Source: NUREG-0713, Vol. 21 (NRC 2000).
(b) 1973-1976 data are not adjusted for multiple reporting of transient individuals.
(c) To convert rem to sievert, multiply by 0.01.
(d) Number of workers by dose range not available for 1973-1976. The dose limit was 3 rem/quarter (12 rem/yr) before the 1991 revision of 10 CFR Part 20; thereafter, it was reduced to 5 rem/yr.
(e) To convert person-rem to person-sievert, multiply by 0.01.
(f) Includes plants not in operation for a full year as of December 31 of the reporting year.

Table G-10.

Occupational Whole-Body Dose at Decommissioning Reactors, Comparison of Dose During Operations to Dose During Decommissioning

						Average Annual Occupational Dose, person-rem/yr			Maximum Annual Occupational Dose, person-rem/yr		
Nuclear Plant	Reactor Type	Capacity, MWe	Years in Operation	Years Post Shutdown	D&D Method	Normal Power Operations	Post Shutdown	Post Shutdown as % of Operations	Operations	Post Shutdown	Post Shutdown as % of Operations
Ft. St. Vrain	HTGR[a]	330	10	12	DECON	3	106	4076.9	6	210	3500
Big Rock Point	BWR[b]	67	34	2	DECON	166	116	69.7	277	144	52.0
La Crosse	BWR	48	17	13	SAFSTOR	247	19	7.8	313	105	33.5
Humboldt Bay, Unit 3	BWR	63	13	25	SAFSTOR	294	183	62.4	339	1905	561.9
Yankee Rowe	PWR[c]	175	30	8	DECON	159	75	47	246	156	63.4
Haddam Neck	PWR	560	28	3	DECON	355	137	38.5	590	261	44.2
Maine Yankee	PWR	860	25	3	DECON	326	154	47.1	653	173	26.5
Trojan	PWR	1080	17	7	DECON	346	38	11	567	52	9.2
San Onofre, Unit 1	PWR	436	25	8	SAFSTOR	512	16	3.1	880	16	1.8
Rancho Seco	PWR	873	14	10	SAFSTOR	385	9	2.3	787	41	5.2
Zion, Units 1 and 2	PWRs	2080	24	2	DECON	645	8	1.2	1043	12	1.2
Average All LWR						343	75	29	570	287	79.9
Average BWR						235	106	46.6	310	718	215.8
Average PWR						390	62	21.5	681	102	21.6
Average DECON						333	88	35.8	563	133	32.7
Average SAFSTOR						359	57	18.9	580	517	150.6

(a) High-temperature gas-cooled reactor.
(b) Boiling water reactor.
(c) Pressurized water reactor.

Table G-11. Occupational Dose by Activity During Decommissioning

Nuclear Plant	Reactor Type	Capacity, MWe	D&D Method	Cumulative Dose Post Shutdown, person-rem[a]	Percent of Total Cumulative Dose to Completion by Activity: Large Component Removal, %	Systems, Structures, and Components Removal, %	Other Decon Activities, %	SNF Management, %	Transportation, %	SAFSTOR Activities, %
Fort St. Vrain	HTGR[b]	330	DECON	433	45.1	25.6	13.8		15.5	
Big Rock Point	BWR[c]	67	DECON	700						
Haddam Neck	PWR[d]	560	DECON	996	37	28.7	19.3	8.7	6.1	
Maine Yankee	PWR	860	DECON	946	9.9	12.8	74.2	3		
Trojan	PWR	1080	DECON	556	22.7	50.7	5.4	21.2		
Zion, Units 1 and 2	PWRs	2080	SAFSTOR	637						
Humboldt Bay, Unit 3	BWR	63	SAFSTOR	354			50.8		3.7	45.5
Rancho Seco	PWR	873	SAFSTOR	483	39.1	47.6	5.8			7.5
San Onofre, Unit 1	PWR	436	SAFSTOR	1100						
Average All Plants				689	26.9	28	36.9	8.3	8.4	18.1
Number of Plants				9	6	6	7	4	3	3
Occupational Dose in Decommissioning BWRs										
Average BWR				527			50.8		3.7	45.5
Number of Plants				2			1		1	1
BWR SAFSTOR				354			50.8		3.7	45.5
BWR DECON				700						
Occupational Dose in Decommissioning PWRs										
Average PWR				786	23.2	28.4	38.7	8.3	6.1	4.4
Number of Plants				6	5	5	5	4	1	2
PWR SAFSTOR				792	23.3	25	47.2	0.3		4.4
PWR DECON				784	23.2	30.8	33	11	6.1	

(a) Dose is estimated for activities during decommissioning at plants that have not reached license termination.
(b) High-temperature gas-cooled reactor.
(c) Boiling water reactor.
(d) Pressurized water reactor.

Table G-12. Reactor Vessel Removal Information and Data

Nuclear Plant	Total Bequerels (Curies) Removed	Personnel Exposure person-sievert (person-rem)	Segmented components/ Lineal inches cut	Cutting Methods	Considerations for Planning and Implementation
Haddam Neck (in progress)	2.8×10^{16} (750,000)	1.77 (177)	• Core baffle • Core former plates • Core barrel in active fuel region • Lower core support plate • Lineal inches cut - 23,251	• Abrasive water • MDM cutting	• Worker exposure • Airborne contamination • Waste form and disposal costs • Cavity cleanup requirements • Schedule
San Onofre, Unit 1 (in progress)	1.2×10^{16} (330,000)	0.73 (73)	• Core region of the core barrel • Core baffles/formers • Lower core support plates • Lineal inches cut - 10,821	• Abrasive water • MDM cutting	
Maine Yankee (in progress)	Not available	(actual to date) 0.24 (24)	• Upper guide structure • Upper core barrel • Core support barrel • Mid-core region • Thermal shield • Lineal inches cut - 14,000	• Abrasive water jet (AWJ) • Conventional machining	• Avoid thermal processing • Use AWJ and conventional machining vs. plasma arc and MDM/EDM to reduce the occupational dose • Modeled all the cuts in a 3D CAD system before actually performing any of the dismantlement • Segregating, capturing, and confining AWJ cutting waste • Solid waste collection system • Cavity water treatment system • Much Maine Yankee dismantlement done under water and remotely, which cut down the worker dose • Abrasive Feed Assist System (patent pending) • Underwater AWJ Vision Enhancement - remote operability (patent pending) • Minimized amount of secondary waste • For underwater equipment, a maintenance and reliability issue • Sequence of cuts (low to high activity) reduced occupational exposure
Big Rock Point (in progress)	Not available	Not available	N/A	N/A	

Table G-12. (contd)

Nuclear Plant	Total Bequerels (Curies) Removed	Personnel Exposure (person-rem)	Segmented components/ Lineal inches cut	Cutting Methods	Considerations for Planning and Implementation
Trojan (completed)	74,000 (2,000,000)[a]	0.72 (72)	N/A	N/A	• Used the fuel transfer crane to lift the reactor vessel and place in the container • Removed reactor vessel with internals intact • The internals were grouted in place with low-density cellular concrete • Placed the reactor vessel on a heavy haul trailer for road transport to the rail • Shipped the reactor vessel with internals to U.S. Ecology, Richland, WA • Eliminated 74,000 Bq (2 million curies) from the Trojan nuclear facility site

(a) The Trojan plant reactor vessel was removed and shipped intact to the disposal facility; reactor vessel internals were not removed as in the other plants listed in this table.

Tables G-11 and G-12 list available data regarding the distribution of the cumulative collective worker dose among the major types of activities that would occur during a typical decommissioning process. The lack of resolution in much of the data and the small number of facilities involved (10) precludes a detailed analysis. However, it appears that the largest share of occupational doses might be expected for three general classes of activities: (1) large component removal (reactor vessel, steam generators), (2) removal of other plant systems, structures, and components, and (3) the remaining general decontamination activities. Data for removal of the reactor vessel (Table G-12) indicate that the choice of removal method (i.e., intact or segmented) may influence the collective dose associated with the operation. Data for plants electing the SAFSTOR alternative were not substantially different from plants undergoing more immediate DECON. The one exception was at Humboldt Bay, where the plant was maintained in a shutdown condition over an extended period of time. In that case, SAFSTOR activities accounted for a relatively large fraction of the total estimated occupational dose. In all cases, the estimated cumulative doses through the end of decommissioning for these plants were within the estimates presented in the 1988 GEIS (NRC 1988).

G.2.2 Dose to Members of the Public

Doses to members of the public from power reactor effluents were summarized in a series of NRC reports entitled *Dose Commitments Due to Radioactive Releases from Nuclear Power Plant Sites*. The last volume published covers reactor operations during 1992 (NUREG/CR-2850, Baker 1996). Radioactive material is released in gaseous (airborne, and may contain particulates, such as radioiodine) and liquid (aqueous) effluents under stringently controlled conditions in accordance with technical specifications and NRC regulations. The term “dose commitment” indicates that the reported doses come from the inhalation and ingestion of radionuclides, as well as from external radiation from noble gases. The population dose caused by direct radiation from plant facilities is negligible. Table G-13 presents results obtained for the 18-year period ending in 1992. The public doses represent collective person-rem received by those who live within an 80-km (50-mi) radius of a site; data for individual sites also appear in this report. The population dose within 80 km (50 mi) of each plant is calculated for each operating reactor in the United States. The total collective dose is then obtained by combining the doses received by these populations. As with the occupational doses, collective dose to the public from reactor effluents has been decreasing steadily since the mid-1980s. The collective dose to members of the public is smaller by several orders of magnitude than the dose to plant workers.

Data on maximally exposed individuals from gaseous effluents is also reported annually to the NRC by each nuclear utility. Data for the period 1985-1987 were compiled in NUMARC (1989) and summarized in NRC (1996). A summary of the data is presented in Table G-14.

Inspection of this table reveals that the maximum doses to individuals via gaseous effluents are on the order of a few mrem per year, and the dose to an individual is orders of magnitude lower for most plants.

Table G-13. Summary of Collective Public and Occupational Doses for All Operating Nuclear Power Facilities Combined[(a)]

		Collective Public Dose, person-rem			
Year	**Number of Operating Reactors[(b)]**	**Liquid Effluents**	**Gaseous Effluents**	**Total**	**Average per reactor-yr, person-rem**
1975	44	76	1300	1300	30
1976	52	82	390	470	9.0
1977	57	160	540	700	12
1978	64	110	530	640	10
1979	67	220	1600	1800	27
1980	68	120	57	180	2.6
1981	70	87	63	150	2.1
1982	74	50	87	140	1.9
1983	75	95	76	170	2.3
1984	78	160	120	280	3.6
1985	82	91	110	200	2.4
1986	90	71	44	110	1.2
1987	96	56	22	78	0.81
1988	102	65	9.6	75	0.74
1989	107	68	16	84	0.79
1990	110	63	15	78	0.71
1991	111	70	17	88	0.79
1992	110	32	15	47	0.43

(a) Collective public dose calculated for those living within an 80-km (50-mi) radius of a nuclear plant site.
(b) Includes plants in operation at least 1 full year at the end of the reporting year.
Source: NUREG/CR-2850 (Baker 1996).
Note: To convert person-rem to person-sievert, multiply by 0.01.

Table G-14. Estimated Doses to the Maximally Exposed Individual from Routine Gaseous Effluents from Operating Facilities, mrem[(a)]

	1985	1986	1987
Average	2.8E-01	2.6E-01	9.1E-02
Minimum	7.8E-04	4.9E-04	1.0E-06
Maximum	1.8E+00	4.3E+00	8.9E-01
Number of plants reporting	26	33	34

(a) Data compiled from reports submitted to the NRC by each nuclear utility.
Adapted from NUMARC (1989).
Note: To convert millirem to millisievert, multiply by 0.01.

A comparison of more recent effluent release rates from both operating and decommissioning facilities (Table G-15) indicates that the gaseous release rates for many types of effluents are similar. Decommissioning facilities reported no emissions of radioiodine in their gaseous effluents, which would be as expected after the plants are shut down and defueled. Most of the iodine isotopes are short-lived and are not present in plants that have been out of operation for any length of time. Releases of longer-lived fission gases and particulate materials in gaseous effluents continue after the end of operation because of the need to maintain plant ventilation systems during activities associated with the decommissioning process. Radionuclide emissions in liquid effluents were typically lower in the shutdown facilities because the reactor core cooling systems were not operating, and the levels of radionuclides in circulating water systems needed to maintain the spent fuel pool are lower than in primary coolant for an operating plant.

Recent DEs to members of the public from emissions at operating and decommissioning facilities were similar, and the doses from gaseous effluents were within the ranges published in NRC (1996) for operating facilities. Both individual and collective doses were very low for liquid and gaseous effluents. Although information was available for a relatively small sample of facilities, there does not appear to be any reason to project substantial increases in emissions or public doses from reactors undergoing decommissioning compared to the levels experienced during normal operation of those facilities.

Table G-15. Summary of Effluent Releases Comparison of Operating Facilities and Decommissioning Facilities

Operating Reactors						
Reactor Type	**PWR**			**BWR**		
	Average	**Max**	**Min**	**Average**	**Max**	**Min**
Capacity (MWe)	829	912	760	972	1154	786
Gaseous Effluents - Total (Ci)	5.8E+01	1.5E+02	4.0E-01	9.3E+01	1.7E+02	1.2E+01
Fission and Activation Gases (Ci)	4.4E+01	1.4E+02	7.5E-02	8.3E+01	1.6E+02	1.5E+00
Iodines (Ci)	6.4E-07	1.3E-06	0	2.3E-03	5.1E-03	0
Particulates (Ci)	1.9E-05	3.8E-05	3.3E-07	8.9E-04	1.6E-03	3.0E-04
Gross Alpha (Ci)	--	--	--	--	--	--
Tritium (Ci)	1.4E+01	3.7E+01	3.2E-01	1.0E+01	1.2E+01	6.2E+00
Liquid Effluents - Total (Ci)	5.2E+02	6.7E+02	4.2E+02	1.2E+01	1.9E+01	6.9E+00
Fission and Activation Products (Ci)	1.6E-01	3.7E-01	8.5E-02	6.2E-02	9.4E-02	1.2E-02
Tritium (Ci)	5.2E+02	6.7E+02	4.2E+02	1.2E+01	1.9E+01	6.9E+00
Dissolved and Entrained Gases (Ci)	1.0E-01	3.8E-01	2.2E-04	4.3E-03	6.7E-03	1.8E-03
Gross Alpha (Ci)	1.2E-03	1.9E-03	4.4E-04	2.4E-06	3.8E-06	0

Decommissioning Reactors						
Reactor Type	**PWR**			**BWR**		
	Average	**Max**	**Min**	**Average**	**Max**	**Min**
Capacity, MWe	970	1080	860	65	67	63
Gaseous Effluents - Total (Ci)	2.1E+01	4.0E+01	2.6E+00	1.1E+02	2.1E+02	1.2E+00
Fission and Activation Gases (Ci)[(a)]	1.6E+01	1.6E+01	1.6E+01	2.1E+02	2.1E+02	2.1E+02
Iodines (Ci)	--	--	--	--	--	--
Particulates (Ci)	0	0	0	1.0E-04	2.0E-04	0
Gross Alpha (Ci)	--	--	--	0	0	0
Tritium (Ci)	1.3E+01	2.4E+01	2.6E+00	1.2E+00	1.2E+00	1.2E+00
Liquid Effluents - Total (Ci)	7.8E-01	1.4E+00	1.2E-01	3.3E-01	1.3E+00	1.0E-03
Fission and Activation Products (Ci)	3.5E-02	6.7E-02	2.6E-03	3.3E-01	1.3E+00	2.0E-04
Tritium (Ci)	7.4E-01	1.4E+00	1.2E-01	9.5E-04	1.1E-03	8.0E-04
Dissolved and Entrained Gases (Ci)	--	--	--	--	--	--
Gross Alpha (Ci)	0	3.0E-05	0	0	0	0

(a) The average, maximum, and minimum values for this radionuclide category are identical within each reactor type because only one facility of each type reported detectable emissions. Other facilities either did not report emissions for this category or indicated that emissions were below detection limits and, therefore, were not included in the calculation.

G.3 References

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, “Standards for protection against radiation.”

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

40 CFR 61. Code of Federal Regulations, Title 40, Protection of Environment, Part 61, “National emissions standards for hazardous air pollutants; regulations of radionuclides.”

40 CFR 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, “Environmental radiation protection standards for nuclear power operations.”

Baker, D.A. 1996. *Dose Commitments Due to Radioactive Releases from Nuclear Power Plant Sites in 1992*. NUREG/CR-2850, vol. 14, NRC, Washington, D.C.

International Atomic Energy Agency (IAEA). 1992. *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards*. Technical Reports Series No. 332. IAEA, Vienna, Austria.

International Council on Radiation Protection (ICRP). 1977. "Recommendations of the International Commission on Radiological Protection," *Annals of the ICRP* 1(3), ICRP Publication 26, Pergamon Press, New York.

International Council on Radiation Protection (ICRP). 1983. “Nonstochastic Effects of Ionizing Radiation,” *Annals of the ICRP* 14(3), ICRP Publication 41, Pergamon Press, New York.

International Council on Radiation Protection (ICRP). 1985. "Statement from the 1985 Paris Meeting of the ICRP." *Health Physics* 48: 828.

International Council on Radiation Protection (ICRP). 1991. “Recommendations of the International Commission on Radiological Protection,” *Annals of the ICRP* 21(1-3), ICRP Publication 60, Pergamon Press, New York.

National Academy of Sciences (NAS), National Research Council, Advisory Committee on the Biological Effects of Ionizing Radiation. 1972. *The Effects on Populations of Exposure to Low Levels of Ionizing Radiations* (BEIR-I). NAS, Washington, D.C.

National Academy of Sciences (NAS), National Research Council, Advisory Committee on the Biological Effects of Ionizing Radiation. 1980. *The Effects on Populations of Exposure to Low Levels of Ionizing Radiation: 1980* (BEIR-III). NAS, Washington, D.C.

National Academy of Sciences (NAS), National Research Council, Advisory Committee on the Biological Effects of Ionizing Radiation. 1990. *Health Effects of Exposure to Low Levels of Ionizing Radiation* (BEIR-V). NAS, Washington, D.C.

National Council on Radiation Protection and Measurements (NCRP). 1987. *Recommendations on Limits for Exposure to Ionizing Radiation*. Report No. 91, NCRP, Bethesda, Maryland.

National Council on Radiation Protection and Measurements (NCRP). 1991. *Effects of Ionizing Radiation on Aquatic Organisms*. Report No. 109, NCRP, Bethesda, Maryland.

Nuclear Management and Resources Council (NUMARC). 1989. *Study of Generic Environmental Issues Related to License Renewal*. NUMARC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1977. *Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable*. NRC Regulatory Guide 8.10, Rev. 1R, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1978. *Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Reasonably Achievable*. NRC Regulatory Guide 8.8, Rev. 3, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997. *Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Facilities*. NUREG-1496, Vol. 1, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1999*. NUREG-0713, vol. 21, NRC, Washington, D.C.

G.4 Related Documents

Connecticut Yankee Atomic Power Company, Docket No. 50-213, CY-01-076. Letter from Noah W. Fetherston, Connecticut Yankee Atomic Power Company, to U.S. Nuclear Regulatory Commission. "Response to NRC Request for Additional Information to Support GEIS Supplement." April 25, 2001.

Entergy. 2000. Entergy, Arkansas Nuclear One - Units 1 and 2 - Annual Radioactive Effluent Release Report for 1999.

Maine Yankee, MN-01-009, RA-01-033. Letter from Thomas L. Williamson to Dino Scaletti, U.S. Nuclear Regulatory Commission. "Request for Information to Support GEIS Supplement." March 21, 2001.

Sacramento Municipal Utility District, Docket 50-312. Letter from Sacramento Municipal Utility District to Dino Scaletti, U.S. Nuclear Regulatory Commission. "Request for Information to Support GEIS Supplement." January 31, 2001.

Southern California Edison. Letter from A. Edward Scher to Dino Scaletti, U.S. Nuclear Regulatory Commission. "Request for Information to Support GEIS Supplement." February 5, 2001.

Southern Company. 2000. Southern Company, E.I. Hatch Nuclear Plant Units 1 & 2, Annual Report - Plant Radioactive Effluent Releases, January 1, 1999 - December 31, 1999.

Appendix H

Summary of Environmental Impacts from Decommissioning Activities

Appendix H

Summary of Environmental Impacts from Decommissioning Activities

This appendix provides two tables that summarize findings from the analysis of the environmental impacts from decommissioning of permanently shutdown nuclear reactors. Table H-1 shows those issues and decommissioning activities that have no environmental impacts. Licensees may conduct these activities without further consideration of the potential environmental impacts. Table H-2 presents each environmental issue that was evaluated, provides the activities that were determined potentially to have environmental impacts, and then states whether the impacts related to the issue's associated activities were determined to be generic or site-specific for all variables. The significance level is identified and a short discussion of the finding is provided on the right-hand side of the table. Section 4.1 defines the significance levels and explains the distinction between generic or site-specific issues.

Table H-1. Issues and Activities with No Environmental Impacts

Issue	Activity
Onsite/Offsite Land Use	Remove fuel Organizational changes Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlment phases of DECON, SAFSTOR, and ENTOMB1 System dismantlement Entombment Transportation License termination activities
Water Use	Remove fuel • Drain primary system • Process liquid Organizational changes • Adjust site training • Changes to licensing basis - site-specific Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large component removal • Steam generator and other large components intact or cut up Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination (surface/specific components) • Decontaminate piping inside walls • Remove contaminated soil from specific areas • Do preventive and corrective maintenance on SSCs • Maintain the security system • Maintain effluent and environmental monitoring programs

Table H-1. (contd)

Issue	Activity
Water Use (contd)	System dismantlement Entombment • Install engineered barriers • Disconnect operational systems (e.g. electrical and fire protection) • Remove all radioactive material that is outside of containment • Place material inside containment LLW packaging and storage Transportation License termination activities
Water Quality	Organizational changes Stabilization • Isolate SSCs that are no longer required • Rewire site to eliminate unneeded electrical circuits Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large Component Removal Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination (surface/specific components) • Decontamination of piping inside walls • Remove contaminated soil from specific areas • Do preventive and corrective maintenance on SSCs • Maintain the security system • Maintain effluent and environmental monitoring programs System dismantlement Structure dismantlement • Removal of structures Entombment LLW packaging and storage Transportation License termination activities

Table H-1. (contd)

Issue	Activity
Air Quality	Remove fuel Organizational changes • Reduce staff • Adjust site training • Change licensing basis - site-specific Stabilization Rewire site to eliminate unneeded electrical circuits Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large component removal Storage preparation activities for SAFSTOR • De-energize systems, put in monitors where they are needed • Perform a radiological assessment Storage (SAFSTOR) • Monitor systems and radiation levels etc. • Do preventive and corrective maintenance on SSCs • Maintain the security system Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination (surface/specific components) • Decontamination of piping inside walls • High-pressure water sprays of surface • Remove contaminated soil from specific areas • Do preventive and corrective maintenance on SSCs • Maintain the security system System dismantlement Entombment • Disconnect operational systems (e.g., electrical and fire protection) • Remove all radioactive material that is outside of containment • Place material inside containment LLW packaging and storage License termination activities

Table H-1. (contd)

Issue	Activity
Aquatic Ecology	Remove fuel Organizational changes Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large Component Removal Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 System dismantlement Structure dismantlement • Rubblization Entombment LLW packaging and storage Transportation License termination activities
Terrestrial Ecology	Remove fuel Organizational changes Stabilization • Drain and flush system • Isolate SSCs that are no longer required Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination (surface/specific components) • Decontamination of piping inside walls • High-pressure water sprays of surface • Do preventive and corrective maintenance on SSCs • Maintain the security system • Maintain effluent and environmental monitoring programs

Table H-1. (contd)

Issue	Activity
Terrestrial Ecology (contd)	System dismantlement Structure dismantlement • Rubblization Entombment LLW packaging and storage Transportation License termination activities
Threatened and Endangered Species	Remove fuel Organizational changes Stabilization • Drain and flush system • Isolate SSCs that are no longer required Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination (surface/specific components) • Decontamination of piping inside walls • High-pressure water sprays of surface • Do preventive and corrective maintenance on SSCs • Maintain the security system • Maintain effluent and environmental monitoring programs System dismantlement Structure dismantlement • Rubbliztion Entombment LLW packaging and storage Transportation License termination activities
Radiological	Organizational changes • Changes to licensing basis - site-specific Create nuclear island • Reduce the security area to that around the fuel • Change security function • Install or modify chemistry controls

Table H-1. (contd)

Issue	Activity
Radiological (contd)	Storage (SAFSTOR) • Maintain the security system • Maintain effluent and environmental monitoring programs Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Maintain the security system • Maintain effluent and environmental monitoring programs Entombment • Entomb facility in concrete Transportation • Equipment into site • Backfill trucked into site • Nonradioactive waste
Radiological Accidents	Organizational changes • Reduce staff • Employ contractor or other additional staff Stabilization • Isolate SSCs that are no longer required • Rewire site to eliminate unneeded electrical circuits Post-shutdown surveys Create nuclear island Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Remove contaminated soil from specific areas • Do preventive and corrective maintenance on SSCs • Maintain the security system • Maintain effluent and environmental monitoring programs Structure dismantlement • Rubblization Entombment • Install engineered barriers • Disconnect operational systems (e.g. electrical and fire protection) • Remove all radioactive material that is outside of containment

Table H-1. (contd)

Issue	Activity
Radiological Accidents (contd)	• Place material inside containment • Entomb facility in concrete Transportation • Equipment into site • Backfill trucked into site • Nonradioactive waste License termination activities
Occupational Issues	Organizational changes • Reduce staff • Employ contractor or other additional staff • Changes to licensing basis Post-shutdown surveys Create nuclear island • Reduce the security area to that around the fuel • Change security function Storage preparation activities for SAFSTOR • Perform a radiological assessment Storage (SAFSTOR) • Monitor system and radiation levels • Maintain security system • Maintain efficient and environmental monitoring programs Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Maintain the security system • Maintain effluent and environmental monitoring programs Transportation • Equipment into site • Backfill trucked into site • Nonradioactive waste License termination activities • Partial site release

Table H-1. (contd)

Issue	Activity
Cost	Remove fuel • Transfer fuel to spent fuel pool Create nuclear island • Install or modify chemistry controls
Socioeconomic	Remove fuel Organizational changes • Adjust site training • Change licensing basis - site-specific Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large component removal Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 System dismantlement Structure dismantlement Entombment LLW packaging and storage Transportation License termination activities
Environmental Justice	Remove fuel Organizational changes • Adjust site training • Change licensing basis - site-specific Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large components removal Storage preparation activities for SAFSTOR Storage (SAFSTOR)

Table H-1. (contd)

Issue	Activity
Environmental Justice (contd)	Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 System dismantlement Structure dismantlement Entombment LLW packaging storage Transportation • Move equipment into site • Backfill trucked into site • Nonradioactive waste License termination activities
Cultural Impacts	Remove fuel Organizational changes Stabilization • Drain and flush system • Isolate SSCs that are no longer required Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination (surface/specific components) • Decontamination of piping inside walls • High pressure water spray of surface • Do preventative and corrective maintenance on SSCs • Maintain security system • Maintain effluent and environmental monitoring programs System dismantlement Structure dismantlement Entombment LLW packaging and storage Transportation • Equipment into site • Backfill trucked into site • Nonradioactive waste License termination activities

Table H-1. (contd)

Issue	Activity
Aesthetic Issues	Remove fuel Organizational changes Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large component removal Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 System dismantlement Entombment • Disconnect operational systems (e.g. electrical and fire protection) • Remove all radioactive material that is outside of containment • Place material inside containment • Lower ceiling (optional) LLW packaging and storage Transportation License termination activities
Noise	Remove fuel Organizational changes Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large components removal Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 System dismantlement

Table H-1. (contd)

Issue	Activity
Noise (contd)	Entombment • Disconnect operational systems (e.g. electrical and fire protection) • Place material inside containment • Lower ceiling (optional) LLW packaging and storage Transportation License termination activities
Irretrievable Resources	Remove fuel Organizational changes Stabilization Post-shutdown surveys Create nuclear island Chemical decontamination of primary loop Large components removal Storage preparation activities for SAFSTOR Storage (SAFSTOR) Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 Entombment Transportation • Equipment into site License termination activities

Table H-2. Summary of Environmental Impacts

Onsite/Offsite Land Use (4.3.1)
Activities that Could Impact Onsite/Offsite Land Uses
Large Component Removal Structure dismantlement (Laydown yards) LLW packaging and storage
Generic
Yes - For onsite activities for all reactor types No - For offsite activities for all reactor types
Impact and Summary of Findings
• Onsite land use activities - SMALL • Offsite land use activities - site specific

Table H-2. (contd)

Water Use (4.3.2)
Activities that Could Impact Water Use
Remove Fuel • Transfer fuel to spent fuel pool Organizational changes (affects potable water use) • Reduce staff • Employ contractor staff or other additional staff Large Component Removal • Remove reactor vessel and internals Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • High-pressure water spray Structure dismantlement (dust control) Entombment • Lower containment ceiling (dust control) • Entomb facility in concrete
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
All activities related to water use that are identified in this Supplement - SMALL The amount of water used during decommissioning is much less than the amount of water used during operations except for possible short periods of time when potable water use may temporarily increase with staffing levels.

Table H-2. (contd)

Water Quality (4.3.3)
Activities that Could Impact Water Quality
Remove Fuel Stabilization • Drain and flush system Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • High-pressure water spray Structure dismantlement (pH concerns) • Rubblization
Generic
Yes - For surface water and groundwater for all reactor types
Impact and Summary of Findings
All activities related to water quality (surface and groundwater) that are identified in this Supplement except for onsite disposal of demolition debris - SMALL The releases during decommissioning are within the NPDES guidelines.

Table H-2. (contd)

Air Quality (4.3.4)
Activities that Could Impact Air Quality
Organizational changes (additional worker vehicle traffic) • Employ contractor staff or other additional staff Stabilization • Drain and flush system • Isolate system structures and components Preparation for Storage (SAFSTOR) • Reactor coolant system ventilation pathways • Containment ventilation pathways Storage (SAFSTOR) • Maintain effluent and environmental monitoring programs Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Maintain effluent and environmental monitoring programs Structural dismantlement (dust control) Entombment • Install engineered barriers (dust control) • Lower containment ceiling (dust control) • Entomb facility in concrete (vehicle traffic) Transportation
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
All activities related to air quality that are identified in this Supplement - SMALL Any fugitive dust from decommissioning activities are temporary and can be controlled by mitigative measures. Air quality impacts from workers' vehicles and for movement of materials to and from the site are expected to be negligible.

Table H-2. (contd)

Aquatic Ecology (4.3.5)
Activities that Could Impact Aquatic Ecology
Structure dismantlement • Remove structures that were necessary for plant operation (intake structure)
Generic
Yes - For activities within the operational area and reactor types
No - Requires site-specific analysis if the activities are outside the boundaries of the operational area.
Impact and Summary of Findings
Activities within the boundaries of the operational areas - SMALL
Activities outside the boundaries of the operational areas - site-specific

Table H-2. (contd)

Terrestrial Ecology (4.3.6)
Activities that Could Impact Terrestrial Ecology
Stabilization • Rewiring of site to eliminate unneeded electrical circuits (includes repowering from the outside) Large Component Removal Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Remove contaminated soil from specific areas Structure dismantlement • Remove structures that were necessary for plant operation
Generic
Yes - For activities within the operational area and for all reactor types No - Requires a site-specific analysis if the activities are outside the boundaries of the operational areas.
Impact and Summary of Findings
Activities within the boundaries of the operational areas - SMALL Activities outside the boundaries of the operational areas - site-specific

Table H-2. (contd)

Threatened and Endangered Species (4.3.7)
Activities that Could Impact Threatened and Endangered Species
Stabilization • Rewiring of site to eliminate unneeded electrical circuits (includes repowering from the outside) Large component removal Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Remove contaminated soil Structure dismantlement • Remove structures that were necessary for plant operation
Generic
No - Requires a site-specific analysis and continued monitoring of site activities concerning the presence of threatened and endangered species.
Impact and Summary of Findings
A site-specific analysis is required. The appropriate Federal agency (either U.S. Fish and Wildlife Service or the National Marine Fisheries Service) must be consulted about the presence of threatened or endangered species.

Table H-2. (contd)

Radiological (4.3.8)
Activities that Could Have Radiological Impacts
Remove Fuel Organizational changes • Reduce staff • Employ contractor or additional staff • Adjust site training Stabilization Post-shutdown surveys Create nuclear island • Install electrical power to SFP • Move old or install new security-related power Chemical decontamination of primary loop Large component removal SAFSTOR preparation SAFSTOR • Monitor systems and radiation levels • Preventive and corrective measures on SSCs

Table H-2. (contd)

Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination • Decontaminate pipes in walls • High-pressure water sprays • Remove contaminated soil • Preventive and corrective maintenance on SSCs System dismantlement Structure dismantlement Entombment • Install engineered barriers • Disconnect operational systems • Remove radioactive material from outside of containment • Place material inside containment • Lower containment ceiling (optional) LLW packaging and storage Transportation • Large components • LLW License Termination Activities
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
Activities resulting in occupational doses to workers - SMALL Activities resulting in dose to the public - SMALL The long-term radiological aspects of Rubblization or onsite disposal of slightly contaminated material would require a site-specific analysis and would be addressed at the time the license termination plan is submitted.

Table H-2. (contd)

Radiological Accidents (4.3.9)
Activities that Could Impact Radiological Accidents
Remove Fuel Organizational changes • Adjust site training Stabilization • Drain and flush system Chemical decontamination of primary loop Large component removal Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination • Decontamination inside pipe walls • High-pressure water sprays System dismantlement Structure dismantlement • Remove structures necessary for plant operations Entombment • Lower containment ceiling (optional) LLW packaging and storage Transportation • Large components • LLW
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
Activities resulting in accidents with offsite dose consequences - SMALL

Table H-2. (contd)

Occupational Issues (4.3.10)
Activities that Could Have Occupational Impacts
Remove fuel Organizational changes • Adjust site training Stabilization Create nuclear island • Install electrical power supply • Install or modify chemistry controls • Move old or install new security-related power Chemical decontamination of the primary loop Large component removal SAFSTOR preparation Storage (SAFSTOR) • Do preventive and corrective maintenance on SSCs Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Chemical decontamination • Decontaminate piping inside walls • High-pressure water sprays of surface • Remove contaminated soil System dismantlement • Do preventive and corrective maintenance on SSCs Structure dismantlement Entombment Low-level waste packaging and storage Transportation • Large components • LLW License termination activities • Complete final radiation survey
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
All activities related to occupational noise, temperature, ergonomic, and biological hazards if proper ES&H procedures are followed - SMALL

Table H-2. (contd)

Cost (4.3.11)
Activities that Could Have Socioeconomics Impacts
Removal Fuel • Drain primary system • Process liquid Organizational changes Stabilization Post-shutdown surveys Create nuclear island • Install electrical power to SFP • Reduce security area • Change security function • Move old or install new security-related power Chemical decontamination of primary loop Large component removal SAFSTOR preparation SAFSTOR Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 System dismantlement Structure dismantlement Entombment LLW packaging and storage Transportation License Termination Activities
Generic
No - Decommissioning costs are site specific
Impact and Summary of Findings
NA – Evaluation of decommissioning cost is not a NEPA requirement. This information is presented as a summary of actual and predicted decommissioning costs based on available data.

Table H-2. (contd)

Socioeconomics (4.3.12)
Activities that Could Have Socioeconomics Impacts
Organizational changes • Reduce staff • Employ contractor or other additional staff
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
All activities and reactor types - SMALL

Table H-2. (contd)

Environmental Justice (4.3.13)
Activities that Could Impact Environmental Justice
Organizational changes • Reduce staff • Employ contractor or other additional staff Transportation • Large components • LLW
Generic
No - Requires a site-specific analysis. The impacts depend on the location of and circumstances of minority and low-income populations in the vicinity of the plant.
Impact and Summary of Findings
A site-specific analysis is required. The licensee must provide, in their PSDAR submittal, appropriate information related to the issue of environmental justice.

Table H-2. (contd)

Cultural and Historic Impacts (4.3.14)
Activities that Could Have Cultural Impacts
Stabilization Large Component Removal Decontamination and dismantlement phases of DECON, SAFSTOR, and ENTOMB1 • Remove contaminated soil from specific areas
Generic
Yes - For activities within the operational area and reactor types
No - Requires a site-specific analysis if the activities are outside the boundaries of operational areas.
Impact and Summary of Findings
Activities are within the boundaries of the operational areas - SMALL
Activities are outside the boundaries of the operational areas - site specific

Table H-2. (contd)

Aesthetic Issues (4.3.15)
Activities that Could Have Aesthetic Impacts
Structure dismantlement Entombment • Install engineered barriers • Entomb facility in concrete
Generic
Yes - For all decommissioning activities
Impact and Summary of Findings
Visual intrusion would be temporary and would serve to reduce the aesthetic impact of the site for most decommissioning activities - SMALL

Table H-2. (contd)

Noise (4.3.16)
Activities that Could Have Noise Impacts
Structure dismantlement Entombment • Install engineered barriers • Remove radioactive structures outside containment • Entomb facility in concrete
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
Noise levels are easily controlled during most decommissioning activities - SMALL

Table H-2. (contd)

Transportation (4.3.17)
Issues that Could be Impacted by Transportation Activities
Air Quality Radiological Radiological accidents Cost Environmental justice Irretrievable resources
Generic
Yes - For all activities and reactor types
Impact and Summary of Findings
All activities, both radiological and nonradiological, related to transportation that are identified in this Supplement - SMALL

Table H-2. (contd)

Irretrievable Resources (4.3.18)
Activities that Could Impact Irretrievable Resources
System dismantlement Structure dismantlement LLW packaging and storage Transportation • Large components • LLW • Backfill trucked into site • Nonradioactive waste
Generic
Yes - For all decommissioning activities
Impact and Summary of Findings
All activities and options related to irretrievable resources - SMALL

Appendix I

Radiological Accidents

Appendix I

Radiological Accidents

The information below summarizes the review of existing information on accidents at decommissioning nuclear power facilities using the DECON or SAFSTOR option. The ENTOMB option was not included in this review because of the lack of available information; however, accidents would likely be similar to the DECON option during preparation of the facility for entombment. The purpose of this review was to determine the potential accidents that could occur at nuclear power facilities that have permanently ceased operations. When available, the potential offsite doses from these accidents were analyzed to determine which accidents could have the greatest offsite impact. This appendix provides an assessment of the activities conducted during decommissioning and determines whether accidents of greater consequence may occur during those activities.

As indicated in the Introduction to this Supplement, although the staff relies on the Commission's Waste Confidence Proceeding Finding, which states, in part, that there is, "reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant impact for at least 30 yrs beyond the licensed life for operation...of that reactor at its spent fuel storage basin..." (54 Federal Register 39767),[a] the staff has elected to include in this Supplement a discussion of potential accidents related to the storage and maintenance of fuel in a spent fuel pool.

Three sources of information were reviewed to obtain a list of potential accidents and their consequences: (1) U.S. Nuclear Regulatory Commission (NRC) research efforts, including NUREGs, NUREG/CRs, and the 1988 GEIS (NRC 1988), (2) industry-related publications and documents, and (3) licensing-basis documents for the individual plants, such as post-shutdown decommissioning activity reports (PSDARs), decommissioning plans, final safety analysis reports (FSARs) or FSAR-equivalent documents, or environmental reports (ERs) developed by the licensee. A list of documents used for this analysis is provided in Section I.5. Included as well were environmental assessments (EAs), environmental impact statements (EISs), safety evaluations, or emergency exemptions that were written by NRC. Twenty of the 22 plants listed in Chapter 3 were included in the analysis, which was completed in late 1999. Zion, Units 1 and 2, the most recent plants to permanently cease operations, were not included.

(a) The Commission reaffirmed this finding of insignificant environmental impacts in 1999. This finding is codified in the Commission's regulations in 10 CFR 51.23(a).

I.1 Potential Accidents Considered During Decommissioning

Table I-1 contains a list of the accidents that were considered for both pressurized water reactors (PWRs) and boiling water reactors (BWRs) during decommissioning in early studies on safety and the cost of decommissioning PWRs and BWRs (Smith et al. 1978 and Oak et al. 1980, respectively). Both documents also considered several other types of accidents that were determined to be either of low probability or to result in very small releases, as shown in Table I-2. These accidents are listed along with a brief description or discussion of the accidents, as given in Smith et al. (1978) and Oak et al. (1980). The discussion in this section does not evaluate whether the accidents described in Smith et al. (1978) or Oak et al. (1980) should still be considered appropriate to the decommissioning process. As a result of improvements in the technology used for decommissioning, several of the accidents listed in Table I-2 may now be considered to be of a much lower probability or, at the least, to result in much-reduced consequences. For example, the use of a single failure-proof crane significantly reduces the potential for certain postulated spent fuel cask drops or heavy load accidents. Table I-3 provides a comprehensive list of accidents of potential accidents at facilities undergoing decommissioning, including HTGRs and FBRs.

The 1988 GEIS (NRC 1988) also considered accidents that could potentially occur during decommissioning. The list of postulated accidents was developed from the lists given in Smith et al. (1978) and Oak et al. (1980). However, not all accidents contained in these two documents were included in the 1988 GEIS, as shown by the footnote in Table I-1.

The staff conducted a study of spent fuel pool accident risk at decommissioning nuclear power facilities to support development of a risk-informed technical basis for reviewing exemption requests and a regulatory framework for integrated rulemaking (NRC 2001). Earlier analyses in NUREG/CR-4982, *Severe Accidents in Spent Fuel Pools in Support of Generic Issue 82*, (Sailor et al. 1987) and NUREG/CR-6451, *A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants* (Travis et al. 1997) included a limited analysis of the offsite consequences of a severe spent fuel pool accident. As part of its effort to develop generic, risk-informed requirements for decommissioning, the staff performed a further, analysis of the offsite radiological consequences of beyond-design-basis spent fuel pool accidents. The external event initiators included:

- seismic events (earthquakes)
- aircraft crashes
- tornadoes and high winds

Table I-1. Summary of Accidents for PWR and BWR Plants Undergoing Decommissioning Operations[a]

Pressurized Water Reactors	Boiling Water Reactors
Explosion of liquid propane gas leaked from a front-end loader – Explosion ruptures filters and prefilters in the purge exhaust filter banks in containment.	**Explosion of liquid propane gas leaked from a front-end loader** – Used to load concrete rubble in the reactor building. Assumed to occur in building ventilation ductwork and to cause failure of filters and blowers as well as to release radioactive contamination that is deposited on the high-efficiency particulate air (HEPA) filters and in the ductwork.
Explosion of oxyacetylene during segmentation of the reactor pressure vessel – Postulated during segmenting of the reactor pressure vessel in the reactor cavity. Explosion is sufficient to cause failure of the HEPA filter in the contamination control envelope.	**Oxyacetylene explosion** – During use of oxyacetylene cutting torch to remove the activated portion of the reactor vessel in air before segmenting the removed sections under water.
Explosion and/or fire in the ion exchange resin – Explosive release of an ion exchange column in a nuclear waste facility.	--
Detonation of Unused Explosives in the Reactor Cavity[b] – A charge used to scarf the bioshield is detonated when the water spray is turned off, and the blasting mat and contamination control envelope are not in place.	**Detonation of unused explosives** – Assumes that a charge positioned to remove the sacrificial shield explodes when the water sprays are off and the contamination control envelope has been removed.
Fire in contaminated sweeping compound[b] – Sweeping compound is composed of sawdust treated with oil or other additives to enhance pickup of contamination. Postulated to catch fire spontaneously. Contains contamination from the floor surfaces.	**Contaminated sweeping compound fire** – Sweeping compound is composed of sawdust treated with oil or other additives to enhance collection of loose surface contamination. A fire is postulated to occur in used sweeping compound contaminated with radioactive material.
Gross leak during *in situ* decontamination – Leak of 10 times the magnitude of the routine *in situ* decontamination leak for 30 minutes.	**Gross leak during loop chemical decontamination** – A massive failure of reactor piping during loop chemical decontamination is assumed to be low. This accident involves a gross leak about 10 times larger than the spray lead. A total of 1% of the liquid in the system is assumed to be made airborne.
Segmentation of reactor coolant system (RCS) piping with unremoved contamination – Released to the reactor containment building since no contamination-control envelope is assumed to be used.	–

Table I-1. (contd)

Pressurized Water Reactors	Boiling Water Reactors
Loss of contamination control envelope during oxyacetylene cutting of the reactor vessel shell – Molten metal particles penetrate the plastic sheet walls. Release lasts 5 minutes.	**Contamination control envelope rupture** – During oxyacetylene cutting. Molten metal particles penetrate the plastic sheet walls and increase leakage into the reactor building. Assumed to occur during the removal of the reactor vessel. Assumed large leak occurs for 1 hour of cutting before it is detected.
Pressure surge damage to filters during blasting of activated concrete bioshield[(b)]	**Filter damage from blasting surges** – During removal of activated concrete in the sacrificial shield.
Loss of blasting mat during removal of activated concrete[(b)] – Protective blasting mat is lost during blasting, and confinement barriers could be breached.	--
Temporary loss of local airborne contamination control during blasting[(a)] – A contamination control envelope is required in the reactor containment building during the explosive removal of the contaminated concrete in the biological shield. Loss of fine fog spray and contamination control increases the dust made airborne.	--
Loss of integrity of portable filtered ventilation enclosure during segmentation of the steam generators[(b)] – Substantial breach occurs and is readily apparent. Segmenting is promptly terminated. Air flow continues for 10 minutes.	--
Vacuum bag rupture – Metal shards rupture the filter bag and puncture the vacuum cleaner, releasing all the collected material into the air.	**Vacuum filter-bag rupture** – From metal shard, releasing all collected material to the reactor building.
Fire involving contaminated clothing or combustible waste[(b)] – Assumed 1 m^3 (35 ft^3) of combustible waste (absorbent materials such as rags or paper wipes).	**Combustible waste fire** – Assumed 1 m^3 (35 ft^3) of combustible waste (absorbent materials such as rags or paper wipes).
Accidental cutting of contaminated piping – Caused by human error. Assumed pipe is 25 cm (10 in.) or smaller.	--
Accidental spraying of concentrated contamination with the high-pressure spray – Postulated to be in the thermal insulation that has hidden a slow leak for a number of years. Results in an airborne release.	–

Table I-1. (contd)

Pressurized Water Reactors	Boiling Water Reactors
Accidental break of contaminated piping during inspection[(b)] – Occurs during SAFSTOR in reactor building. Pipe is weakened by corrosion and becomes damaged by incidental jostling or hitting of pipe. Assumed not to have been decontaminated *in situ*. Ventilation system is not operating.	--
Minor accidents with closed van	**Minor transportation accident** – Truck collision or overturn with waste containers that may rupture, or a collision and overturn with a minor fire (½ hour or less) involving one Type A waste container.
Moderate accidents with closed van	--
Severe accidents with closed van	**Severe transportation accidents** – Truck collision or overturn and a major fire (1 hour or longer) involving 40 Type A waste containers.

(a) All accidents listed are from Smith et al. (1978) and Oak et al. (1980).
(b) These accidents were not included in the 1988 GEIS (NRC 1988).

- compression or buckling of stored assemblies from the impact of a dropped heavy load (such as a fuel cask)
- loss of neutron absorber plates that separate the stored assemblies.

The results of the staff's analysis is presented in Section I.2.

The accidents and malfunctions considered in licensing documents were divided into subgroupings within five main categories:

- fuel-related accidents, which center around the storage of fuel in the spent fuel pool
- other radiological, non-fuel-related accidents, which include onsite accidents related to decontamination or dismantlement activities (e.g., material-handling accidents or accidental cutting of contaminated piping), or storage activities (e.g., fires or ruptures of liquid waste tanks)
- external events, which include aircraft crashes, floods, tornadoes and extreme winds, earthquakes, volcanic activity, forest fires, lightning storms, freezing, and intruder events

Table I-2. Accidents Considered but Not Evaluated in Smith et al. (1978) and Oak et al. (1980)

Pressurized Water Reactors	Boiling Water Reactors
Accidents involving fuel – Extensively studied and considered in other references. Not unique to or amplified by decommissioning.	--
Temporary loss of local airborne containment control during jackhammer scarfing of concrete surfaces – Manual operation, so the loss of local airborne containment is readily apparent to operator. Operation is suspended before significant release occurs.	--
Dropping of contaminated concrete rubble – Causing fine particles to become suspended in air. Quantity of such material is assumed to be small since most of the readily suspendible particles are removed during routine operations.	--
Dropping a concrete slab during placement in onsite retrievable waste storage – Precast concrete slab used for top shield and sealing surface is dropped 6 m (20 ft) while it is being placed. Surface particles become airborne, but do not increase routine release significantly and are not considered further in this study.	--
--	**Ion-exchange resin accidents** – Assumes no danger of combustion. Handling accidents appear likely, but would lead to little airborne release because of liquid nature of wastes involved.
Temporary loss of services, such as water, power, or airflow – Constitutes a lesser hazard for airborne releases than other postulated accidents.	**Loss of services, such as water supply, electrical power, or air flow** – Constitutes a lesser magnitude release than other postulated accidents, so no further analysis was made.
Natural phenomena – Reference PWR is designed to withstand effects of natural phenomena. It is assumed that this structural integrity is preserved during decommissioning as long as required for safety. These are low-probability events, e.g., floods, earthquakes, tornadoes, and high winds.	**Natural phenomena** – Reference BWR is designed to withstand the most severe natural phenomena recorded for the site with appropriate margins for uncertainties. Events are of low probability, and impact is less than the impacts calculated for operating BWRs. Includes floods, earthquakes, tornadoes, and high winds.
Aircraft crashes – Probability is low, risk is not escalated by dismantlement operations.	**Aircraft crashes** – Probability is low and risk of damage is low and not escalated by dismantlement operations.
--	**Man-caused events** – Covers wide spectrum of magnitude, ranging from releases induced by casual trespassers to releases induced by armed terrorists. Detailed analysis beyond scope of study.

- offsite events, which consist solely of transportation accidents that occur offsite
- hazardous, nonradiological, chemical-related accidents, with the potential for injury to the offsite public either directly from the accident, or as a result of further actions initiated by the accident.

Table I-3 contains the list of accidents as described in the licensing documentation for each of the 20 plants reviewed. The accidents are organized under the five category headings shown above and under subgroup headings that describe a specific type of accident, e.g.,"cask or heavy load handling accidents" or "spent resin accidents." Each of the plants described the accidents they evaluated in a specific way, which may or may not be identical to the subgroup headings. For example, Big Rock Point considered a "loss of spent fuel pool cooling," while the Trojan Nuclear Plant described a similar accident as a "loss of spent fuel decay heat removal without concurrent spent fuel pool inventory loss." The exact descriptions given by the plants were used when available. In some cases, however, a short description was not available, and it was necessary to paraphrase or summarize from a longer discussion of the accident.

Categorizing accidents is not a straightforward process. Frequently, an initiating event causes more than one type of accident. For example, the loss of electric power could cause the loss of spent fuel cooling, resulting in the potential for fuel failure and subsequent offsite release. The same loss of electric power could result in a crane or hoist failure, resulting in a heavy object being dropped either into the spent fuel pool with subsequent failure of fuel cladding, or in a highly contaminated object other than fuel being dropped onto an unyielding surface, causing the release of contamination. The same loss of electric power could affect the ventilation system and result in the loss of high-efficiency particulate air (HEPA) filtration and subsequent release of contamination. Alternatively, a single accident could be caused by multiple types of initiating events. For example, the loss of spent fuel pool coolant could be caused by the loss of offsite power, a break in a pipe (resulting from cutting the wrong pipe), or an external event (such as damage to the pipes from freezing or rupture of the pool during an earthquake) causing the release of the water. Because an effort was made to categorize the accidents as they were described by the licensing documents for each plant, a "loss of offsite power accident" may be the same thing as a "loss of spent fuel cooling accident." In some cases, a single plant would analyze both the loss of offsite power and the loss of spent fuel pool cooling as separate accidents, whereas they both concluded with the same result.

Table I-3. Comprehensive Accident List

Fuel-Related Accidents	Nuclear Plant
Cask or Heavy Load Handling Accident	
Cask drop into spent fuel pool	Haddam Neck
Spent fuel shipping cask drop in the spent fuel pool	Maine Yankee
Spent fuel cask drop	San Onofre, Unit 1
Shipping cask or heavy load drop in fuel element storage well	La Crosse
Heavy load drop (equivalent to spent fuel cask drop) into pool	Big Rock Point
Drop of heavy object (cask) into spent fuel pool	Indian Point, Unit 1
Heavy load drop (equivalent to spent fuel cask drop) into spent fuel pool	Humboldt Bay, Unit 3
Heavy load drop	Fort St. Vrain
Spent Fuel-Handling Accident	
Fuel assembly drop	Haddam Neck
Fuel-handling accident	Trojan
Fuel-handling accident	San Onofre, Unit 1
Fuel-handling accident	Rancho Seco
Spent fuel handling accident	Humboldt Bay, Unit 3
Spent fuel handling event	Yankee Rowe
Fuel-assembly handling accident in the spent fuel pool	Maine Yankee
Spent fuel handling accident in fuel element storage well	La Crosse
Loss of Spent Fuel Pool Cooling	
Loss of spent fuel pool cooling water (caused by loss of offsite power)	Big Rock Point
Loss of fuel pool cooling	Indian Point, Unit 1
Loss of spent fuel pool cooling water	Yankee Rowe
Loss of fuel element storage well cooling	La Crosse
Loss of prestressed concrete reactor vessel shielding water (after fuel has been removed)	Fort St. Vrain
Loss of spent fuel pool decay heat-removal capability	Maine Yankee
Loss of spent fuel decay heat-removal without concurrent spent fuel pool inventory loss	Trojan
Failure of auxiliary electrical systems related to fuel pool cooling	Dresden, Unit 1
Loss of offsite power; limited loss of spent fuel pool cooling	San Onofre, Unit 1
Nonmechanistic loss of cooling and airborne release	Humboldt Bay, Unit 3
Loss of Water from the Spent Fuel Pool	
Loss of spent fuel pool water level	Big Rock Point
Loss of spent fuel pool water (nonmechanistic; earthquake beyond design basis)	Haddam Neck
Loss of spent fuel pool water	Indian Point, Unit 1
Loss of spent fuel pool inventory (loss of heat sink or by inadvertent siphoning)	Maine Yankee
Loss of spent fuel pool water from pool rupture of unknown origin	Humboldt Bay, Unit 3
Loss of cooling water	Yankee Rowe
Fuel pool drain-down	Dresden, Unit 1

Table I-3. (contd)

Fuel-Related Accidents (contd)	Nuclear Plant
Fuel element storage well system pipe break	La Crosse
Loss of spent fuel pool decay heat-removal capability with concurrent spent fuel pool inventory loss	Trojan
Loss of Offsite Power	
Loss of offsite power (resulting in loss of spent fuel cooling)	Big Rock Point
Loss of offsite power (resulting in loss of water from the pool)	La Crosse
Loss of offsite power (resulting in loss of spent fuel pool cooling)	Rancho Seco
Loss of power	Fort St. Vrain
Temporary loss of offsite power (crane or hoist failure)	Trojan
100% Fuel Failure	
100% fuel failure	Indian Point, Unit 1
100% fuel failure	Shoreham
Simultaneous failure of fuel assemblies	Dresden, Unit 1
Criticality	
Inadvertent criticality (misplaced assembly in pool)	Maine Yankee
Criticality, stored spent fuel rearranged from seismic or other events	Humboldt Bay, Unit 3
Accidents Involving Radioactive Materials (Non-Fuel-Related)	
Decontamination-Related Accidents	
Spray release during in situ decontamination of systems	Saxton
Gross leak or accident during in situ decontamination (spray and liquid)	Trojan
Decontamination of liquid spill	Three Mile Island, Unit 2
Decontamination events	Yankee Rowe
Accidental spraying of concentrated contamination with high-pressure spray	Three Mile Island, Unit 2
Concentrated contamination spray	Three Mile Island, Unit 2
Radioactive Material (Non-fuel) Handling Accidents	
Waste container drop	Pathfinder
Waste container drop and rupture (containing activated concrete rubble)	Shoreham
Dropping of filters or packages of particulate material	Trojan
Dropping of contaminated components	Trojan
Dropping of concrete rubble	Fort St. Vrain
Dropping of concrete rubble	Trojan
Packaging events	Yankee Rowe
Materials-handling event	Yankee Rowe
Steam generator load drop inside containment	Trojan
Dropping the reactor pressure vessel	Pathfinder
Dropping steam generator primary module	Fort St. Vrain
Steam generator load drop outside of containment	Trojan

Table I-3. (contd)

Accidents Involving Radioactive Materials (Non-Fuel-Related) (contd)	Nuclear Plant
Dismantlement-Related Accidents	
Contamination release during accidental cutting of contaminated piping	Three Mile Island, Unit 2
Contamination release during accidental break of contaminated piping	Three Mile Island, Unit 2
Loss of engineering controls during dismantlement of reactor cavity	Big Rock Point
Contamination release during dismantlement of main coolant system loop	Yankee
Dismantlement of RCS and safety injection piping without or with loss of local engineering controls	Saxton
Absence of blasting mat during removal of activated concrete	Trojan
Loss of HEPA Filters	
Rupture of contamination-control envelope; release of contamination on HEPA filter	Shoreham
HEPA filter failure	Three Mile Island, Unit 2
Loss of integrity of portable filtered ventilation enclosure	Trojan
Pressure-surge damage to filters during blasting of activated concrete bioshield	Trojan
Temporary loss of local airborne contamination control during blasting	Trojan
Temporary loss of local airborne contamination control during scarfing of contaminated concrete surfaces with jackhammer	Trojan
Loss of contamination-control envelope during oxyacetylene cutting of the reactor-vessel shell	Trojan
Radioactive Gas Waste System Leaks	
Leaks and failures in radioactive waste gas system in radwaste decay tanks	Maine Yankee
Leak or failure in radioactive waste gas system	Trojan
Radioactive Liquid Waste Releases	
Liquid waste tanks rupture	Fermi, Unit 1
Storage tank rupture	Three Mile Island, Unit 2
Liquid waste storage vessel failure	Saxton
Postulated radioactive releases due to liquid tank failures	Trojan
Liquid radioactive tank release	Humboldt Bay, Unit 3
Liquid radioactive waste release to lake through cracks in building, earthquake-induced	Fermi, Unit 1
Rupture of spent fuel pool, contents released to bay	Humboldt Bay, Unit 3
Liquid waste discharge pumped to river without sampling	La Crosse
Leaks and failures in radioactive liquid waste system	Maine Yankee
Condensate storage tank contents pumped into ground during in-service leak test (actual event report)	Dresden, Unit 1
Containment Breach (Open Penetration to Containment)	
Containment vessel breach, subsequent loss of contents to air/water	Saxton
Open penetration – unfiltered pathway from containment	Three Mile Island, Unit 2

Table I-3. (contd)

Accidents Involving Radioactive Materials (Non-Fuel-Related) (contd)	Nuclear Plant
Release of helium coolant	Peach Bottom 1
Spent Resin Accidents	
Spent resin handling accident (exothermic reaction during dewatering)	Haddam Neck
Dropped resin vessel during removal from containment building	Saxton
Low-level waste storage accident (resin liner drop)	Maine Yankee
Release of resins from makeup and purification demineralizer	Three Mile Island, Unit 2
Storage of spent resins	Big Rock Point
Explosion and/or fire in ion exchange resins	Trojan
Vacuum Filter Bag Ruptures	
Vacuum filter bag rupture during decontamination of spent fuel pool floor	Saxton
Vacuum filter bag rupture during cleaning of the Reactor Building floor	Shoreham
Vacuum canister failure	Three Mile Island, Unit 2
Loss of Electric Power	
Loss of offsite power	Yankee Rowe
Loss of offsite power	Trojan
Loss of electric power with unknown scenario	Pathfinder
Loss of offsite power affecting HEPA filters, etc.	Saxton
Loss of Compressed Air	
Temporary loss of compressed air	Trojan
Loss of compressed air	Yankee Rowe
Fire	
Fire	Dresden, Unit 1
Fire	San Onofre, Unit 1
Fire	Fort St. Vrain
Fire	Indian Point, Unit 1
Fire events (primarily those that could impact SFP cooling)	Big Rock Point
Fire inside of containment	Three Mile Island, Unit 2
Fire inside reactor vessel	Peach Bottom 1
Fire inside stairwell	Three Mile Island, Unit 2
Fire in D-rings	Three Mile Island, Unit 2
Fire in reactor building or fuel handling building	Pathfinder
Fire in boiler building	Pathfinder
Fire in storage facilities	Yankee Rowe
Fire in intermodel container of waste	Yankee Rowe
Fire in combustible waste stored in yard	Saxton
Fire in low-level radioactive waste storage building	Trojan
Combustible waste fire in 208-L (55-gal) drum container	Shoreham
Contaminated clothing or combustible waste fire	Trojan

Table I-3. (contd)

Accidents Involving Radioactive Materials (Non-Fuel-Related) (contd)	Nuclear Plant
Contaminated sweeping compound fire (sawdust with oil and other additives, used to enhance collection of loose surface contaminants)	Shoreham
Fire or other catastrophic event, initiator for residual sodium release	Fermi, Unit 1
Explosion	
Explosion of liquid propane gas leaked from front-end loader in containment	Trojan
Liquid propane gas explosion on front-end loader	Shoreham
Liquid propane gas explosion caused by an accidental leak on front-end loader used in containment building	Saxton
Oxyacetylene explosion in the containment building while cutting reactor coolant system piping and release of HEPA filter contents within portable enclosure	Saxton
Oxyacetylene explosion and release of HEPA filter contents	Shoreham
Explosion of oxyacetylene during segmenting of reactor vessel shell	Trojan
Explosion event inside vapor container	Yankee Rowe
Explosion inside area warehouse	Yankee Rowe
Explosion of large fuel-oil storage tanks	Humboldt Bay, Unit 3
Detonation of unused explosives in reactor cavity	Trojan
Sodium interaction with water caused by water inflow through a crack in a tank	Fermi, Unit 1
Onsite Transportation Accidents	
Onsite transportation accident	Yankee Rowe
Accidents Initiated in External Events	
Aircraft Crashes	
Aircraft hazards	Big Rock Point
Aircraft crashes	Trojan
Aircraft impact	Yankee Rowe
Floods	
Flood	San Onofre, Unit 1
Flood	Yankee Rowe
Flood	Pathfinder
Flooding	Saxton
External flooding	Big Rock Point
External flooding	Trojan
Site flooding	Dresden, Unit 1
Site flooding	Indian Point, Unit 1
Site flooding	Peach Bottom, Unit 1
Flood, seiches, and tsunamis	Shoreham
Low Water	
Probable minimum water level, from negative lake surge or sieche	Big Rock Point

Table I-3. (contd)

Accidents Initiated in External Events (contd)	Nuclear Plant
Wind	
Tornadoes and extreme winds	Pathfinder
Tornadoes and extreme winds	Trojan
Tornadoes and extreme wind	Yankee Rowe
Tornadoes and extreme wind	Saxton
Tornadoes and wind	Big Rock Point
Wind and tornadoes	La Crosse
Wind and tornado missiles	San Onofre, Unit 1
Tornados and hurricanes	Shoreham
Natural disaster, tornado	Fort St. Vrain
Earthquakes	
Earthquake	Big Rock Point
Earthquake	Indian Point, Unit 1
Earthquake	Pathfinder
Earthquake	Trojan
Earthquake	Saxton
Earthquake	San Onofre, Unit 1
Earthquake	Shoreham
Earthquakes	Yankee Rowe
Seismic events	Dresden, Unit 1
Seismic event	La Crosse
Volcanoes	
Volcanic activity	Trojan
Lightning	
Lightning	Trojan
Lightning	Saxton
Lightning	Yankee Rowe
Forest Fire	
Forest fires	Yankee Rowe
Forest or brush fire	Saxton
Freezing Temperatures	
Freezing temperatures, loss of plant heating	Big Rock Point
Freezing temperatures (actual accident)	Dresden, Unit 1
Physical Security	
Intruder event	Saxton
Physical security breach	Shoreham
Physical security breach	Pathfinder

Table I-3. (contd)

Offsite Transportation-Related Accidents	
Offsite transportation accident	Shoreham
Offsite transportation accident	Yankee Rowe
Transportation accident	Three Mile Island, Unit 2
Truck carrying radwaste – fire	Pathfinder
Truck and two intermodel containers, transportation accident with fire	Saxton
Reactor pressure vessel railroad accident and fire	Pathfinder
Reactor pressure vessel in the river during transportation by rail	Pathfinder
Offsite radiological event (shipment of radioactive materials)	Saxton
Hazardous Nonradiological Chemical Events	
Toxic chemical event (initiation for material handling event)	Saxton
Toxic chemical event	Trojan
Chemical combustion (from sodium-water interaction) and dispersal	Fermi, Unit 1
Toxic chemical event, initiator for fuel-handling event	Trojan

All accidents identified by licensees were included in Table I-3, even if they were just considered without a detailed discussion or analysis of the consequences. A number of accidents were initially considered, but were determined without further analysis to fall under one of the following categories:

- an accident that is not possible or probable – For example, a licensee might consider an aircraft impact as an accident, but state in their documentation that the probability of occurrence is low and, therefore, the accident is not analyzed further.

- an accident may occur, but not result in any type of consequence – For example, during consideration of a flood, the licensee might state that “flooding events do not result in significant radiological release; therefore, public health and safety are not adversely affected,” or in the case of a material-handling event, make a statement such as, “compliance with management programs and quality assurance plan ensure that the probability of occurrence and the consequences do not significantly affect the public health and safety.”

- an accident may occur, but mitigative actions can be taken before any radioactive material is released offsite – For example, during consideration of a seismic event, a statement is made that the facility was designed to accommodate the initiating event, and no damage resulting in a release would occur.

- an accident may occur, but with minimal offsite dose consequences – For example, loss of cooling for a spent fuel pool where the fuel has cooled to a level that would not result in the release of activity for a number of days and where mitigative actions could be taken to ensure that there would be no release of radioactive materials.

Although these accidents were not analyzed in depth, they were considered and, therefore, are included in Table I-3.
Most licensees did not describe the entire scenario that would cause the accident. For example, most documents that discussed the analysis of the release of liquid radioactive waste did not provide an indication of the event that caused the rupture of a liquid waste tank or storage tank. Therefore, it was a simple decision to place this accident in the group of "Liquid Radwaste Releases." However, some licensees did provide a complete scenario, such as a description that the tanks located in the basement were assumed to have been cracked during an earthquake, allowing fluid to leak into the earth and then into an aquifer, finally settling in a nearby lake. This accident could have been grouped by the initiating event (an earthquake) or the consequence (a release of liquid radioactive waste). In such cases, the initiators (or the consequences) are also shown in Table I-3.

In other cases, the accident could easily be placed under more than one heading. For example, one licensee (Trojan Nuclear Plant) analyzed an explosion and/or fire in the ion exchange resins. This accident could have been included under "Explosions," "Fires," or "Spent Resin Accidents." In this case, the last choice was selected. Another example would be the "oxyacetylene explosion and release of HEPA filter contents," which was analyzed by the licensees for the Saxton, Shoreham, and Trojan Nuclear Plants. This accident could have been included under either "Explosions" or "Loss of HEPA filters." In this case, the first choice was selected.

In some cases, the descriptions provide much more information regarding the accident than they do in other cases. For instance, under the heading "Fire," five of the licensees did not give any more detailed description other than they were analyzing a "fire" or "fire events." Other licensees described the location of the fire (inside stairwells, inside boiler buildings, etc.), and the remainder discussed the items that were combusted (contaminated clothing or waste, or contaminated sweeping compound).

Some of the descriptions of the accidents did not give any details regarding the scenario that resulted in offsite dose consequences. These accidents were described as nonmechanistic, i.e., they had no associated scenarios or initiators. For example, three licensees evaluated the simultaneous failure of 100% of the fuel assemblies in the spent fuel pool but gave no reason for the simultaneous failure.

The fuel-related accidents centered around the storage of the spent fuel in the spent fuel pool. The most common fuel-related accidents analyzed include the loss of spent fuel pool cooling (10 facilities), the loss of water in the spent fuel pool (9 facilities), cask or heavy handling (8 facilities), and the spent fuel handling (8 facilities). The accidents listed under "Loss of Offsite Power Accidents" also result in the loss of cooling, the loss of water from the pool, or a handling accident.

The non-fuel-related accidents center around decontamination, dismantlement, or storage-type activities. Decontamination-related activities include *in situ* decontamination and rupture of vacuum-filter bags. Accidents from these activities could include fires that occur in contaminated clothing or sweeping compounds. Dismantlement-related activities include accidental cutting or breaking of contaminated piping or breaching of containment, loss of HEPA filters during cutting or blasting operations, and material-handling accidents, such as dropping of contaminated components, concrete rubble, or spent resins. Dismantlement activities also include the potential for explosions either from front-end loaders or while using oxyacetylene during dismantlement activities. Storage-type activities include storage of non-fuel wastes that could result in liquid waste tank ruptures and explosive gas buildup in ion exchange resins. There is also the potential for fires in buildings or in waste stored inside the facility.

The most common non-fuel-related accidents that involved radioactive material were the fires (20 total accidents from 12 different plants). A fire may be one of the more important accidents to consider for a plant in decommissioning because of the large loading of combustible material resulting from the amount of low-level radioactive waste in the form of wipes, clothing, etc. Fire events included generic listings of "fire," specific listings of locations where the fire might occur (in the boiler building or low-level waste storage buildings) or the material the fire involves (contaminated clothing or contaminated sweeping compounds).

The second most common non-fuel-related accident related to the handling of radioactive (non-fuel) material such as waste containers, filters, concrete rubble, contaminated components, or larger items such as reactor pressure vessels or steam generators (13 accidents identified from 5 separate plants). The third most common radiation-related (non-fuel) accident was from explosions, which comprise 11 accidents from 5 separate plants. These accidents included explosion of liquid propane gas from front-end loaders being used for dismantlement activities and oxyacetylene explosions during dismantlement, which released HEPA filter contents, or during the reactor vessel shell. The fourth most common non-fuel-related accident is the release of liquid radioactive waste from storage tanks. The majority of these accidents resulted from the rupture or failure of a tank storing liquid radioactive waste. However, one of the postulated accidents occurs during the inadvertent pumping or transfer of the liquid radioactive waste to the river without sampling. Another of the postulated accidents in this group was the rupture of the spent fuel pool, with the contents released to a nearby body of water. This accident looked at the offsite dose consequences of the contaminated water being released to

the environment and did not consider the resultant effect on the spent fuel remaining in the now-drained pool (considered a separate accident).

The licensees considered external events, including aircraft crashes into the facility's buildings, floods, low water levels, wind, earthquakes, volcanoes, lightning, forest fires, freezing temperatures, and physical security (intruder-initiated events). Earthquakes or seismic events (11 accidents from 10 plants), site flooding (10 accidents from 10 plants) and tornado or extreme wind (10 accidents from 9 plants) were the most commonly cited.
There is only one subgrouping of transportation-related accidents. Eight potential transportation-related accidents were discussed, ranging from transportation of low-level waste to transportation of large components, such as the reactor pressure vessel.

There were four accidents related to nonradiological, chemical releases that were found in the licensing-basis documentation. Three of the four accidents would result in an offsite release of toxic chemicals, and the fourth would result in a chemical event that would incapacitate the operator of a crane inside the plant, thus initiating a material-handling event.

I.2 Consequences of Potential Accidents

In addition to compiling a comprehensive list of accidents and malfunctions at permanently shutdown facilities, the potential offsite dose consequences were evaluated. The evaluation of dose consequences is necessary for understanding the risk to the public from these accidents. Compared to the potential consequences from an accident at an operating facility, most of the accident consequences for a permanently shutdown facility are small. This section addresses accident consequences both from the accidents obtained from NRC-sponsored research and the accidents found in the licensing documentation.

Table I-4 presents the highest doses in each of four categories of radiological accidents as obtained from licensing-basis documents. The highest doses result from postulated fuel-related accidents and radioactive-material-related accidents. All accidents that were reviewed used conservative assumptions to calculate the offsite dose. For example, some licensees analyzed accidents that considered the 100% failure of fuel by using assumptions that were non-mechanistic to determine the estimated dose.

Information obtained from licensing-basis documents for the fuel-related accidents showed that the highest doses were from the cask or heavy load handling accidents, the accidents that assumed a 100% fuel failure, and the spent fuel handling accidents. Although some of the licensing-basis documents gave calculated doses to the offsite population from the loss of water in the spent fuel pool (Maine Yankee, 2.3 mSv [0.23 rem]; Fort St. Vrain, 0.35 mSv [0.035 rem]) and from the loss of cooling capability to the spent fuel pool (Maine Yankee, 2.2E-5 mSv [0.002 mrem]), the majority of the documents stated that these accidents would

result in no appreciable offsite dose because the accident could be mitigated before offsite-dose consequences could occur.

Table I-4. Highest Offsite Doses Calculated for Postulated Accidents in Licensing-Basis Documents

Accident Description	Nuclear Plant	Offsite Whole-Body Dose, rem
Fuel-Related Accidents		
Cask drop into spent fuel pool	Haddam Neck	0.418
Loss of spent fuel pool inventory (loss of heat sink or by inadvertent siphoning)	Maine Yankee	0.23
Shipping cask or heavy load drop into fuel element storage well	La Crosse	0.186
Loss of prestressed concrete reactor vessel shielding water (after fuel has been removed)	Fort St. Vrain	0.035
100% fuel failure	Indian Point, Unit 1	0.027
Simultaneous failure of fuel assemblies	Dresden, Unit 1	0.016
Spent fuel handling accident	Humboldt Bay, Unit 3	0.013
Fuel-handling accident	Rancho Seco	0.01
Heavy load drop	Fort St. Vrain	0.007
Fuel assembly drop	Haddam Neck	0.0026
Radioactive Material-Related Accidents (Non-Fuel)		
Spent resin handling accident (exothermic reaction during dewatering)	Haddam Neck	0.96
Explosion inside vapor container	Yankee Rowe	0.44
Radioactive liquid waste system leaks and failure	Maine Yankee	0.23
Materials-handling event	Yankee Rowe	0.16
Fire	Fort St. Vrain	0.12
Fire in intermodal container of waste	Yankee Rowe	0.1
Fire in D-rings	Three Mile Island, Unit 2	0.049
Decontamination events	Yankee Rowe	0.039
Liquid radioactive waste released to lake through cracks in building (earthquake-induced)	Fermi, Unit 1	0.02364
Release of resins from makeup and purification demineralizer	Three Mile Island, Unit 2	0.02
External-Events Initiated Accidents		
Natural disaster, tornado	Fort St. Vrain	0.001
Physical security breach	Pathfinder	<0.000001
Offsite Transportation Accidents		
Reactor pressure vessel railroad accident and fire	Pathfinder	0.00014
Truck carrying radioactive waste – fire	Pathfinder	0.000005
Reactor pressure vessel drop into river during transportation by rail	Pathfinder	0.000001
Transportation accident	Three Mile Island, Unit 2	<0.000001

To convert from rem to sievert, multiply by 0.01.

In addition to the licensing-basis documents reviewed, the staff's report *Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants* report (NRC 2001) provides an analysis of the consequences of the spent fuel pool accident risk. As discussed previously, earlier analyses in NUREG/CR-4982, *Severe Accidents in Spent Fuel Pools in Support of Generic Issue 82*, (Sailor et al. 1987) and NUREG/CR-6451, *A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants* (Travis et al. 1997) included a limited analysis of the offsite consequences of a severe spent fuel pool accident occurring up to 90 days after the last discharge of spent fuel into the spent fuel pool. These analyses showed that the likelihood of an accident that drains the spent fuel pool is very low, although the consequences of such accidents could be comparable to those for a severe reactor accident. As part of its effort to develop generic, risk-informed requirements for decommissioning, the staff performed a further analysis of the offsite radiological consequences of beyond-design-basis spent fuel pool accidents using fission product inventories at 30 and 90 days and 2, 5, and 10 years. The accident progression scenarios that lead to large radiological releases following the drainage of a spent fuel pool require many nonmechanistic assumptions. This is because the geometry of the fuel assemblies, and the air cooling flow paths, cannot be known following a major dynamic event that might drain the water from the spent fuel pool. In addition, no credit is taken for preventative or mitigative actions and large uncertainties exist in the source term and consequence calculations. Because of these uncertainties, the staff developed bounding risk curves in NUREG-1738 (NRC 2001) that capture both the frequency and consequences of a beyond-design-basis spent fuel pool drainage event. The risk curves are provided in Figures I-1 and I-2. The results of the study indicate that the risk at spent fuel pools is low and well within the Commission's Quantitative Health Objectives. The risk is low because of the very low likelihood of a zirconium fire even though the consequences from a zirconium fire could be serious.

For the "Other Radioactive Material-Related" accidents (nonfuel), the accident subgroup with the highest estimated offsite dose was 0.96-rem total effective dose equivalent (TEDE) for a spent resin handling accident. The spent resin handling accident is only slightly below the U.S. Environmental Protection Agency's Protective Action Guide (PAGs). Other associated accident scenarios included handling accidents occurring during dewatering, releases from makeup and purification demineralizers, and the dropping of liners. Other categories with significant estimated doses include accidental releases of radioactive liquid wastes, radioactive material (nonfuel) handling accidents, explosions, and fires. However, there was a significant variation in doses within each subcategory. For example, for the radioactive liquid waste release accidents, the estimated doses range from a high of 2.3 mSv (0.23 rem) TEDE for a leak in the radioactive liquid waste system (Maine Yankee) to an estimate of "no dose" for the uncontrolled liquid waste discharge via a tank pumped directly to the river (Humboldt Bay 3).

The external event accidents (aircraft crashes, forest fires, floods, freezing temperatures, low water levels, lightning, earthquakes, volcanoes, and extreme winds and tornadoes) were in all but one case determined by the licensee's analyses either to be of a very low probability of occurrence, to have no dose consequences, to have doses that were bounded by other accidents, or to have doses that were below the U.S. Environmental Protection Agency (EPA) PAGs (EPA 1991). Most of the time, it was indicated that the doses would be significantly less than the EPA PAGs. The one case where an offsite dose was calculated was a tornado event (Fort St. Vrain), which was estimated to result in a whole body, 2-hour dose of 0.0058 mSv (0.0058 rem) and an organ dose (lung) of 0.17 mSv (0.017 rem).

Doses from offsite transportation accidents were very small, ranging from a "no dose" estimate to an estimated 0.0014 mSv (0.00014 rem) for a reactor pressure vessel that was involved in a railroad accident (Pathfinder).

The accident consequences during decommissioning are somewhat time-dependent since some of the radionuclide inventory significantly decreases shortly following shutdown, and then continues to decrease at a slower rate during the entire decommissioning period. This is most pronounced for the fuel-related accidents since some of the radionuclides present in the fuel, such as iodine-131, have a significant impact on the severity of the dose, but have a short half-life and will decay to negligible amounts within a few months following shutdown.

I.3 Correlation of Activities with Potential Accidents During Decommissioning

Activities and hazards at reactor sites following permanent shutdown and defueling may be different from those routinely experienced at an operating reactor; however, there are similarities in decommissioning activities and the activities that take place during refueling and maintenance outages.

Table I-5 lists the activities that characterize the type of actions that are being taken at sites both in DECON and SAFSTOR and compares the activities to the accidents listed in Table I-3, "Comprehensive Accident List." This list of activities was obtained from documentation from the sites that have recently completed, or have recently started, the decommissioning process. The list is divided into activities performed during DECON and SAFSTOR. The decontamination and dismantlement activities were included for those sites that are in SAFSTOR but are performing incremental decontamination and dismantlement. Under DECON, the activities are categorized as having to do with construction; decontamination; contamination control; dismantlement; removal of the vessel, internals, and other large components and systems; radioactive waste management; spent fuel pool; soil remediation;

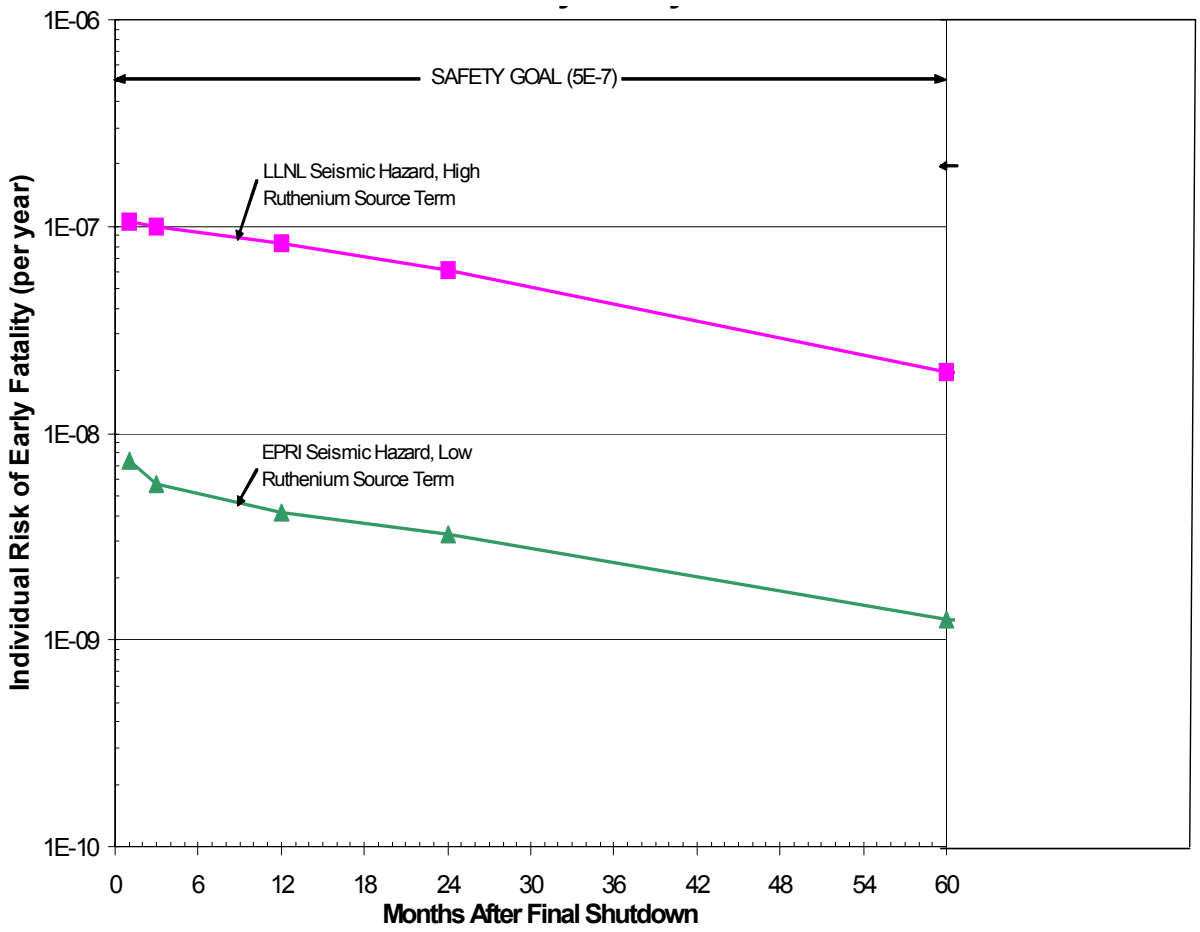

Figure I-1. Individual Early Fatality Risk Within 1 Mile of the Plant After a Beyond-Design-Basis Spent Fuel Pool Drainage Event.

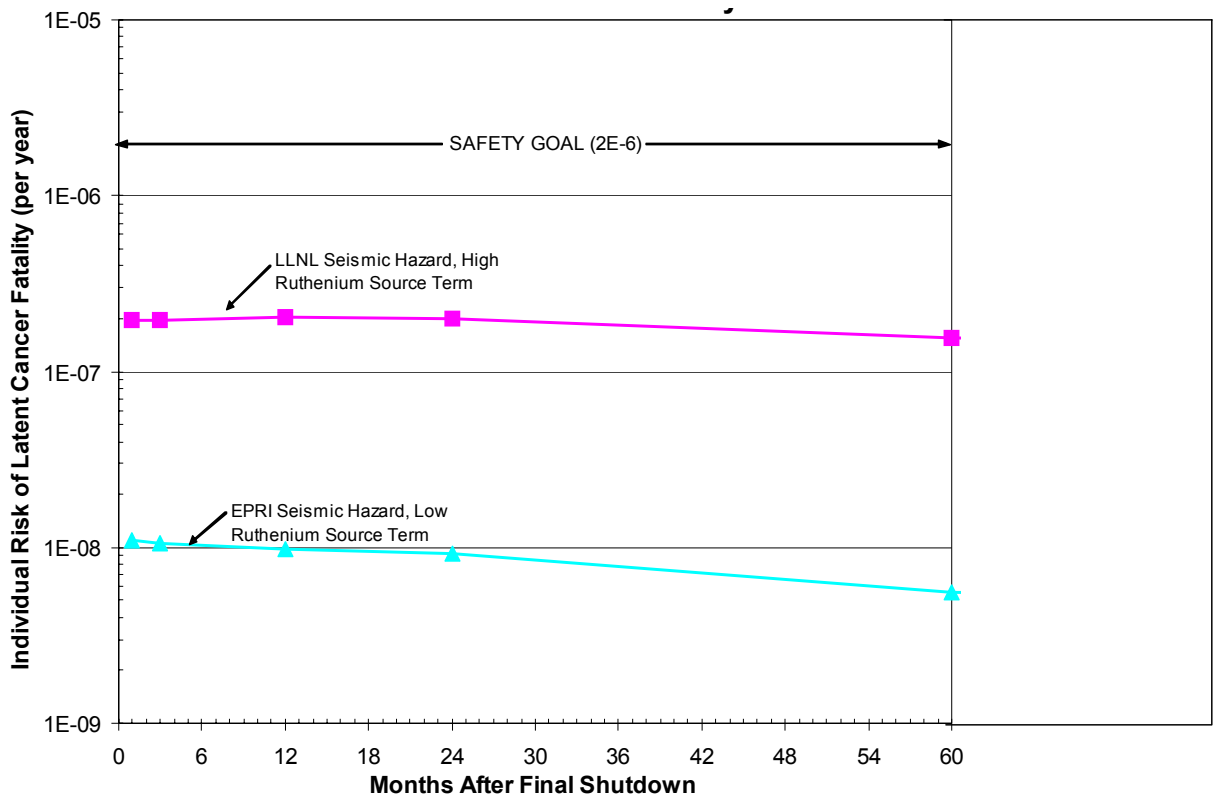

Figure I-2. Individual Latent Cancer Fatality Risk Within 10 Miles of the Plant After a Beyond-Design-Basis Spent Fuel Pool Drainage Event.

and the final radiation survey. For activities that take place during SAFSTOR, activities are simply listed as taking place in preparation for or during SAFSTOR.

For each activity, an assessment was made to determine the accident type that might occur during that activity. In the right-hand column of Table I-5, an associated accident is given, using the subgroup heading used in Table I-3. If an activity was determined not to have the potential for an accident, then it is described as “no accident.” From the comparison of activities to accidents, it was determined that there would be no accident of greater consequence than the accidents already identified.

Table I-5. Comparison of Activities and Accidents During DECON and SAFSTOR

Activities	Associated Accidents
DECON	
Construction and Establishment	
Possible establishment of site construction power site	No accident
Possible establishment of monitoring stations separate from the control room	No accident
Possible construction of independent spent fuel storage installation (ISFSI)	Cask or heavy load handling
Possible establishment of spent fuel pool cooling system that is independent of existing plant systems	Loss of spent fuel cooling
Possible construction of decommissioning support building and utilities	No accident
Possible establishment of radioanalytical facilities	No accident
Possible design and fabrication of special shielding and contamination-control envelopes	No accident
Possible establishment of radiological monitoring stations	No accident
In situ chemical decontamination of primary coolant system	Decontamination-related accidents
Decontamination of outside of large components, facility surfaces, components, and piping surfaces	Decontamination-related accidents
Vacuuming	Vacuum filter bag ruptures
Ultra-high-pressure water lancing	Decontamination-related accidents
Abrasive grit blasting	Decontamination-related accidents
Manual decontamination techniques (handwriting), wet mopping, scrubbing.	Decontamination-related accidents
Painting or applying coatings to stabilize contamination	No accident
Contamination Control	
Bag items to prohibit contamination spread	Fire
Dismantlement	
Remove contaminated piping and tubing - cut and install covers and plugs	Dismantlement-related accidents; fire; hazardous materials accidents
Remove walls	Radioactive material (nonfuel) handling accidents
Demolish buildings	Radioactive material (nonfuel) handling accidents
Concrete removal with impact hammers, saw cutting, and diamond wire cutting	Radioactive material (nonfuel) handling accidents
Abrasive water jet cutting (scabbier) for concrete.	Decontamination-related accidents
CO_2 blasters for concrete	Decontamination-related accidents

Table I-5. (contd)

Activities	Associated Accidents
DECON (contd)	
Metal component dismantlement - saw cutting - power band saws - diamond wire saws - machining - mechanical shearing - manual disassembly - abrasive shell cutting - OD milling machines - torch cutting (thermal methods melt or vaporize surfaces of materials being cut)	Radioactive material (nonfuel) related accidents; dismantlement-related accidents; fire; hazardous materials accidents
Rigging used to remove heavy or awkward sections	Radioactive material (nonfuel)
Small-diameter piping	related accidents; dismantlement-related accidents
Filings collected in catch basins and vacuumed, as needed	Radioactive material (nonfuel) related accidents; vacuum filter bag rupture
Removal of Reactor Pressure Vessel and Internals	
Piping and instrumentation lines cut; interferences removed	Radioactive material (nonfuel) related accidents; dismantlement-related accidents; fire; hazardous materials accidents
Decontaminated, segmented, packaged, and shipped offsite – segmenting included underwater semi-automatic plasma arc and metal disintegration machining equipment	Decontamination-related accidents; radioactive material (nonfuel) related accidents; dismantlement-related accidents; fire; hazardous materials accidents
Remove intact or segment	Radioactive material (nonfuel) related accidents; dismantlement-related accidents; fire; hazardous materials accidents
Intact removal requires - opening in building - grouting of openings created by cutting operations - removal from containment and placement in lay down area - removal of internals - injection of grout into reactor vessel - installation of welded closure caps on all openings - installation of structural members, as necessary - potential welding around reactor vessel.	Radioactive material (nonfuel) related accidents; dismantlement-related accidents; containment breach accidents

Table I-5. (contd)

Activities	Associated Accidents
DECON (contd)	
Removal of Other Large Components (Steam Generators and Pressurize)	
Intact removal or partial segmentation	Dismantlement-related accidents; radioactive material (nonfuel) handling accidents
Cut piping attachments	Dismantlement-related accidents; radioactive material (nonfuel) handling accidents; fire; hazardous materials accidents
Install temporary supports, cut hanger rods	No accidents given
Decontaminate external surfaces	Decontamination-related accidents
Seal-weld openings	
Move vessels horizontally for lifting through removable hatch or new opening in concrete building	Radioactive material (nonfuel) related accidents
Grout if required or segment greater than class C (GTCC) components for storage with the spent fuel	Dismantlement-related accidents; radioactive material (fuel- and nonfuel-related accidents)
Reactor Coolant System	
Decontaminate, segment, and dispose of RCS and other larger-bore piping	Radioactive material (nonfuel) related accidents; dismantlement-related accidents; fire; hazardous materials accidents
Remove and package asbestos insulation	Nonradioactive hazardous materials accidents
Remove turbine control oil	Fire
Remove nonradioactive materials, including fuel oil, lubricating oil, 1,1,1-tricholorethane, laboratory chemicals, lead, mercury, paint, battery acid, asbestos	Fire; nonradioactive hazardous materials accidents
Radwaste Management	
Ship radioactive materials	Transportation accidents
Ship mixed wastes to approved disposal sites	Transportation accidents
Spent Fuel Pool	
Remove spent fuel and GTCC waste	Cask or heavy load handling accidents; spent fuel pool handling accidents
Decontaminate and dismantle spent fuel facility after all spent fuel has been removed	Decontamination-related accidents; dismantlement-related accidents; radioactive material (nonfuel) related accidents

Table I-5. (contd)

Activities	Associated Accidents
DECON (contd)	
Soil remediation	Radioactive material (non-fuel) related accidents
Final radiation survey	No accidents
SAFSTOR	
Preparation for SAFSTOR	
Assess functional requirements for all plant systems, structures, and components for all phases of decommissioning	None
Deactivate systems; dispose of nonessential structures and systems	Radioactive material (nonfuel) related accidents; fire; hazardous materials accidents
Drain and flush plant systems	Decontamination-related accidents; hazardous materials accidents
Decontaminate, as necessary	Decontamination-related accidents
Either lay-up or isolate plant systems, structures, and components no longer required	No accidents
Remove filter elements and demineralizer resin beds	Spent resin accidents
Wet-mopping of clean areas	No accidents
Process, package, and ship liquid and solid radioactive waste generated during plant closure activities	Radioactive material (nonfuel) related accidents; radioactive liquid waste-release accidents; transportation accidents; hazardous materials accidents
Install permanent safety-related electrical power supply to spent fuel pool cooling system	Spent fuel pool cooling accidents
Establish a permanent reactor coolant system vent path (permanent passive venting of RCS to containment atmosphere)	Loss of HEPA filters; fire
Establish a permanent containment vent path	Loss of HEPA filters; fire
Removal of nitrogen gas cylinders	No accidents
Reconfigure the instrument/service air system	No accidents
Make electrical modifications required to de-energize equipment	No accidents
Remove dedicated safe-shutdown diesel and generator	Fire; hazardous materials accidents
Perform an assessment of current radiological conditions	No accidents
SAFSTOR Activities and Tasks	
24-hour guard force	No accidents
Maintain environmental and radiation monitoring program	No accidents
Preventative and corrective maintenance on operating/functional plant systems, structures, and components	No accidents
Maintain structural integrity	No accidents
Process liquid radwaste	Radioactive liquid waste releases
Provide for safe spent fuel storage	Loss of spent fuel cooling accidents

Table I-5. (contd)

Activities	Associated Accidents
SAFSTOR (contd)	
Maintain security systems	No accidents
Maintain radwaste systems	Radioactive gas waste system leaks radioactive liquid waste releases
Maintain heating and ventilation, where necessary	No accidents
Maintain lighting, fire protection, heating, ventilation, and air conditioning, and alarm systems, as required	No accidents
Dispose of nonradioactive hazardous waste	Hazardous materials accidents
Remove unused equipment during SAFSTOR	No accidents
Operate and monitor required systems	No accidents
Limited decontamination of selected structures and systems	Decontamination accidents; hazardous materials accidents
Perform general inspections during annual containment entry	No accidents

I.4 References

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

54 FR 39767. "10 CFR Part 51 Waste Confidence Decision Review." *Federal Register*. September 28, 1989.

64 FR 68005. "Waste Confidence Decision Review." *Federal Register*. December 6, 1999.

Oak, H. D., G. M. Holter, W. E. Kennedy, Jr., and G. J. Konzek. 1980. *Technology, Safety and Cost of Decommissioning a Reference Boiling Water Reactor Power Station*. NUREG/CR-0672, NRC, Washington, D.C.

Sailor, V. L., et al. 1987. *Severe Accidents in Spent Fuel Pools in Support of Generic Safety Issue 82*, NUREG/CR-4982, NRC, Washington, D.C.

Smith, R. I., G. J. Konzek, and W. E. Kennedy, Jr. 1978. *Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station*. NUREG/CR-0130, NRC, Washington, D.C.

Travis, R. J., R. E. Davis, E. J. Grove, and M. A. Azarm. 1997. *A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants*. NUREG/CR-6451, NRC, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1991. *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*, 400-R-92-001, EPA, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0583, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1989. *Regulatory Analysis for the Resolution of Generic Issue 82, "Beyond Design Basis Accidents in Spent Nuclear Fuel Pools."* NUREG-1353, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001. *Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants*. NUREG-1738, NRC, Washington, D.C.

I.5 Licensing Basis Documents

One of the sources of information used in this report was licensing basis documents. The sources of information listed below by nuclear facility were consulted. The documents that are listed have been docketed by the NRC and are publicly available. The docket numbers for the facilities are noted below next to the facility name.

The documents can be obtained one of three ways. First, by accessing the NRC's website the reader can obtain most of the Post-Shutdown Defueling Activities Reports (PSDARs) and License Termination Plans (LTPs) that are cited in this chapter. The address for the decommissioning page on the NRC's website is http://www.nrc.gov/OPA/reports/dcmmssng.htm.

Second, the documents can be obtained from the Public Electronic Reading Room, which provides access to the NRC's new records-management system of publicly available information the Agency wide Documents Access and Management System (ADAMS). Within this system you can access two libraries: the Publicly Available Records System, and that Public Legacy Library.

This system, which was implemented on October 12, 1999, marks a change in the previous practice where records were available only in paper or microfiche copies at either the main NRC Public Document Room in Washington, DC or at 86 local public document rooms at libraries near nuclear power plants and other regulated facilities throughout the United States. Access

to the NRC Public Electronic Reading Room will now be possible from personal computers, including those located in most public libraries.

ADAMS is an electronic information system that allows access to NRC's publicly available documents via the Internet. It permits full text searching and the ability to view document images, download files, and print locally. It also provides a more timely release of information by the NRC and faster access to documents by the public, than before. The reader can obtain the documents cited in this Appendix by providing the facility name (e.g., Trojan) or the docket number cited for each facility as shown at the end of this section, and the name or date of the document.

ADAMS can be accessed via the Internet at the NRC's website using the following URL: http://www.nrc.gov/NRC/ADAMS/index.html. This site contains instructions for installing and running ADAMS as well as information on obtaining assistance during installation or use.

The Public Electronic Reading Room on the NRC Web site at: www.nrc.gov, allows the public to use the Internet to search for any of the records that NRC has already released to the public. This site uses NRC's Agency wide Documents Access and Management System (ADAMS) to search two electronic libraries: the Public Legacy Library and the Publicly Available Records System (PARS) Library. The Public Legacy Library currently has a selection of bibliographic descriptions and some full text files of NRC records released to the public, prior to Fall 1999. Records in this library were copied from the NRC Bibliographic Retrieval System (BRS) and the Nuclear Document System (NUDOCS), the two systems previously used by the public to search for NRC records. Both BRS and NUDOCS will remain available for searching until all the records are in the Legacy Library. The other library, the Publicly Available Records System (PARS) Library, contains all NRC publicly available records released since Fall 1999. The records in the PARS Library are in, both, full text and image and the public can perform full text searches of the database, as well as view, download, and print the files from there.

Third, the NRC Public Document Room (PDR) at NRC Headquarters in Rockville, Maryland (One White Flint North, 20555 Rockville Pike, Washington DC 20555-0001 (1-800-397-4209), has a complete collection of over two million NRC documents released prior to the Fall of 1999 that are still retained as agency documents. The public may view documents at the PDR and there are reference librarians available to help in identifying, retrieving, organizing, and evaluating NRC documents from various resources and formats, including the Public Electronic Reading Room. Members of the public may also access the Electronic Reading Room libraries from computer terminals in the PDR. The PDR also provides reproduction services and, for a fee, the public can order copies of any of the records in the PDR, the Legacy, and the PARS libraries.

Big Rock Point (NRC Docket Number 50-155)

U.S. Nuclear Regulatory Commission (NRC). Undated. Transmittal of Safety Evaluation, Environmental Assessment and Notice of Issuance.

Consumers Energy. February 27, 1995. Big Rock Point Plant Decommissioning Plan.

U.S. Nuclear Regulatory Commission (NRC). 1995. Environmental Assessment by the U.S. Nuclear Regulatory Commission Related to the Request to Authorize Facility Decommissioning of Big Rock Point Nuclear Power Company, Consumers Energy.

U.S. Nuclear Regulatory Commission (NRC). 1995. Safety Evaluation Report by the U.S. Nuclear Regulatory Commission Related to the Request to Authorize Facility Decommissioning of Big Rock Point Nuclear Plant, Consumers Energy.

Consumers Energy. September 19, 1997. Big Rock Point Post-Shutdown Decommissioning Activities Report, Rev. 1.

Consumers Energy. September 19, 1997. Letter from Kenneth P. Powers, Consumers Energy, to the U.S. Nuclear Regulatory Commission. "Big Rock Point Plant - Request for Exemption from 10 CFR 50 Requirements for Emergency Planning."

U.S. Nuclear Regulatory Commission (NRC). February 23, 1998. Letter from NRC to Kenneth P. Powers, Big Rock Nuclear Plant, Consumers Energy Company. "Request for Additional Information Request for Exemption from Offsite Emergency Planning Requirements."

Consumers Energy. February 23, 1998. Request for Addition Information: Request for exemption from offsite emergency planning requirements.

U.S. Nuclear Regulatory Commission (NRC). September 30, 1998. Letter from NRC to Consumers Energy, "Exemption from Certain Requirements of 10 CFR 50.54(q) Regarding Offsite Emergency Planning Activities at Big Rock Point Nuclear Plant and Approval of Defueled Emergency Plan."

Dresden, Unit 1 (NRC Docket Number 50-010)

Commonwealth Edison Company. April 10, 1989. "Dresden Nuclear Power Station, Unit 1, Emergency Plan Response to Request for Additional Information."

U.S. Nuclear Regulatory Commission (NRC). September 3, 1993. Letter from Office of Nuclear Reactor Regulation, NRC, to D.L. Farrar, Commonwealth Edison Company. "Order to Authorize Decommissioning of Dresden Nuclear Power Station, Unit 1, and Amendment No. 37 to License No. DPR-2."

U.S. Nuclear Regulatory Commission (NRC). April 15, 1994. Letter from NRC to M.J. Wallace, Commonwealth Edison Company, "Special Inspection of a Potential Loss of Water from the Dresden Unit 1 Spent Fuel Storage Pool and the Plant's Compliance to the SAFSTOR Decommissioning Plan (Inspection Report No. 50-010/94001)."

U.S. Nuclear Regulatory Commission (NRC). October 20, 1995. Letter from Office of Nuclear Reactor Regulation, NRC, to D.L. Farrar, Commonwealth Edison Company. "Issuance of Amendments."

Commonwealth Edison Company. December 1996. Decommissioning Program Plan for the Dresden Nuclear Power Station Unit 1: Commonwealth Edison Company. Rev. 5.

Commonwealth Edison Company. December 19, 1996. Letter from J. Stephen Perry, Dresden Station, Commonwealth Edison Company, to U.S. Nuclear Regulatory Commission. "Dresden Nuclear Power Station Unit 1 Decommissioning Program Plan, vision 5, NRC Docket Number 50-010." JSPLTR #960245.

U.S. Nuclear Regulatory Commission (NRC). July 8, 1997. "Issuance of Amendment 39." [Includes Technical Specifications and Safety Evaluation.]

Fermi, Unit 1 (NRC Docket Number 50-016)

Detroit Edison Company. September 15, 1986. Letter from Detroit Edison to U.S. Nuclear Regulatory Commission. "Request for Additional Information as Outlined in 10CFR51.45(b) for Fermi 1." VP-86-0118.

U.S. Nuclear Regulatory Commission (NRC). April 1989. The Office of Nuclear Reactor Regulation Safety Evaluation Supporting Amendment No. 9 to Possession-Only License No. DRP-9: Fermi Unit No. 1.

U.S. Nuclear Regulatory Commission (NRC). April 28, 1989. Letter from Office of Nuclear Reactor Regulation, NRC, to W.S. Orser, Detroit Edison Company. "Issuance of Amendment No. 9 to Renew Possession-Only License No. DPR-9 for Fermi Unit 1.

U.S. Nuclear Regulatory Commission (NRC). April 2, 1996. "Inspection Results - Fermi 1."

Detroit Edison Company. August 23, 1996. Letter from Douglas R. Gipson, Detroit Edison Company, to U.S. Nuclear Regulatory Commission. "Enrico Fermi Atomic Power Plant, Unit 1: Annual Report Year Ending June 30, 1996." #NRC-96-0110.

U.S. Nuclear Regulatory Commission (NRC). November 21, 1996. Meeting Summary by U.S. Nuclear Regulatory Commission. "Summary of September 27, 1996, Meeting Regarding Status of Detroit Edison Company's Plans to Decommission its Fermi 1 Facility."

Detroit Edison Company. October 2, 1997. Letter from Douglas R. Gipson, Detroit Edison Company, to U.S. Nuclear Regulatory Commission. "Notification of Changes in Fermi 1 Schedule and Activities." #NRC-97-0110.

Detroit Edison Company. December 15, 1997. Letter from Douglas R. Gipson, Detroit Edison Company, to U.S. Nuclear Regulatory Commission. "Application for a License Amendment – Fermi Safety Analysis Report." #NRC-97-0115.

Fort St. Vrain (NRC Docket Number 50-267)

U.S. Nuclear Regulatory Commission (NRC). October 3, 1991. "Natural Gas Hazards at Fort St. Vrain." NRC Information Notice 91-63.

U.S. Nuclear Regulatory Commission (NRC). November 20, 1992. Letter from NRC to Public Service Company of Colorado. "Environmental Assessment and Finding of No Significant Impact regarding exemption from emergency preparedness requirements of 10 CFR 50.54(q)."

U.S. Nuclear Regulatory Commission (NRC). November 23, 1992. Letter from Office of Nuclear Reactor Regulation, NRC, to A. Clegg Crawford, Public Service Company of Colorado. "Order to Authorize Decommissioning of Fort St. Vrain and Amendment No. 85 to Possession Only License No. DPR-34."

Haddam Neck (NRC Docket Number 50-213)

Haddam Neck Plant Updated Final Safety Analysis Report. October 1995. Section 15.1, pp. 15.1-1 – 15.5-4; Table 15.5-1 (May 1987), 15.5-2 (May 1996), and 15.5-3 May 1987).

Connecticut Yankee Atomic Power Company. August 31, 1996. "Licensee Event Report: Pinhole Leak on Inlet Valve to "A" Residual Heat Removal Heat Exchanger."

Connecticut Yankee Atomic Power Company. August 22, 1997. Cover letter from Connecticut Yankee Atomic Power Company to U.S. Nuclear Regulatory Commission re "Haddam Neck Plant Post Shutdown Decommissioning Activities Report." CY-97-075.

Connecticut Yankee Atomic Power Company. December 18, 1997. Letter from R.A. Mellor, Connecticut Yankee Atomic Power Company, to U.S. Nuclear Regulatory Commission. "Haddam Neck Plant: Additional Information for the Proposed Defueled Emergency Plan." CY-97-121.

U.S. Nuclear Regulatory Commission (NRC). August 28, 1998. Letter from NRC to Connecticut Yankee Atomic Power Company, "Exemption from a Portion of 10 CFR 50.54(q) and Approval of Defueled Emergency Plan at Haddam Neck Plant."

Humboldt Bay, Unit 3 (NRC Docket Number 50-133)

U.S. Nuclear Regulatory Commission (NRC). April 1987. Final Environmental Statement for Decommissioning Humboldt Bay Power Plant, Unit No. 3. NUREG-1166, U.S. Nuclear Regulatory Commission, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). July 1994. SAFSTOR: Decommissioning Plan for the Humboldt Bay Power Plant, Unit 3. Revision 1.

Pacific Gas and Electric. February 27, 1998. Humboldt Bay Power Plant, Unit 3, Post-Shutdown Decommissioning Activities Report.

Indian Point, Unit 1 (NRC Docket Number 50-003)

U.S. Nuclear Regulatory Commission (NRC). October 17, 1980. "USNRC Order to Authorize Decommissioning and Amendment No. 45."

Consolidated Edison Company of New York, Inc. March 28, 1988. Supplemental Environmental Information in Support of Indian Point Unit 1.

Consolidated Edison Company of New York, Inc. August 10, 1989. Letter from A. Clegg Crawford, Consolidated Edison Company of New York, Inc., to Office of Nuclear Reactor Regulation, NRC. "Response to NRC Request for Additional Information on Indian Point Unit 1 Decommissioning."

U.S. Nuclear Regulatory Commission (NRC). June 18, 1993. Letter from Office of Nuclear Reactor Regulation, NRC, to Stephen B. Bram, Consolidated Edison Company of New York, Inc.. "Indian Point Unit 1 Decommissioning Plan Request for Additional Information."

Consolidated Edison Company of New York, Inc. September 20, 1993. Indian Point Unit 1 Decommissioning Plan. Request for Additional Information.

U.S. Nuclear Regulatory Commission (NRC). January 2, 1996. "Approval of Decommissioning Plan and Amendment of License for Indian Point Unit 1, Consolidated Edison Company of New York, Inc."

Consolidated Edison Company of New York, Inc. January 31, 1996. Appendix A to Provisional Operating License DPR-5 for the Consolidated Edison Company of New York, Inc. Amendment No. 45, Indian Point Station Unit No. 1.

U.S. Nuclear Regulatory Commission (NRC). January 31, 1996. Order to Authorize Decommissioning and Amendment No. 45 to License No. DPR-5 for Indian Point Unit No. 1.

U.S. Nuclear Regulatory Commission (NRC). January 31, 1996. Cover letter from Office of Nuclear Reactor Regulation, NRC, to the Consolidated Edison Company of New York, Inc. Indian Point Unit No. 1. "Amendment to Provisional Operating License."

La Crosse (NRC Docket Number 50-409)

U.S. Nuclear Regulatory Commission (NRC). December 23, 1987. Letter from NRC to Dairyland Power Cooperative. "Exempted from Requirement to Conduct 1987 Exercise and Exempted from Requirement to Produce and Distribute Annual Information Brochure to Public."

U.S. Nuclear Regulatory Commission (NRC). April 1, 1988. "Notice of Consolidation of Issuance of Amendment to Facility License."

La Crosse Boiling Water Reactor (LACBWR). May 1991. Decommissioning Plan. Prepared by the LACBWR staff, La Crosse, Wisconsin.

U.S. Nuclear Regulatory Commission (NRC). September 15, 1994. Letter from Office of Nuclear Materials Safety and Safeguards, NRC, to William L. Berg, La Crosse Boiling Water Reactor, Dairyland Power Cooperative. "Confirmatory Order Modifying the August 7, 1991, Decommissioning Order for the La Crosse Boiling Water Reactor."

Dairyland Power Cooperative. December 10, 1996. Letter from William L. Berg, Dairyland Power Cooperative, La Crosse Boiling Water Reactor, to U.S. Nuclear Regulatory Commission. Dairyland Power Cooperative, La Crosse Boiling Water Reactor (LACBWR), Possession-Only License DPR-45, "Annual Decommissioning Plan Revision." LAC-13570.

Pathfinder (NRC Docket Number 50-130)

Northern States Power Company. August 31, 1988. Pathfinder Plant Decommissioning Plan. Northern States Power Company, Minneapolis, Minnesota.

U.S. Nuclear Regulatory Commission (NRC). June 1990. Environmental Assessment of Proposed Final Decommissioning of the Fuel Handling Building and Reactor Building at the Pathfinder Generating Plant.

U.S. Nuclear Regulatory Commission (NRC). June 1990. Safety Evaluation Report on Proposed Final Decommissioning of the Fuel Handling Building and Reactor Building at the Pathfinder Generating Plant.

Peach Bottom, Unit 1 (NRC Docket Number 50-171)

Philadelphia Electric Company. July 1974. Decommissioning Plan and Safety Analysis Report: Peach Bottom Atomic Power Station Unit 1. Docket No. 50-171.

Philadelphia Electric Company. May, 1975. Decommissioning Plan and Safety Analysis Report Revision. Peach Bottom Atomic Power Station, Unit 1.

Rancho Seco (NRC Docket Number 50-312)

Sacramento Municipal Utility District. "Supplement to Applicant's Environmental Report – Post Operating License Stage. Rancho Seco Nuclear Generating Station."

Sacramento Municipal Utility District. Undated. "Technical Specifications to Defueled Rancho Seco Facility - Proposed Amendment 182, Rev. 2."

U.S. Nuclear Regulatory Commission (NRC). February 22, 1991. Letter from Office of Nuclear Reactor Regulation, NRC, to Dan R. Keuter, Rancho Seco Nuclear Generating Station. "Issuance of Exemption to 10 CFR 50.54(q) for the Rancho Seco Nuclear Generating Station and Approval of the Rancho Seco Emergency Plan, Change 4, 'Long Term Defueled Condition'."

Rancho Seco Decommissioning Plan. April 1991. Pp. 3-1 – 10-1, and Glossary, pp. G-1 – G-8; Decommissioning Cost Study for the Rancho Seco Nuclear Generating Station. Prepared by TLG Engineering, Inc. for the Sacramento Municipal Utility District (SMUD), Sacramento, California.

Sacramento Municipal Utility District. May 20, 1991. Letter from Dan R. Keuter, SMUD, to U.S. Nuclear Regulatory Commission. "Proposed Decommissioning Plan." #AGM/NUC 91-081.

Sacramento Municipal Utility District. April 15, 1992. Letter from James R. Shetler, SMUD, to U.S. Nuclear Regulatory Commission. "Response to the Request for Additional Information in Support of the Rancho Seco Decommissioning Plan and Associated Environmental Report." #DAGM/NUC 92-086.

U.S. Nuclear Regulatory Commission (NRC). June 16, 1993. Letter from Office of Nuclear Reactor Regulation, NRC, to James R. Shetler, Rancho Seco Nuclear Generating Station. "Environmental Assessment, Notice of Issuance of Environmental Assessment and Finding of No Significant Impact, Safety Evaluation, and Evaluation of the Decommissioning Funding Plan Related to Request to Decommission Rancho Seco Nuclear Generating Station."

U.S. Nuclear Regulatory Commission (NRC). March 20, 1995. Letter from Office of Nuclear Reactor Regulation, NRC, to James R. Shetler, Rancho Seco Nuclear Generating Station. "Order Approving the Decommissioning Plan and Authorizing Decommissioning of Rancho Seco Nuclear Generating Station and Approval of the Decommissioning Funding Plan."

Sacramento Municipal Utility District. March 18, 1996. Letter from Steve J. Redeker, SMUD, to U.S. Nuclear Regulatory Commission. "Proposed License Amendment No. 192, Updated Cask Drop Design Basis Analysis and Editorial Changes to Load Handling Limit Specification D3/4.3." MPC&D 96-034.

Sacramento Municipal Utility District. October 14, 1996. "Amendment 2 to the Rancho Seco Defueled Safety Analysis Report."

Sacramento Municipal Utility District. January 29, 1997. Letter from Steve J. Redeker, SMUD, to U.S. Nuclear Regulatory Commission. "Rancho Seco Decommissioning Schedule Change." MPC&D 97-006.

Sacramento Municipal Utility District. March 20, 1997. Rancho Seco Post-Shutdown Decommissioning Activities Report, Docket No. 50-312. Rancho Seco Nuclear Generating Station, License No. DPR-54.

San Onofre, Unit 1 (NRC Docket Number 50-206)

San Onofre Nuclear Generating Station, Unit 1. Decommissioning Plan. Vision 0. Southern California Edison Company, Irvine, California, and San Diego Gas and Electric Company, San Diego, California.

San Onofre Nuclear Generating Station, Unit 1. December 1988. San Onofre 1 Final Safety Analysis Report, Updated. Section 15.17, pp. 15.17-1 – 15.18-4, Tables 15.18-1 – 15.18-3, and Figures 15.18-1 – 15.18-4.

Southern California Edison Company. November 23, 1993. Letter from Walter Marsh, Southern California Edison Company, to U.S. Nuclear Regulatory Commission. "Docket No. 50-206, Amendment Application No. 211, Supplement 2, Permanently Defueled Technical specifications, San Onofre Nuclear Generating Station, Unit 1."

Southern California Edison Company. May 12, 1993. Letter from Harold B. Ray, Southern California Edison Company, to U.S. Nuclear Regulatory Commission. "Docket No. 50-206. Amendment Application No. 211, Permanently Defueled Technical Specifications, San Onofre Nuclear Generating Station, Unit 1."

U.S. Nuclear Regulatory Commission (NRC). December 28, 1993. Letter from Office of Nuclear Reactor Regulation, NRC, to Harold B. Ray, Southern California Edison Company. "Issuance of Amendment No. 155 to Facility Operating License No. DPR-13, San Onofre Nuclear Generating Station, Unit No. 1, Permanently Defueled Technical Specifications."

U.S. Nuclear Regulatory Commission (NRC). December 28, 1993. Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 155 to Facility Operating License No. DPR-13. Southern California Edison Company, San Diego Gas and Electric Company, San Onofre Nuclear Generating Station, Unit No. 1, Docket No. 50-206.

Southern California Edison Company. March 7, 1994. "Revision 6.0 to the Site Emergency Plan."

Southern California Edison Company. November 3, 1994. "Proposed Decommissioning Plan, San Onofre Nuclear Generating Station, Unit 1."

Southern California Edison Company. November 29, 1994. "Application for Termination of License."

Southern California Edison Company. August 16, 1996. Letter from Gregory T. Gibson, Southern California Edison Company, to U.S. Nuclear Regulatory Commission. "Unit 1 Spent Fuel Pool Information: San Onofre Nuclear Generating Station, Unit 1."

Saxton (NRC Docket Number 50-146)

GPU Nuclear, Inc. February 16, 1996. "Decommissioning Plan for Saxton Nuclear Experimental Facility." 0301-96-2006.

GPU Nuclear, Inc. February 1998. Updated Safety Analysis Report for Decommissioning the SNEC Facility. Revision 2. Saxton Nuclear Experimental Corporation/GPU Nuclear, Inc., Middletown, Pennsylvania.

GPU Nuclear, Inc. March 3, 1998. Letter from G.A. Kuehn, GPU Nuclear, Inc. to U.S. Nuclear Regulatory Commission. "SNEC Facility Response to Question 7 of the Fourth Request for Additional Information." 6L20-98-20105.

U.S. Nuclear Regulatory Commission (NRC). March 1998. Letter from Office of Nuclear Reactor Regulation, NRC, to G.A. Kuehn, Jr., GPU Nuclear, Inc.. "Environmental Assessment and Finding of No Significant Impact Related to Request to Authorize Facility Decommissioning, Saxton Nuclear Experimental Facility."

U.S. Nuclear Regulatory Commission (NRC). March 1998. Letter from Office of Nuclear Reactor Regulation, NRC, to G.A. Kuehn, Jr., GPU Nuclear, Inc.. "Issuance of Amendment No. 15 to Amended Facility License No. DPR-4 – GPU Nuclear, Inc. and Saxton Nuclear Experimental Corporation."

Shoreham (NRC Docket Number 50-322)

Shoreham Nuclear Power Station. January 15, 1994. Letter from A.J. Bortz, Shoreham Nuclear Power Station, to U.S. Nuclear Regulatory Commission. "Request for Approval of Decommissioning Plan Change: Spent Fuel Storage Pool (SFSP) Decommissioning Shoreham Nuclear Power Station – Unit 1, Docket No. 50-322."

Shoreham Nuclear Power Station. January 1994. Licensee Event Report 93-002, Shoreham Nuclear Power Station – Unit 1, Docket No. 50-322. LSNRC-2143, Shoreham Nuclear Power Station, Wading River, New York.

U.S. Nuclear Regulatory Commission (NRC). February 1993. Updated Decommissioning Plan, Long Island Power Authority, Shoreham Nuclear Power Station. U.S. Nuclear Regulatory Commission, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). September 30, 1993. Letter from NRC to Long Island Power Authority, "Issuance of Exemption from the Emergency Preparedness Requirements of 10 CFR 50.54(q) for the Shoreham Nuclear Power Station, Unit 1. Emergency Assessment and Finding of No Significant Impact."

Shoreham Nuclear Power Station. October 1993. Decommissioning Plan Change Notification: Removal of Reactor Pressure Vessel Bioshield Wall: Shoreham Nuclear Power Station – Unit 1. Docket No. 50-332, Shoreham Nuclear Power Station, Wading River, New York.

Trojan Nuclear Plant (NRC Docket Number 50-344)

Portland General Electric Company. June 18, 1997. Letter from Stephen M. Quennoz, Portland General Electric Company, Trojan Nuclear Plant, to U.S. Nuclear Regulatory Commission. "Response to NRC Request for Additional Information – Reactor Vessel Package."

Portland General Electric Company. June 18, 1997. Trojan Reactor Vessel Dose Analysis. VPN-048-97, Portland General Electric Company, Portland, Oregon.

Portland General Electric Company. March 31, 1997. Trojan Reactor Vessel Package: Safety Analysis Report. PGE-1076, Portland General Electric Company, Portland, Oregon.

Vallecitos Nuclear Center, GE-VBWR (NRC Docket Number 50-018)

Kornblith, L., Jr., E. Strain, and L. Welsh. February 1, 1957. The General Electric Developmental Boiling Water Reactor: Description. SG-VAL 1, General Electric Company, Portland, Oregon.

U.S. Atomic Energy Commission. July 25, 1966. Order Authorizing Dismantling of Facility General Electric Company/Vallecitos Boiling Water Reactor. U.S. Atomic Energy Commission, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). September 30, 1992. Letter from Office of Nuclear Reactor Regulation, NRC, to Gary L. Stimmell, General Electric Company. "Issuance of Amendment No. 16 to Facility License No. TR-1 for the General Electric Test Reactor License."

General Electric Company. August 21, 1995. Letter from G.E. Cunningham, General Electric Company, to U.S. Nuclear Regulatory Commission. "License R-33, Docket No. 50-73, VNC Reactor Facilities Radiological Emergency Plan; October, 1981 (as Revised)."

U.S. Nuclear Regulatory Commission (NRC). April 22, 1996. Letter from Thomas P. Bwynn, Division of Reactor Safety, NRC, to Gary L. Stimmell, General Electric Company, Vallecitos Nuclear Center. "NRC Inspection Report 50-073/96/01; 50-070/96-01; 50-018/96/01; 50-183/96-01.

Yankee Rowe (NRC Docket Number 50-029)

U.S. Nuclear Regulatory Commission (NRC). October 30, 1992. Letter from NRC to Yankee Atomic Electric Company, "Exemption from the Emergency Preparedness Rule 10 CFR 50.54(q) and Approval of the Defueled Emergency Plan at the Yankee Nuclear Power Station."

U.S. Nuclear Regulatory Commission (NRC). August 19, 1993. Letter from Division of Reactor Projects, NRC, to Mr. Jay K. Thayer, Yankee Atomic Electric Company. "Yankee Rowe Inspection 93-05."

Yankee Atomic Electric Company. December 20, 1993. "Decommissioning Plan for Yankee Nuclear Power Station." BYR 93-087.

U.S. Nuclear Regulatory Commission (NRC). December 14, 1994. Environmental Assessment Related to the Request to Authorize Facility Decommissioning: Yankee Nuclear Power Station, Yankee Atomic Electric Company.

U.S. Nuclear Regulatory Commission (NRC). February 2, 1995. "Issuance of Decommissioning Order to Yankee Atomic Electric Company Approving Yankee Nuclear Power Station Decommissioning Plan."

U.S. Nuclear Regulatory Commission (NRC). February 14, 1995. Letter from Office of Nuclear Reactor Regulation, NRC, to James A. Kay, Yankee Atomic Electric Company. "Order Approving the Decommissioning Plan and Authorizing Decommissioning of the Yankee Nuclear Power Station."

U.S. Nuclear Regulatory Commission (NRC). November 5, 1995. Letter from Division of Reactor Safety, NRC, to Russell Mellor, Yankee Atomic Electric Company. "Yankee Rowe Inspection 95-04." NRC Inspection Report 50-029/95-04.

Appendix J

Socioeconomics and Environmental Justice Impacts Related to the Decision to Permanently Cease Operations

Appendix J

Socioeconomics and Environmental Justice Impacts Related to the Decision to Permanently Cease Operations

This appendix presents information on the socioeconomic and environmental justice aspects of selected nuclear power facilities currently in the decommissioning process or that have recently completed the process. This Appendix provides a discussion of the impacts related to the decision to permanently cease operations that are outside the scope of this Supplement (See Section 1.3). The NRC staff reviewed this information to provide additional information related to concerns raised during scoping and Supplement development about Socioeconomic Impacts (Section 4.3.12) and Environmental Justice (Section 4.3.13).

Impact significance is assigned to specific issues as described in 10 CFR Part 51 Subpart A, Appendix B, Table B-1. The impacts are based on the definitions of three significance levels. Unless the significance level is identified as beneficial, the impact is adverse, or in the case of "small," may be negligible. The definitions of significance follow:

SMALL -- For the issue, environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

MODERATE -- For the issue, environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE -- For the issue, environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

J.1 Socioeconomic Impacts

There are two primary pathways through which the decision to permanently cease operations at a nuclear power plant creates socioeconomic impacts on the area surrounding the plant. The first is through direct expenditures in a local community by the plant work force, plus any purchases of goods and services required for plant activities. The second pathway for socioeconomic impact is through the effects on local government tax revenues and services. The impact pathways (direct expenditures and tax revenues) relate specifically to changes in the workforce and population, local tax revenues, housing availability, and public services.

Socioeconomic changes related to direct expenditures in the local community are considered not detectable if there is little or no impact on housing values, education, and other public services, and local government finances are not distinguishable from normal background variation due to other causes. Impacts on housing are considered not detectable when no discernable change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and little or no housing construction or conversion occurs. Detectable impacts result when there is a discernable increase or reduction in housing availability, rental rates and housing values exceed the inflation rate elsewhere in the State, or more than minor housing conversions and additions or abandonments occur. Destabilizing impacts occur when project-related demand results in a very large excess of housing or very limited housing availability, there are considerable increases or decreases in rental rates and housing values, and there is substantial conversion or abandonment of housing units.

Socioeconomic changes related to tax revenues and services (education, transportation, public safety, social services, public utilities, and tourism and recreation) are considered not detectable if the existing infrastructure (facilities, programs, and staff) could accommodate any changes in demand related to plant closure without a noticeable effect on the level of service. Detectable impacts arise when the changes in demand for service or use of the infrastructure is sizeable and would noticeably decrease the level of service or require additional resources to maintain the level of service. Destabilizing impacts would result when new local government programs, upgraded or new facilities, or substantial numbers of additional staff and unsupportable levels of resources are required because of facility-related demand.

The information provided here is based, in part, on data obtained from or about facilities that have completed decommissioning and facilities that are currently being decommissioned. This data was obtained in the areas of workforce and population, local tax revenues, housing availability, and public services. The time period used for was the mid-1960s to 2001.

J.1.1 Changes in Work Force and Population

The size of the work force varies considerably among operating U.S. nuclear power facilities, with the onsite staff generally consisting of 600 to 800 personnel per reactor unit. The average permanent staff size at a nuclear power facility site ranges from 800 to 2400 people, depending on the number of operating reactors at the site. In rural or low-population communities, this number of permanent jobs can provide employment for a substantial portion of the local work force. In addition to the work force needed for normal operations, many nonpermanent personnel are required for various tasks that occur during outages. Between 200 and 900 additional workers may be employed during these outages to perform the normal outage maintenance work. These are work force personnel who will be in the local community only a short time, but during these periods of extensive maintenance activities, the additional

personnel will have a substantial effect on the locality. If the local economy is stable or declining, the result of the reduction in work force related to plant closure could be economic hardships, including declining property values and business activity, and problems for local government as it adjusts to lower levels of tax revenues.

If there is a net reduction in the community work force but the economy is growing, the adverse impacts of this ongoing growth (e.g., housing shortages and school overcrowding) could be reduced. Changes of over 3 percent to a local population in a single year are expected to have detectable effects, while changes of over 5 percent are expected to result in destabilizing impacts. These negative impacts include reduction of school system enrollments, weakened housing markets, and loss of demand for goods and services provided by local business.

The impact from facility closure depends on the rate and amount of population change. If post-closure work begins shortly after shutdown with a large work force, then the impact of facility closure is mitigated. Facilities where layoffs are sudden and there is a long delay before post-closure work begins are likelier to experience negative population-related socioeconomic impacts. Thus, large plants located in rural areas that permanently shut down early and choose the SAFSTOR option are the likeliest to have negative impacts. Considering all variables such as plant size and community size as the same, plants that go into immediate DECON have fewer negative impacts that are less immediate than those of SAFSTOR. The impacts from the ENTOMB option, assuming those preparations were made immediately after shutdown, would also be less significant than those of SAFSTOR.

In only two cases did the corresponding county populations decline around the time of the closure (Indian Point, Unit 1, in Westchester, New York, and Millstone, Unit 1, in New London, Connecticut). However, during the same time period that the host counties experienced population declines, the hosting States also experienced population declines. This suggests that the decline in the county population was most likely part of an overall State population trend. Observing population trends over a decade may not capture small population declines or reductions in the rate of growth from one year to the next; however, longer trends should indicate whether or not the county had any large destabilizing population or housing impacts from the facility closure.

In 18 out of the 20 facility case studies where populations grew, the populations of the counties where the facilities are located increased more rapidly or at the same rate as the State population. The two cases where the populations of the counties grew at a slower rate include relatively rural counties in California (Humboldt and Alameda) during time periods when California as a whole experienced very high urban population growth.

Data was gathered on the changes in workforce at facilities that are currently being decommissioned (i.e., where operations have ceased), where information on operational and

decommissioning workforces was available. This information is shown in Table J-1. The table also shows the total population in the host county at the time of plant shutdown, to indicate the potential importance of the facility closure.

U.S. Census population estimates for the counties that house the closed plants are used to assess population changes around the time of shutdown by comparing percentage changes in county and State populations for the same time periods (Table J-2).

J.1.2 Local Tax Revenues

The tax revenue impacts on the local communities of plant closure vary widely from zero impact (tax-exempt plants) to a loss of 90 percent of the community tax base. The magnitude of tax-related impacts varies primarily by the size of the taxing jurisdiction and the taxing structure of the State in which the plant is sited, as well as certain plant characteristics. All else being equal, the smaller the taxing community (less economically diverse), the greater the tax-revenue impact when the nuclear facility closes down.

In communities where the revenues from the facility made up over 50 percent of the tax revenue base (with the remaining tax revenues made up primarily of private residential real estate), there were significant increases in the tax rates on the remaining real estate as well as cut-backs in services supported by property-tax revenues. The manner in which a State calculates the value of the plant also affects (a) both the amount and timing of tax losses when a nuclear power facility closes and (b) how much such a closure disrupts the tax revenue stream in a given community:

- At one plant, the assessed value of the plant was calculated as a proportional share of the value of the parent corporation, where the percentage is based on the book value of assets in the State (or sub-State taxing jurisdiction) compared with the book value of the assets of the entire corporation. This approach kept the plant at full assessed value for 7 years after its permanent closure until it was dropped from the books of the parent corporation as an asset.

- Tax rules may or may not permit gradual phase-out. In some cases, the taxable asset value of the plants was allowed to phase out over a period of time (3 to 5 years). In other cases, the plants were simply taken off the tax roles in 1 year.

Table J-1. Impact of Plant Closure on Workforce at Nuclear Power Plants Currently Being Decommissioned

Nuclear Plant	Thermal Power	Decommissioning Option[a]	Shutdown Date[b]	Maximum Workforce	Post-termination Workforce	Maximum Workforce Change	County Population
Big Rock Point	240 MW	DECON	08/30/97	--	232	--	24,496 (1997)
Dresden, Unit 1	700 MW	SAFSTOR	10/31/78	--	--	--	--
Fermi, Unit 1	200 MW	SAFSTOR[c]	09/22/72	--	--	--	--
Fort St. Vrain	842 MW	DECON[d]	08/18/89	--	--	--	--
GE-VBWR	50 MW	SAFSTOR	12/09/63	--	--	--	--
Haddam Neck	1825MW	DECON	07/22/96	--	--	--	--
Humboldt Bay, Unit 3	200 MW	SAFSTOR[c]	07/02/76	150	60	90	99,692 (1975)
Indian Point, Unit 1	615 MW	SAFSTOR	10/31/74	--	--	--	--
La Crosse	165 MW	SAFSTOR	04/30/87	82	23	59	25,965 (1987)
Maine Yankee	2700 MW	DECON	12/06/96	481	360	121	31,760 (1997)
Millstone, Unit 1	2011 MW	SAFSTOR	11/04/95	--	--	--	--
Pathfinder	190 MW	SAFSTOR[d]	09/16/67	--	--	--	--
Peach Bottom, Unit 1	115 MW	SAFSTOR	10/31/74	--	--	--	--
Rancho Seco	2772 MW	SAFSTOR[c]	06/07/89	--	200-250	--	--
San Onofre, Unit 1	1347 MW	SAFSTOR[c]	11/30/92	424	295	129	2,723,782 (1997)
Saxton	23 MW	SAFSTOR[c]	05/01/72	--	--	--	--
Shoreham	2436 MW	DECON[d]	06/28/89	–	–	--	1,303,501 (1989)
Three Mile Island, Unit 2	2772 MW	Accident cleanup, followed by storage	03/28/79	1150	125	1125	222,100 (1979)
Trojan	3411 MW	DECON	11/09/92	1319	177-432	887-1142	44,513 (1997)
Yankee Rowe	600 MW	DECON	10/01/91	--	--	--	--
Zion, Unit 1	3250 MW	SAFSTOR	02/21/97	--	--	--	--
Zion, Unit 2	3250 MW	SAFSTOR	09/19/96	--	--	--	--

(a) The option shown in the table for each plant is the option that has been officially provided to NRC. Plants in DECON may have had a short (1 to 4 yr) SAFSTOR period. Likewise, plants in SAFSTOR may have performed some DECON activities or may have transitioned from the storage phase into the decontamination and dismantlement phase of SAFSTOR.
(b) The shutdown date corresponds to the date of the last criticality.
(c) Plant has recently performed or is currently performing the decontamination and dismantlement phase of SAFSTOR.
(d) Plants has completed decommissioning.

Table J-2. County and State Population Changes During Plant Closure and Decommissioning

Nuclear Plant	Reactor Type	Thermal Power	Decommissioning Option	Location	County	County Population	County Population Change, %	State Pop. Change, %
Big Rock Point	BWR	240 MW	DECON	Charlevoix, MI	Charlevoix	24,496 (1997)	6.5	1.7
Dresden, Unit 1	BWR	700 MW	SAFSTOR	Morris, IL	Grundy	28,400 (1975)	14.9	2.8
Fermi, Unit 1	FBR	200 MW	SAFSTOR	Monroe Co., MI	Monroe	126,300 (1975)	12.7	4.1
Fort St. Vrain	HTGR	842 MW	DECON	Platteville, CO	Weld	130,764 (1979)	18	18
GE-VBWR	BWR	50 MW	SAFSTOR	Alameda Co., CA	Alameda	1,071,446 (1975)	2.6	16.4
Haddam Neck	PWR	1825 MW	DECON	Haddam, CT	Middlesex	149,010 (1997)	4.1	4.2
Humboldt Bay, Unit 3	BWR	200 MW	SAFSTOR	Eureka, CA	Humboldt	99,692 (1975)	9.8	25.8
Indian Point, Unit 1	PWR	615 MW	SAFSTOR	Buchanan, NY	Westchester	874,300 (1975)	-2.7	-3.3
La Crosse	BWR	165 MW	SAFSTOR	Genoa, WI	Vernon	25,965 (1987)	6.1	5.7
Maine Yankee	PWR	2700 MW	DECON	Wiscasset, ME	Lincoln	31,760 (1997)	5.8	2.6
Millstone, Unit 1	BWR	2011 MW	SAFSTOR	Waterford, CT	New London	246,959 (1997)	-0.8	-0.5
Pathfinder	BWR	190 MW	SAFSTOR	Sioux Falls, SD	Minnehaha	95,209 (1975)	12.2	3.4
Peach Bottom, Unit 1	HTGR	115 MW	SAFSTOR	Delta, PA	York	272,603 (1975)	13.8	1
Rancho Seco	PWR	2772 MW	SAFSTOR	Sacramento, CA	Sacramento	869,581 (1989)	8.1	8.3
San Onofre, Unit 1	PWR	1347 MW	SAFSTOR	San Clemente, CA	San Diego	2,723,782 (1997)	9	8.3
Saxton	PWR	23 MW	SAFSTOR	Saxton, PA	Bedford	42,353 (1975)	10.7	1
Shoreham	BWR	2436 MW	DECON	Suffolk County, NY	Suffolk	1,303,501 (1989)	3.1	0.5
Three Mile Island, Unit 2	PWR	2772 MW	Accident cleanup, followed by storage	Middletown, PA	Dauphin	232,317 (1979)	2.4	0.2
Trojan	PWR	3411 MW	DECON	Rainier, OR	Columbia	44,513 (1997)	16.5	14.1
Yankee Rowe	PWR	600 MW	DECON	Rowe, MA	Franklin	70,626 (1997)	1.8	1.7
Zion, Unit 1	PWR	3250 MW	SAFSTOR	Zion, IL	Lake	594,799 (1997)	8.3	4.4
Zion, Unit 2	PWR	3250 MW	SAFSTOR	Zion, IL	Lake	594,799 (1997)	8.3	4.4

- The State may or may not share the burden with local government. In one State, school districts' lost property-tax collections were offset by equalization methods at the State level, which reduced the impact due to plant closures. In another State, the small neighboring township was the sole recipient of all property-tax revenues generated by the plant. Thus, the community's tax revenues were significantly reduced when the revenue source shut down.

- In addition, ratepayers in some jurisdictions are entitled to share in funds recovered from the sale of plant components and commodities and unspent decommissioning funds. These are not taxes but are available to general fund revenues.

In addition to characteristics specific to the taxing jurisdiction, the size, age, and ownership of the facilities play a role in how much the facilities affect tax revenues. Generally, the larger the facility (in the MWt), the larger the tax revenue impact. In addition, aging of the facilities depreciates its book value and assessed value over time. Usually, the falling assessed value of an aging facility will have reduced the tax revenue of the facility before closure, thus lessening the change in tax revenues generated by the facility after closure. A facility that closes suddenly, well before the end of its license expiration, will have a greater impact on the community tax base. Finally, if a facility is owned by a public entity, there is no effect on the tax base from closure because the facility was never taxable.

Changes in tax revenues of less than 10 percent are considered not detectable, i.e., they resulted in little or no change in local property tax rates and the provision of public services. Losses between 10 percent and 20 percent result in detectable impacts, with increased property tax levies (where State statutes permit) and decreased services by local municipalities. Changes over 20 percent have destabilizing impacts on the governments involved. Tax levies must usually be increased substantially or services cut substantially, and the payment of debt for any substantial infrastructure improvements made in the past becomes extremely problematic. Borrowing costs for local jurisdictions may also increase because bond rate agencies downgrade their credit rating. However, it is important to remember that these rules of thumb are based on uncompensated changes. For example, if a local taxing jurisdiction lost a nuclear facility that amounted to 35 percent of its tax base, but 30 percentage points of this loss were made up by the opening of a new manufacturing facility, the net impact would be 5 percent or not detectable. Small, rural areas are more likely to be affected than more urban areas having a wider variety of economic opportunities and more sources of tax revenue. Impacts depend on the type of plant, size of plant, and whether or not there are multiple units at a site, all of which help determine the net loss in employment at plant closure as well as the loss of tax base.

Table J-3 shows the impact of closure on local tax revenues for selected plants currently in decommissioning (or that have completed decommissioning), for which data are available. The primary taxing authorities for most of the closed plants are the county and city in which the plant is sited. Tax information is typically provided by local taxing authorities (an assessor's office) or from town planners familiar with the tax revenues generated by the plants. Only in the case of Humboldt Bay was tax-impact information available on a smaller, older plant (-$377,000 in 1983-84). The plants where information is not available are very small plants that most likely had very little impact on the tax base of the community. Many of these plants were shut down in the 1960s and 1970s.

Table J-3. Impact of Plant Closure on Local Tax Revenues

Nuclear Plant	Location	Shutdown Date	Thermal Power	Decom-missioning Option	Tax Revenues Change, millions (M)	Tax Change, %	Notes
Big Rock Point	Charlevoix, MI	08/30/97	240 MW	DECON	--	--	--
Haddam Neck	Middlesex, CT	07/22/96	1825 MW	DECON	yr 1 -$0.7M yr 2 -$0.7M yr 3 -$1.3M yr 4 -$1.2M yr 5 -$0.5M	-30% (phased out over 5 yr)	
Maine Yankee	Wiscassset, ME	12/06/96	2700 MW	DECON	yr 1 -$6.3M yr 2 -$2.5M yr 3 -$1.1M yr 4 -$0.6M	-70% (phased out in 4 yr)	Taxes paid to town. Plant made up about 90% of tax revenue. They have phased out tax expenditure payments over 6-yr period.
Millstone, Unit 1	Waterford, CT	11/04/95	2011 MW	SAFSTOR	-$0.8M	-2% due to plant closure	Impacts to tax revenues in this area during this time include 1) the natural depreciation rate of Unit 1. Assessment had become less than 5% of market value of plant by time of closure. (2) Deregulation environment brings assessed value of plants down 50%.
Rancho Seco	Sacramento, CA	6/7/89	2772 MW	SAFSTOR	no change	0	Rancho Seco was tax-exempt because it is considered to be owned by the government. Besides sales tax, etc., no impact.
San Onofre, Unit 1	San Clemente, CA	11/30/92	1347 MW	SAFSTOR	yr 1 -$1.2M yr 2 -$1.1M yr 3 -$1.2M		
Shoreham	Suffolk Co., NY	06/28/89	2436 MW	DECON	-$10M/yr up to -$115M total change after phase-out	10% decrease in yr 1, to 60% decrease by 2003	This county was hit hard by the abrupt manner in which this plant ceased operation and the lawsuits over tax assessment that proceeded (in which a judge determines assessed value close to 0 based on projected income stream from plant).
Three Mile Island, Unit 2	Middletown, PA	03/28/79	2772 MW	Accident cleanup followed by storage	no change	0	Utilities were tax exempt in 1979.
Trojan	Rainier, OR	11/09/92	3411 MW	DECON	yr 1-7 no change yr 8 -$2.3M	7.3% reduction for the county as a whole. Loss of 52.6% for one rural fire protection district.	Oregon taxes on the basis of the percentage of capital value of the parent company (ENRON) in county, based on 87% of book value of the parent in state. The Trojan "asset" stayed on ENRON's books until the year 2000.
Yankee Rowe	Rowe, MA	10/01/91	600 MW	DECON	-$0.4M	12% reduction	Rowe has a hydro-electric plant that generates most of the tax revenue (over 75%). This allieviated some of the tax impacts.
Zion, Units 1 and 2	Zion, IL	02/21/97 and 09/19/96	3250 MW (each)	SAFSTOR	yr 1 -$0.4M yr 2 -$3M yr 3 -$7M	12% in yr 1, rising to 50% by yr 5 (2002)	This is an assessment of both units together. There is a phase- out approach, where assessed value is reduced from $210 M to $10 M over 8 yr.

J.1.3 Housing Availability

The prevailing belief of realtors and planners in communities surrounding the case study facilities is that closing the facilities has had a range of effects on the marketability or value of homes in the vicinity. Housing choices of local residents are rarely affected by the presence of the facility, but people may move into the area in response to (temporarily) softer housing prices and commute to a nearby urban area.

J.1.4 Public Services

The impacts of closure on public services are closely related to the tax-related impacts on the community and are affected by the same characteristics of the plant: its size and age, its tax treatment, and the dependence of the local community on plant-related revenues, but not on the choice of decommissioning option or the amount of time between shutdown and active decommissioning. The impacts to the following public services may occur as a result of plant closure: education, transportation, public safety, social services, public utilities, and tourism and recreation.

Inquiries were made to local governments in the vicinity of closed plants about public service impacts during and after shutdown and decommissioning (Table J-4). Analysis was also conducted in the course of preparing NUREG-1437 (NRC 1996). Based on that experience, the following generalizations can be made.

In general, detectable impacts arise when the demand for service or use of the infrastructure is sizeable and would noticeably decrease the level of service or require additional resources to maintain the level of service. Destabilizing impacts would result when new programs, upgraded or new facilities, or substantial additional resources and staff are required because of facility-related demand.

In general, the communities that suffered the most from the tax-related impacts of plant closure also experienced the greatest impacts on public services. To some extent, the communities themselves control the amount of impact by how they allocate property taxes to local budgets before shutdown and how they prioritize these services post-shutdown. For example, one community channeled a great deal of the surplus revenues into building extensive social services for the elderly and for local youth in its community. After the plant ceased operations, the tax revenues decreased, all of the social services were downsized, and many will be eliminated because these are not considered to be priority programs (relative to public safety and education). In a second case, the county provided relatively few social services. Thus, the impact on social services after the shutdown was minor, although several other categories of

Table J-4. Impact of Plant Closure on Local Public Services

Nuclear Plant	Housing	Education	Transportation	Public Safety	Social Services	Public Utilities	Tourism and Recreation
Big Rock Point	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Dresden, Unit 1	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Fermi, Unit 1	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Fort St. Vrain	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
GE-VBWR	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Haddam Neck	SMALL to MODERATE	MODERATE	SMALL to MODERATE	MODERATE	SMALL to MODERATE	SMALL	SMALL
Humboldt Bay, Unit 3	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Indian Point, Unit 1	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
La Crosse	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL	SMALL
Maine Yankee	MODERATE	MODERATE	SMALL	MODERATE	SMALL	SMALL	SMALL
Millstone, Unit 1	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Pathfinder	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Peach Bottom, Unit 1	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Rancho Seco	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
San Onofre, Unit 1	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Saxton	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Shoreham	MODERATE	MODERATE to LARGE	MODERATE	MODERATE	SMALL to MODERATE	MODERATE	SMALL
Three Mile Island, Unit 2	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Trojan	SMALL to MODERATE	MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL	SMALL
Yankee Rowe	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Zion, Unit 1	SMALL	MODERATE	MODERATE	MODERATE	MODERATE to LARGE	SMALL	SMALL
Zion, Unit 2	SMALL	MODERATE	MODERATE	MODERATE	MODERATE to LARGE	SMALL	SMALL

public service experienced larger impacts. For example, education was largely funded by plant tax revenues and the responsible school district has recently indicated that it may have to file for bankruptcy, so the impact there was substantial.[a]

(a) The size of impact can be significantly influenced by the mechanism that the State uses for funding, e.g., if the State makes up the difference between what the local school districts can fund from the local property tax and what the State has decided is the appropriate level of per-student expenditures.

In general, impacts are nondetectable and nondestabilizing if the existing infrastructure (facilities, programs, and staff) could accommodate any plant-related demand without a noticeable effect on the level of service. Detectable and nondestabilizing impacts arise when the demand for service or use of the infrastructure is sizeable and would noticeably decrease the level of service or require additional resources to maintain the level of service. Detectable and destabilizing impacts would result when new programs, upgraded or new facilities, or substantial additional staff are required because of plant-related demand. The impacts of plant closure were determined for education, transportation, public safety, social services, public utilities, and tourism and recreation.

Education: The NRC considered changes in enrollment in another licensing framework (see *The Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, NUREG-1437 [NRC 1996]) that is useful in the context of plant closure. In general, nondetectable and nondestabilizing impacts are associated with project-related enrollment increases of 3 percent or less. Impacts are considered nondetectable and nondestabilizing if there is no change in the school systems' abilities to provide educational services and if no changes in the number of teaching staff or classroom space are needed. Detectable but destabilizing impacts generally are associated with 4 to 8 percent decreases in enrollment. Impacts are considered moderate if a school system must decrease its teaching staff or classroom space even slightly to preserve its pre-project level of service. Any decrease in teaching staff, however small (e.g., 0.5 full-time equivalent), that occurs from retiring or laying off personnel or changing the duties of existing personnel (e.g., a guidance counselor assuming classroom duties) may result in moderate impacts, particularly in small school systems. Detectable and destabilizing impacts are associated with project-related enrollment decreases of more than 8 percent. Some of the case-study communities had challenges adjusting to the loss of children of the plant staff from the local school systems. For example, some of the local schools had to go on a 4-day week in the Rainier, Oregon, area because loss of enrollment made the schools much more expensive to run per student served.

Transportation: The U.S. Nuclear Regulatory Commission (NRC) considered transportation issues in another licensing framework (see NUREG-1437 [NRC 1996]) that is useful in the context of plant closure. That framework considered impacts on the Transportation Research Board's level of service (LOS) definitions (Transportation Research Board 1985). LOS is a qualitative measure describing operational conditions within a traffic stream and their perception by motorists.

LOS A and B are associated with nondetectable and nondestabilizing impacts because the operation of individual users is not substantially affected by the presence of other users. At this level, no delays occur and no improvements are needed. LOS C and D are associated with detectable and nondestabilizing impacts because the operation of individual users begins to be severely restricted by other users, and at level D small increases in traffic cause operational

problems. Consequently, upgrading of roads or additional control systems may be required. LOS E and F are associated with detectable and destabilizing impacts because the use of the roadway is at or above capacity level, causing breakdowns in flow that result in long traffic delays and a potential increase in accident rates. Major renovations of existing roads or additional roads may be needed to accommodate the traffic flow.

Impacts to transportation during the license renewal term would be similar to or less than those experienced during current operations, driven mainly by the workers involved in plant closure, who are generally fewer in number than the operating staff. Consequently, LOS conditions are likely to move in the direction of A and B at all plants. Based on past and projected impacts at the case study sites, transportation impacts would continue to be nondetectable and nondestabilizing at all sites.

Public safety: Impacts on public safety are considered nondetectable and nondestabilizing if there is little or no need for additional police or fire personnel. No disruptions of police and fire-protection services occurred at the case-study sites after plant closure. Existing services were adequate to handle the influx of decommissioning staff, who are less numerous than the operations staff.

Social services: The impacts on social services are considered nondetectable and nondestabilizing if no change in the current level of service occurs, detectable and nondestabilizing if service declines noticeably, and detectable and destabilizing if services are seriously disrupted. Impacts on social services following closure largely depend on the ability of the community to replace the jobs lost at the end of operations or to successfully assist the laid-off workers and other affected workers in the community to transition out of the community. Most of the case-study sites have been able to do this, so closure impacts have been nondetectable and nondestabilizing to detectable but nondestablizing.

Public utilities: The NRC considered public utility issues in another licensing framework (see NUREG-1437 [NRC 1996]) that is useful in the context of plant closure. As in that framework, impacts on public-utility services are considered nondetectable and nondestabilizing if little or no change occurs in the ability to respond to the level of demand, and, thus, there is no need to add to capital facilities. Impacts are considered detectable and nondestabilizing if overtaxing of facilities during peak demand periods occurs. Impacts are considered detectable and destabilizing if existing service levels (such as the quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services. Overall, there have been nondetectable and nondestabilizing impacts on public utilities as a result of plant closure. The existing capacity of public utilities was sufficient to accommodate the small influx of decommissioning staff, and some locales experienced a noticeable decrease in the level of demand for services with the completion of plant operations.

Tourism and recreation: Few adverse effects have occurred during current operations at the case-study sites, and some positive effects have resulted because taxes paid by the plants and tours of the plants have also increased local tourism. Based on the case-study analysis, it is projected that because decommissioning essentially turns the operating facility back into a construction site while removing tax payments, the impacts of plant closure should be temporary, nondetectable and nondestabilizing at all plants. Some positive impact to tourism and recreation also may continue if the plant site is then converted for tourism activities, as planned for Trojan.

J.2 Environmental Justice

An evaluation of environmental justice is performed to determine if minority and low-income groups bear a disproportionate share of negative environmental consequences. Selected socioeconomic indicators are found in Table J-5 for closed nuclear power plants for which data were available. These include the median county family income as a percentage of State median family income in the year 1989, and the percentage of minority (non-white plus white Hispanic) persons in the county in the year 2000.

J.3 Reference

U. S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, NRC, Washington, D.C.

Table J-5. Socioeconomic Indicators Relevant to Environmental Justice at Closed Nuclear Power Plants

Nuclear Plant	Reactor Type	Decommissioning Option	Public Services Impacts	County Median Family Income (MFI), as % of State MFI[a]	Minority (Non-White and White Hispanic) in County, %[b]
Big Rock Point	BWR	DECON	SMALL	79.5	< 5
Dresden, Unit 1	BWR	SAFSTOR	SMALL	107.4	< 6
Fermi, Unit 1	FBR	SAFSTOR	SMALL	110.4	< 6
Fort St. Vrain	HTGR	DECON	SMALL	85.8	30
GE-VBWR	BWR	SAFSTOR	SMALL	110.9	59
Haddam Neck	PWR	DECON	SMALL to MODERATE	103.4	10
Humboldt Bay, Unit 3	BWR	SAFSTOR	SMALL	74.8	18
Indian Point, Unit 1	PWR	SAFSTOR	SMALL	148.3	35
La Crosse	BWR	SAFSTOR	SMALL	75.4	< 2
Maine Yankee	PWR	DECON	SMALL to MODERATE	103.1	< 2
Millstone, Unit 1	BWR	SAFSTOR	SMALL	87.9	15
Pathfinder	BWR	SAFSTOR	SMALL	124.2	< 8
Peach Bottom, Unit 1	HTGR	SAFSTOR	SMALL	107.7	< 9
Rancho Seco	PWR	SAFSTOR	SMALL	93.2	42
San Onofre, Unit 1	PWR	SAFSTOR	SMALL	128.3	45
Saxton	PWR	SAFTSOR	SMALL	72.7	< 2
Shoreham	BWR	DECON	SMALL to MODERATE	134.0	21
Three Mile Island, Unit 2	PWR	Accident cleanup, followed by storage	SMALL	106.9	24
Trojan	PWR	DECON	SMALL to MODERATE	106.5	< 7
Yankee Rowe	PWR	DECON	SMALL	82.4	< 6
Zion, Unit 1	PWR	SAFSTOR	MODERATE	135.2	26
Zion, Unit 2	PWR	SAFSTOR	MODERATE	135.2	26

(a) Source: 1990 Census of Population. *American Factfinder* Table 1990 QT. http://factfinder.census.gov
(b) Source: 2000 Census of Population. *American Factfinder* Table QT. http://factfinder.census.gov

Appendix K

Transportation Impacts

Appendix K

Transportation Impacts

A generic analysis was conducted to estimate human health impacts associated with transporting decontamination and dismantlement wastes from reactor sites to low-level waste (LLW) burial grounds using the RADTRAN 4 computer code (Neuhauser and Kanipe 1992). RADTRAN was originally developed by Sandia National Laboratory to support the NUREG-0170 (NRC 1977) environment impact analysis and is commonly used for transportation impact calculations in support of environmental documentation. The more recent code, RADTRAN 5 (Neuhauser and Kanipe 1996), which uses the RADTRAN 4 models in stochastic framework, was not used because the goal of the analysis was to estimate bounds of impacts rather than a probabilistic distribution of impacts. The results of the RADTRAN 4 analysis are found in Section 4.3.17. The following is a discussion of the model input parameters.

- Waste volumes: The total volume of LLW generated during reactor decontamination and dismantlement is a function of the alternative being implemented. Waste volume estimates for decommissioning facilities were obtained for eight facilities from Post Shutdown Decommissioning Activity Reports (PSDARs), Environmental Reports (ERs), or data provided by licensees with the assistance of the Nuclear Energy Institute (NEI). Because of the small number of facilities from which estimates were obtained, the data tends to be skewed by the unique attributes of the decommissioning process for a given plant. For example, the only pressurized water reactor (PWR) facility with data for the SAFSTOR option is San Onofre, a plant that is removing all structures. The information received on LLW is summarized in Table K-1. The actual number of shipments of waste from a site during decommissioning may be inflated by State and local government regulations that require removal of all structures and concrete from the site, whether contaminated or not. For a number of sites listed in Table K-1, all waste was considered LLW, which inflated the values in the table.

  The Trojan Nuclear Plant Radiological Site Characterization Report (Trojan 1995) and the Maine Yankee License termination plan (Maine Yankee 2001) clearly show that all low-level waste is not the same. There is a relatively small volume of waste that includes the reactor vessel and internal components that has most of the residual radioactivity following cessation of operations (about 2.5-million curies). There is a slightly smaller volume of waste, such as concrete containing activation products, that contains most of the remaining residual activity (several hundred curies), and a much larger volume of waste that contains

Table K-1. Low-Level Waste Shipment Data for Decommissioning Nuclear Power Facilities

Nuclear Plant	Reactor Type	Decommissioning Option	LLW Volume, cubic meters	LLW Shipments	Distance, km (mi)
Maine Yankee	PWR	DECON	31,924 plus 853[(b)]	364 (truck), 181 (rail), 2 (barge)[(b)]	1900-4600 (1200-2860)
Haddam Neck	PWR	DECON	8017	496-582	1500-4000 (1400-2500)
Trojan	PWR	DECON	9765	470	482 (300)
San Onofre, Unit 1	PWR	SAFSTOR	--	91 (truck) 869 (rail)	--
Saxton	PWR	SAFSTOR	580	100	1000 (620)
Rancho Seco	PWR	SAFSTOR		1250 (truck) <25 (rail)	1000-4300 (620-2700)
Big Rock Point	BWR	DECON	2042	--	--
Millstone, Unit 1	BWR	SAFSTOR	18,014	--	--
Yankee Rowe[(a)]	PWR	DECON	4136	--	--

(a) From NUREG-1307, Rev. 9, p. A.3.
(b) Reactor pressure vessel and steam generators.

small amounts of activity (a few curies). The breakdown of LLW assumed for the evaluation of impacts of LLW transportation is shown in Table K-2.

- Number of shipments: The number of shipments was also determined from PSDARs, ERs, and data provided by NEI. These numbers represent the total number of shipments over the entire decommissioning period, which mostly occurs during decontamination and dismantlement and takes place in a period of 2-6 years. Shipment estimates were obtained for six facilities. The estimates vary significantly based on mode of transportation available at the site (truck, rail or barge), the decommissioning option chosen, the decommissioning methods being employed, the extent of facility dismantlement, and state and local requirements.

  Table K-2 includes the number of shipments estimated for each type of LLW in this analysis. The estimates were derived from the volume estimates by assuming that, on the average, each shipment of high-activity waste moved 5.3 m^3 (6.9 cubic yards) of material (capacity of a CNS 14-190 shipping cask), and each shipment of low-activity and very low-activity waste .

Table K-2. Volume and Activity Assumed for Evaluation of Radiological Impacts of Transportation of Low-Level Waste

	Total Volume, m^3 (ft^3)	Total Activity, Bq (Ci)	Activity Density, Bq/m^3 (Ci/m^3)	Shipments
High-activity waste (reactor vessel and internal components)	1200 (42,400)	9.81×10^{16} (2,650,000)	8.14×10^{13} (2200)	227
Low-activity waste (activated concrete)	750 (26,500)	1.5×10^{13} (400)	1.97×10^{10} (0.533)	84
Very low-activity waste (debris, soil)	5400 (191,00)	3.7×10^{11} (10)	6.85×10^{-7} (0.0019)	360

moved 9 m^3 (12 cubic yards) of material (equivalent to 48 55-gal. drums). The reduced volume of material per shipment of the high activity waste reflects the shielding required to keep dose rates and truck weight within legal limits.

- Shipping distance: Transportation impacts and costs are a function of the distance traveled. Distances for decommissioning facilities range from 8 km (5 mi) to 4540 km (2840 mi). A bounding shipping distance of 4800 km (3000 mi) one-way was assumed for evaluation of radiological impacts of transportation; a round trip distance of 9600 km (6000 mi) was assumed for nonradiological impacts.

- Land class information: RADTRAN permits division of the transportation route into urban, suburban, and rural segments. Input to the code includes the fraction of the route that falls into each of these land-use classes, the population density in each segment, and the transport speed in each segment. Table K-3 gives the values for RADTRAN parameters used in the evaluation of LLW transport that are functions of land-use class. The percentage of the route and population density for each land-use class was estimated from routes for transport from the northeast and southeast United States to Nevada (Ramsdell et al. 2001), and the transport speeds were taken from NUREG/CR-6672 (Sprung et al. 2000). Accident rates given by Saricks and Tompkins (1999) were used in the calculations. They give the national average fatality rate for trucks as 5.5×10^{-9} fatalities per kilometer (8.8×10^{-9} fatalities per mile).

- Radiation dose rate: In calculating the doses to the public (onlookers and along the route), the radiation dose rate emitted from the shipping container was assumed to be at

Table K-3. RADTRAN Land-Use Class Dependent Parameter Values Assumed for Evaluation of Impacts of Transportation of LLW

Land-Use	Percent of Route	Population Density, people/km^2 (people/mi^2)	Transport Speed, km/h (mi/h)	Accidents per km (mi)
Urban	3	7.7 (20)	88 (55)	3.15×10^{-7} (5.07×10^{-7})
Suburban	18	390 (1000)	88 (55)	3.66×10^{-7} (5.89×10^{-7})
Rural	79	2300 (6000)	88 (55)	6.54×10^{-7} (1.05×10^{-7})

the regulatory maximum limit for transportation of high-activity waste and one-tenth of the regulatory limit for transportation of low-activity waste. The activity estimates for very low-activity waste are sufficiently small that the activity may be neglected in the evaluation of the radiological impacts of transportation of LLW. Dose rates for workers were calculated assuming 2.0×10^{-5} Sv/h (2 mrem/h).

- Radioactive material inventory: The inventory of radioactive material in a given shipment is variable. For the high-activity waste, which includes reactor vessel and internal components, the dominant radionuclides are activation products of the constituents of steel. Similarly, the dominant radionuclides in the low-activity waste are activation products of the constituents of concrete, with lesser contributions from surface contamination. Radionuclide distributions reported for residual radiation at Trojan (Trojan 1995) and Maine Yankee (Maine Yankee 2001) form the basis for the activity assumed in evaluation of the radiological impacts of LLW transport, which is shown in Table K-4. The specific isotopes for each type of LLW were selected by considering the fraction of the total activity represented by each isotope combined with the radiological consequences of exposure to the isotope. The total activity and radionuclide distributions given in these reports are generally consistent with activity and distribution estimates given in early estimates for reference reactors (Smith et al. 1978; Oak et al. 1980). RADTRAN 4 does not include nickel-63 in its library, so it was not included in the dose calculations for accidents. However, the dose is dominated by the contribution of cobalt-60 such that the dose from nickel-63 would have been negligible had it been included.

The transportation of the very low-activity waste is considered in evaluation of the nonradiological impacts of LLW transportation. In fact, most of the nonradiological impacts of transporting LLW are the result of transporting the very low-level activity because these impacts are directly associated with the number of miles driven but not with the amount of activity moved.

- Material Characterization: RADTRAN offers several default options for characterization of the dispersability of material for purposes of evaluation of the radiological consequences of transportation accidents. For this analysis, the high-activity waste was characterized as immobile because the material being transported is primarily composed of metal and the activity is primarily activation products in the metal. In an accident, 0.0001 percent of the immobile material is assumed to become airborne, and 5 percent of the airborne material is assumed to be respirable. Similarly, the low-activity waste was characterized as "loose chunks" because it tends to be concrete pieces with activation products dominating the activity. In an accident, 1 percent of the material in loose chunks is assumed to become airborne, and 5 percent of the airborne material is assumed to be respirable. These fractions, which are the RADTRAN default values, are adapted from NUREG-0170 (NRC 1977).

Table K-4. Low-Level Waste Activity Distributions Assumed for Evaluation of Radiological Impacts of LLW

	Activity Fraction		Activity per Truckload, Bq (Ci)	
	High-Activity Waste	**Low-Activity Waste**	**High-Activity Waste**	**Low-Activity Waste**
Mn-54	0.001	--	5.2×10^{11} (14)	--
Fe-55	0.348	--	1.5×10^{14} (4070)	--
Co-60	0.573	0.269	2.5×10^{14} (6680)	8.0×10^{10} (1.29)
Ni-63	0.078	--	3.4×10^{13} (920)	--
Cs-134	--	0.020	--	3.7×10^{9} (0.10)
Cs-137	--	0.010	--	1.9×10^{9} (0.05)
Eu-152	--	0.652	--	1.1×10^{11} (3.08)
Eu-154	--	0.059	--	1.0×10^{10} (0.28)

K.1 References

Maine Yankee, License No. DPR-36. January 13, 2000. Letter from George A. Zinke to U.S. Nuclear Regulatory Commission. "Maine Yankee's License Termination Plan."

Neuhauser, K. S., and F. L. Kanipe. 1992. *RADTRAN 4 – Volume 3:User's Guide*. SAND89-2370, Sandia National Laboratories, Albuquerque, New Mexico.

Neuhauser, K. S., and F. L. Kanipe. 1996. *RADTRAN 5–A Computer Code for Transportation*

Risk Analysis. SAND91-2600C, Sandia National Laboratories, Albuquerque, New Mexico.

Oak, H. D., G. M. Holter, W. E. Kennedy, Jr., and G. J. Konzek. 1980. *Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station.* NUREG/CR-0672, Vol. 2, NRC, Washington, D.C.

Ramsdell, J. V., Jr., C. E. Beyer, D. D. Lanning, U. P. Jenquin, R. A. Schwarz, D. L. Strenge, P. M. Daling, and R. T. Dahowski. 2001. *Environmental Effects of Extending Fuel Burnup Above 60 GWd/MTU*. NUREG/CR-6703 (PNNL-13257), NRC, Washington, D.C.

Saricks, C.L., and M.M. Tompkins. 1999. *State-Level Accident Rates of Surface Freight Transportation: A Reexamination*. ANL/ESD/TM-150, Argonne National Laboratory, Argonne, Illinois.

Smith, R. I., G. J. Konzek, and W. E. Kennedy, Jr. 1978. *Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station.* NUREG/CR-0130, Vol. 2, NRC, Washington, D.C.

Sprung, J. L., D. J. Ammerman, N. L. Breivik, R. J. Dukhart, F. L. Kanipe, J. A. Koski, G. S. Mills, K. S. Neuhauser, H. D. Radloff, R. F. Weiner, and H. R. Yoshimura. 2000. *Reexamination of Spent Fuel Shipment Risk Estimates*. NUREG/CR-6672 (SAND2000-0234), NRC, Washington, D.C.

Trojan Nuclear Plant. 1995. *Trojan Nuclear Plant Radiological Site Characterization Report*. Revision 0.1, Portland General Electric Company, Portland, Oregon.

U.S. Nuclear Regulatory Commission (NRC). 1977. *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other*. NUREG-0170, Vol. 1, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report, Section 6.3–Transportation, Table 9.1, "Summary of findings on NEPA issues for license renewal of nuclear power plants*." NUREG-1437, Vol. 1, Addendum 1, NRC, Washington, D.C.

K.2 Related Documents

Connecticut Yankee Atomic Power Company, Letter CY-00-129. August 1, 2000. Letter from Noah W. Fetherston to U.S. Nuclear Regulatory Commission. "Submittal of Decommissioning Environmental Review."

Connecticut Yankee Atomic Power Company, Letter CY-97-075. August 22, 1997. Letter from T.C. Feigenbaum to U.S. Nuclear Regulatory Commission. "Haddam Neck Plant-Post Shutdown Decommissioning Activities Report."

Consumers Energy Company, License DPR-6. September 19, 1997. Letter from Kenneth P. Powers to U.S. Nuclear Regulatory Commission. "Big Rock Point Plant-Post Shutdown Decommissioning Activities Report; Revision 2."

Maine Yankee, MN-01-009, RA-01-033. March 21, 2001. Letter from Thomas L. Williamson to U.S. Nuclear Regulatory Commission. "Request for Information to Support GEIS Supplement."

Maine Yankee Letter, License No. DPR-36. September 19, 1997. Letter from Michael J. Meisner to U.S. Nuclear Regulatory Commission. "Maine Yankee Plant-Post Shutdown Decommissioning Activities Report."

Northeast Nuclear Energy Company. June 14, 1999. Letter from R. P. Necci to U.S. Nuclear Regulatory Commission. "Millstone Nuclear Power Station Unit No. 1-Post Shutdown Decommissioning Activities Report."

Portland General Electric, SMQ-008-2001. January 31, 2001. Letter from Stephen M. Quennoz to U.S. Nuclear Regulatory Commission. "Request for Information to Support GEIS Supplement."

Sacramento Municipal Utility District. January 31, 2001. Letter from Sacramento Municipal Utility District to U.S. Nuclear Regulatory Commission. "Request for Information to Support GEIS Supplement."

Saxton Nuclear Experimental Corporation Facility. February 2000. "Decommissioning Environmental Report, Revision 1."

Southern California Edison. February 5, 2001. Letter from A. Edward Scherer to U.S. Nuclear Regulatory Commission. "Request for Information to Support GEIS Supplement."

U.S. Nuclear Regulatory Commission (NRC). 1977. *Final Environmental Impact Statement on the Transportation of Radioactive Materials by Air and Other Modes*. Vols. 1 and 2, NUREG-0170, NRC, Washington, D.C.

Appendix L

Relevant Regulations and Federal Permits

Appendix L

Relevant Regulations and Federal Permits

This appendix highlights the U. S. Nuclear Regulatory Commission's (NRC's) regulations and Federal statutes and regulations enacted by other Federal agencies as well as Executive Orders that are applicable to decommissioning nuclear power plants.

L.1 Applicable NRC Regulations

A brief summary of the applicable regulations of Title 10 CFR related to decommissioning are provided in this subsection. Although not a comprehensive list, this appendix briefly discusses those regulations that are most pertinent to decommissioning and were considered to be potentially of greatest interest to the reader. Licensees of facilities being decommissioned are required to continue following the regulations applicable to an operating plant unless directed otherwise by the regulations.

L.1.1 10 CFR Part 20, Standards for Protection Against Radiation

Sections of 10 CFR Part 20 establish the NRC regulations pertaining to radiological protection.

Subpart B - Radiation Protection Programs

Subpart B of 10 CFR Part 20 provides the framework for the radiation protection programs required at licensed facilities. It requires that each licensee develop and implement a radiation protection program, that the concept of keeping doses as low as reasonably achievable (ALARA) be an integral part of the program, and that the licensee annually review the program to ensure compliance with all regulations. The need for an adequate radiation protection program is essential for decommissioning plants to ensure the health and welfare of the licensee's personnel and the public.

Subpart C - Occupational Dose Limits

Subpart C of 10 CFR Part 20 provides the radiological occupational dose limits for licensee personnel and the public and the method used to demonstrate compliance with these limits.

Subpart D - Radiation Dose Limits for Individual Members of the Public

Subpart D of 10 CFR Part 20 contains the regulations that define the maximum dose limits that an individual member of the public may receive and acceptable compliance methods. These regulations are applicable for operating and decommissioning plants until license termination. Appendix B provides reference material used for determining annual limits on intake and derived air concentrations of radionuclides for occupational exposure and effluent and sewage release concentrations.

Subpart E - Radiological Criteria for License Termination

Subpart E of 10 CFR Part 20 contains the radiological criteria for license termination that apply to unrestricted and restricted use. Important aspects of the criteria include the opportunity for public participation and the assurance of adequate decommissioning funds to ensure sufficient oversight to protect public health.

Subpart F - Surveys and Monitoring

Subpart F of 10 CFR Part 20 requires surveys and monitoring commensurate with the conditions at a licensed facility. Until the license is terminated at a facility, there is a potential for radiological exposure, which would necessitate continued radiological monitoring and surveys.

Subpart G - Control of Exposure from External Sources in Restricted Areas

Subpart G of 10 CFR Part 20 requires the licensee to control access to high and very high radiation areas. These regulations are applicable to a decommissioning plant, especially in the early years of decommissioning.

Subpart H - Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas

Subpart H of 10 CFR Part 20 requires measures to control airborne radioactive materials and the use of protective equipment to limit personnel intake.

Subpart I - Storage and Control of Licensed Material

Subpart I of 10 CFR Part 20 addresses the security and control issues related to licensed material (source material or by-product material that includes highly irradiated materials).

Subpart J - Precautionary Procedures

Subpart J of 10 CFR Part 20 defines radiological posting requirements to indicate where radiation areas are located and to label containers of licensed materials. The minimum quantities that require labeling are provided in Appendix C of 10 CFR Part 20.

Subpart K - Waste Disposal

Subpart K of 10 CFR Part 20 provides the requirements for the disposal of licensed material, including low-level waste. It provides the regulations related to manifests and manifest tracking.

Subpart L - Records

Subpart L of 10 CFR Part 20 provides requirements for recordkeeping of radiological control records. This includes individual exposure records, historical recordkeeping, and any release of radioactive effluents to the environment. Audit rectors and other reviews of the radiological control program content and implementation are required to be maintained for a period of 3 yrs, which could conceivably extend beyond the decommissioning process.

Subpart M - Reports

Subpart M of 10 CFR Part 20 provides the regulations pertaining to reporting requirements at licensed facilities. The reporting requirements contained in this subpart pertain to theft or loss of licensed materials, incident notification, radiological exposures that exceed limits, special exposures, individual overexposure, and individual monitoring. Annual personnel monitoring reports on personnel exposure are also required to be submitted.

L.1.2 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities

10 CFR 50.82, Termination of License

The current rule for decommissioning was published in August 1996 providing major changes from the previous rule. The current rule redefines the decommissioning process and requires licensees to provide the NRC with early notification of planned decommissioning activities. The rule describes the following:

- information on certifications of permanent cessation of operation and permanent removal of fuel from the plant [10 CFR 50.82(a)(1)(i), and (ii)]

- the submittal of the post-shutdown decommissioning activities report (PSDAR) (10 CFR 50.82(a)(4)(i)), which discusses the decommissioning activities and schedule for the activities, an estimate of expected costs, and the reasons for concluding that the environmental impacts associated with the site-specific decommissioning activities will be bounded by previously described environmental impacts [10 CFR 50.82(a)(4)(i)]

- the restrictions of activities of licensees performing decommissioning activities that may (a) foreclose release of the site for possible unrestricted use, (b) result in significant environmental impacts not previously reviewed, or (c) result in there no longer being reasonable assurance that adequate funds will be available for decommissioning [10 CFR 50.82(a)(6)]

- the requirement for the licensee to notify the NRC before performing any decommissioning activity inconsistent with, or making any significant schedule change from, those activities and schedules described in the PSDAR [10 CFR 50.82(a)(7)]

- how the decommissioning trust funds can be used - Withdrawals from the decommissioning trust fund can only be used [10 CFR 50.82(a)(8)(i)]

  -- if they are used for legitimate decommissioning activities that are consistent with the definition of decommissioning in 10 CFR 50.2

  -- if they do not reduce the value of the decommissioning trust below an amount necessary to place and maintain the reactor in a safe storage condition if unforeseen expenses or conditions arise

  -- if they do not inhibit the ability of the licensee to complete funding of any shortfalls in the decommissioning trust needed to ensure the availability of funds to ultimately release the site and terminate the license.

- the amount of funds available to the licensee, which varies depending on the stage of decommissioning [10 CFR 50.82(a)(8)(ii)(iii)]

  -- initially, 3 percent of the generic amount specified in 10 CFR 50.75 may be used for decommissioning planning

  -- an additional 20 percent may be used 90 days after the NRC has received the PSDAR

- -- remaining funds can be used following submittal of the site-specific decommissioning cost estimate, which is required within 2 yrs following permanent cessation of operation

- submittal of the license termination plan [10 CFR 50.82(a)(9)] and the termination of the license [10 CFR 50.82(a)(11)].

10 CFR 50.36, Technical Specifications

10 CFR 50.36(c)(6) describes requirements for technical specifications specific to decommissioning. However, the requirements of 10 CFR 50.36(a), (b) and (c) still remain applicable, as modified by paragraph (c)(6). For example, a decommissioning licensee should still evaluate paragraphs (c)(1) thru (5) regarding safety limits, limiting safety-system settings, limiting control settings, limiting conditions for operation, surveillance requirements, design features, and administrative controls; (c)(7) regarding initial notification reports; and (c)(8) regarding written reports. This is reflected by the requirement of 10 CFR 50.36(e), which states that the "provisions of this section apply to each nuclear reactor licensee whose authority to operate the reactor has been removed by license amendment, order, or regulations."

10 CFR 50.48, Fire Protection

10 CFR 50.48(f) requires that licensees of permanently shutdown nuclear power plants maintain a fire-protection program to address the potential for fires that could result in the release or spread of radioactive materials.

10 CFR 50.59, Changes, Tests, and Experiments

This section allows licensees to make changes to facilities undergoing decommissioning using these requirements.

10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants

The maintenance rule (10 CFR 50.65) requires monitoring the performance or condition of structures, systems, or components (SSCs). For licensees that have permanently ceased operation, this section applies only to the extent that the licensee shall monitor the performance or condition of SSCs associated with the storage, control, and maintenance of spent fuel. The number of SSCs within the maintenance rule program at a decommissioning facility will be significantly less than that at an operating facility.

10 CFR 50.68, Criticality Accident Requirements

This section describes the requirements that are used in lieu of maintaining a monitoring system capable of detecting a criticality in the spent fuel pool, as described in 10 CFR 70.24.

10 CFR 50.71, Inspection

This section describes the maintenance of records and making of reports. Although all paragraphs of this section are applicable, one difference between an operating facility and one being decommissioned is the requirement to update the final safety analysis report, or equivalent. As described in 10 CFR 50.71(e)(4), the decommissioning requirement is for revisions to be filed every 24 months.

10 CFR 50.73, Licensee Event Reporting System

Licensees are still required to submit a licensee event report for specific events described in the regulations within 60 days after discovery of the event. This includes airborne or liquid-effluent releases at specific levels above the concentrations in Appendix B to 10 CFR Part 20.

10 CFR 50.75, Reporting and Recordkeeping for Decommissioning Planning

Reporting and recordkeeping require that subsequent revisions updating the licensing basis must be filed with the NRC at least every 24 months by nuclear power facilities that have certified permanent cessation of operation and permanent removal of fuel for decommissioning planning. This regulation, in part, discusses how the licensee will provide reasonable assurance that funds will be available for decommissioning of the nuclear reactor.

L.1.3 10 CFR Part 71, Packaging and Transportation of Radioactive Material

Requirements for packaging, preparation for shipment, and transportation of licensed (radioactive) material are provided in these regulations. In addition, these regulations refer to the regulations of the Department of Transportation given in Title 49 of the Code of Federal Regulations.

L.1.4 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste

The regulations in 10 CFR Part 72 contain requirements, procedures, and criteria for the issuance of licenses to receive, transfer, and possess power-reactor spent fuel, power-reactor-related Greater-than-Class-C (GTCC) Waste, and other radioactive materials associated with spent fuel storage in an independent spent fuel storage installation and the terms and conditions under which the Commission will issue these licenses. The regulations also establish requirements, procedures, and criteria for the issuance of licenses to the U.S. Department of Energy (DOE) to receive, transfer, package, and possess power-reactor spent fuel, high-level radioactive waste, power-reactor-related GTCC waste, and other radioactive materials associated with the storage of these materials in a monitored retrievable storage installation. Finally, these regulations also establish requirements, procedures, and criteria for the issuance of Certificates of Compliance approving spent fuel storage cask designs.

L.2 Federal Statutes

Following are examples of major laws, regulations, and other requirements that may be applicable to decommissioning and environmental evaluations that occur during the decommissioning process.

American Indian Religious Freedom Act of 1978 (42 USC 1996): This act reaffirms Native American religious freedom under the First Amendment and sets United States policy to protect and preserve the inherent and constitutional right of American Indians to believe, express, and exercise their traditional religions. The act requires that Federal actions avoid interfering with access to sacred locations and traditional resources that are integral to the practice of religions.

Archaeological Resource Protection Act, as amended (16 USC 470aa et seq.): This Act requires a permit for any excavation or removal of archaeological resources from public or Indian lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed are to remain the property of the United States. Consent must be obtained from the Indian tribe owning lands on which a resource is located before issuance of a permit, and the permit must contain terms or conditions requested by the tribe.

Atomic Energy Act of 1954, as amended (42 USC 2011 et seq.): The Atomic Energy Act of 1954 authorizes NRC to regulate the Nation's civilian use of by-product, source, and special nuclear materials to ensure adequate protection of the public health and safety and the

DOE to establish standards to protect health or minimize dangers to life or property with respect to activities under its jurisdiction. The Atomic Energy Act and the Reorganization Plan No. 3 of 1970 [5 USC (app. at 1343)] and other related statutes gave the U.S. Environmental Protection Agency (EPA) responsibility and authority for developing generally applicable environmental standards for protection of the general environment from radioactive material. The EPA has promulgated several regulations under this authority.

Bald and Golden Eagle Protection Act, as amended (16 USC 668-668d): The Bald and Golden Eagle Protection Act makes it unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States (Section 668, 668c). A permit must be obtained from the U.S. Department of the Interior to relocate a nest that interferes with resource development or recovery operations.

Clean Air Act, as amended (42 USC 7401 et seq.): The Clean Air Act, as amended, is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act, as amended, requires that each Federal agency, such as DOE, with jurisdiction over any property or facility that might result in the discharge of air pollutants, comply with "all Federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution. The Act requires the EPA to establish National Ambient Air Quality Standards as necessary to protect public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 USC 7409). The Act also requires establishing national standards of performance for new or modified stationary sources of atmospheric pollutants (42 USC 7411) and requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 USC 7470). Hazardous air pollutants, including radionuclides, are regulated separately (42 USC 7412). Air emissions are regulated by the EPA in 40 CFR Parts 50 through 99. In particular, radionuclide emissions and hazardous air pollutants are regulated under the National Emission Standard for Hazardous Air Pollutants Program (see 40 CFR Parts 61 and 63).

Clean Water Act, as amended (33 USC 1251 et seq.): The Clean Water Act, which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act, as amended, requires all branches of the Federal government engaged in any activity that might result in a discharge or runoff of pollutants to surface waters to comply with Federal, State, interstate, and local requirements. In addition to setting water quality standards for the nation's waterways, the Clean Water Act supplies guidelines and limitations for effluent discharges from point-source discharges and provides

authority for the EPA to implement the National Pollutant Discharge Elimination System (NPDES) permitting program. The NPDES program is administered by the Water Management Division of the EPA pursuant to regulations in 40 CFR Part 122 et seq.

Sections 401 and 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act Section 402(p) requires that the Environmental Protection Act establish regulations for issuing permits for stormwater discharges associated with industrial activity. Stormwater discharges associated with industrial activity are permitted through the NPDES. General Permit requirements are published in 40 CFR Part 122.

Emergency Planning and Community Right-to-Know Act of 1986 (42 USC 11001 et seq.) (also known as SARA Title III): Under Subtitle A of this Act, Federal facilities provide various information (such as inventories of specific chemicals used or stored and releases that occur from these sites) to the State Emergency Response Commission and to the Local Emergency Planning Committee to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. Implementation of the provisions of this Act began voluntarily in 1987, and inventory and annual emissions reporting began in 1988, based on 1987 activities and information. The requirements for this Act were promulgated by the EPA in 40 CFR Parts 350 through 372.

Endangered Species Act, as amended (16 USC 1531 et seq.): The Endangered Species Act, as amended, is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. The Act is jointly administered by the U.S. Departments of Commerce and the Interior. Section 7 of the Act requires consultation with the U.S. Fish and Wildlife Service to determine whether endangered and threatened species or their critical habitats are known to be in the vicinity of the proposed action.

Migratory Bird Treaty Act, as amended (10 USC 703 at seq.): The Migratory Bird Treaty Act, as amended, is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan, and Russia. It regulates the harvest of migratory birds by specifying the mode of harvest, hunting seasons, and bag limits. The Act stipulates that it is unlawful at any time, by any means, or in any manner to “kill ... any migratory bird.” Although no permit is required under the Act, Federal agencies are required to consult with the U.S. Fish and Wildlife Service regarding impacts to migratory birds and to evaluate ways to avoid these effects in accordance with the U.S. Fish and Wildlife Service Mitigation Policy.

Native American Grave Protection and Repatriation Act of 1990 (25 USC 3001): This law directs the Secretary of Interior to guide responsibilities in repatriation of Federal archaeological collections and collections held by museums receiving Federal funding that are culturally affiliated to Native American tribes. Major actions to be taken under this law include (a) establishing

a review committee with monitoring and policy-making responsibilities, (b) developing regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims, (c) overseeing of museum programs designed to meet the inventory requirements and deadlines of this law, and (d) developing procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal land.

National Environmental Policy Act of 1969 as amended (42 USC 4321 et seq.): The National Environmental Policy Act (NEPA) establishes a national policy promoting awareness of the environmental consequences of the activity of humans on the environment and promoting consideration of the environmental impacts during the planning and decisionmaking stages of a project. NEPA requires all agencies of the Federal government to prepare a detailed statement on the environmental effects of proposed major Federal actions that may significantly affect the quality of the human environment. The environmental document should discuss reasonable alternatives to the proposed action and their potential environmental consequences in accordance with the Council on Environmental Quality regulations for implementing the procedural provisions of the NEPA Implementing Procedures (40 CFR Parts 1501 through 1508) and NRC implementing regulations (10 CFR Part 51).

National Historic Preservation Act, as amended (16 USC 470 et seq.): The National Historic Preservation Act, as amended, provides that sites with significant national historic value be placed on the *National Register of Historic Places.* There are no permits or certifications required under the Act. However, if a particular Federal activity may impact a historic property resource, consultation with the Advisory Council on Historic Preservation will generally generate a Memorandum of Agreement, including stipulations that must be followed to minimize adverse impacts. Coordinations with the State Historic Preservation officer are also undertaken to ensure that potentially significant sites are properly identified and appropriate mitigative actions are implemented. These regulations are included in 36 CFR Part 800. 10 CFR Part 63 contains guidance by which historic properties are evaluated and determined eligible for listing on the National Register.

Noise Control Act of 1972, as amended (42 USC 4901 et seq.): Section 4 of the Noise Control Act of 1972, as amended, directs all Federal agencies to carry out “to the fullest extent within their authority” programs within their jurisdictions in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare.

Nuclear Waste Policy Act of 1982, as amended (42 USC 10101): The Act authorizes the Federal agencies to develop a geologic repository for the permanent disposal of spent nuclear fuel and high-level radioactive waste. The Act specifies the process for selecting a repository site and constructing, operating, closing, and decommissioning the repository. The Act also establishes programmatic guidance for these activities, including guidance to the NRC regarding the adoption of DOE’s EIS for the proposed repository.

Occupational Safety and Health Act of 1970, as amended (29 USC 651 et seq.): The Occupational Safety and Health Act establishes standards to enhance safe and healthful working conditions in places of employment throughout the United States. The Act is administered and enforced by the Occupational Safety and Health Administration, a U.S. Department of Labor agency. While the Occupational Safety and Health Administration and the EPA both have a mandate to reduce exposures to toxic substances, the Occupational Safety and Health Administration's jurisdiction is limited to safety and health conditions that exist in the workplace environment. In general, under the Act, it is the duty of each employer to furnish all employees a place of employment free of recognized hazards likely to cause death or serious physical harm. Employees have a duty to comply with the occupational safety and health standards and all rules, regulations, and orders issued under the Act. Occupational Safety and Health Administration regulations (published in Title 29 of the Code of Federal Regulations) establish specific standards telling employers what must be done to achieve a safe and healthful working environment.

Pollution Prevention Act of 1990 (42 USC 13101 et seq.): The Pollution Prevention Act of 1990 establishes a national policy for waste management and pollution control that focuses first on source reduction, followed sequentially by environmentally safe recycling, treatment, and disposal. Disposal or releases to the environment should only occur as a last resort.

Resource Conservation and Recovery Act, as amended (42 USC 6901 et seq.): The treatment, storage, or disposal of hazardous and nonhazardous waste is regulated under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Amendments of 1984. Pursuant to Section 3006 of the Act, any State that seeks to administer and enforce a hazardous waste program pursuant to the Resource Conservation and Recovery Act may apply for EPA authorization of its program. The EPA regulations implementing the Resource Conservation and Recovery Act are found in 40 CFR Parts 260 through 280. These regulations define hazardous wastes and specify hazardous waste transportation, handling, treatment, storage, and disposal requirements.

The regulations imposed on a generator or a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed of. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements.

Safe Drinking Water Act, as amended (42 USC 300 [F] et seq.): The primary objective of the Safe Drinking Water Act, as amended, is to protect the quality of the public water supplies and all sources of drinking water. The implementing regulations, administered by the EPA unless delegated to the states, establish standards applicable to public water systems. They promulgate maximum contaminant levels, including those for radioactivity, in public water systems, which are defined as public water systems that serve at least 15 service connections used by

year-round residents or regularly serve at least 25 yr-round residents. Safe Drinking Water Act requirements have been promulgated by the EPA in 40 CFR Parts 100 through 149. For radionuclides, the regulations in effect now specify that the average annual concentration of beta particle and photon radioactivity from manmade radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 0.004 rem (4 millirem) per year. The maximum contaminant level for gross alpha particle activity is 15 picocuries per liter. The EPA proposed revisions to limits on regulating radionuclides on July 18, 1991. The proposed rule has not been finalized, and the more conservative standards were used for purposes of analysis. Other programs established by the Safe Drinking Water Act include the Sole Source Aquifer Program, the Wellhead Protection Program, and the Underground Injection Control Program.

Toxic Substances Control Act (15 USC 2601 et seq.): The Toxic Substances Control Act provides the EPA with the authority to require testing of chemical substances, both new and old, entering the environment and regulates them where necessary. The law complements and expands existing toxic substance laws such as §112 of the Clean Air Act and §307 of the Clean Water Act. The Toxic Substances Control Act came about because there were no general Federal regulations for the potential environmental or health effects of the thousands of new chemicals developed each year before they were introduced into the public or commerce. The Toxic Substances Control Act also regulates the treatment, storage, and disposal of toxic substances, specifically polychlorinated biphenyls, chlorofluorocarbons, asbestos, dioxins, certain metal-working fluids, and hexavalent chromium. The asbestos regulations under the Toxic Substances Control Act were ultimately overturned. However, regulations pertaining to asbestos removal, storage, and disposal are promulgated through the National Emission Standard for Hazardous Air Pollutants Program (40 CFR Part 61, Subpart M). For chlorofluorocarbons, Title VI of the Clean Air Act Amendments of 1990 requires a reduction of chlorofluorocarbons beginning in 1991 and prohibits production beginning in 2000.

L.3 Executive Orders

During the history of NEPA implementation, a number of Executive Orders have been issued that may be applicable to environmental evaluation during the decommissioning process. The following provides a short summary of some of these Orders.

Executive Order 11988 (Floodplain Management): Directs Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken in a floodplain and that floodplain impacts be avoided to the extent practicable.

Executive Order 11990 (Protection of Wetlands): Directs government agencies to avoid, to the extent practicable, any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

Executive Order 12898 (Environmental Justice): Directs Federal agencies to achieve environmental justice by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. The Order creates an Interagency Working Group on Environmental Justice and directs each Federal agency to develop strategies within prescribed time limits to identify and address environmental justice concerns. The Order further directs each Federal agency to collect, maintain, and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on the surrounding populations, when such facilities or sites become the subject of a substantial Federal environmental administrative or judicial action and to make such information publicly available.

Executive Order 13007 (Indian Sacred Sites): Directs Federal agencies to accommodate, to the extent practicable, access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of these sites.

Appendix M

Glossary

Appendix M

Glossary

Absorbed dose — The amount of radiation energy absorbed, especially by human tissue; measured in rads.

Absorption — The process of taking in, as when a sponge takes up water. Chemicals can be absorbed through the skin into the bloodstream and then transported to other organs. Chemicals can also be absorbed into the bloodstream after breathing or swallowing.

Acute — Occurring over a short time, usually a few minutes or hours. An acute effect happens within a short time after exposure. An acute exposure can result in short-term or long-term health effects. See Chronic.

ALARA — Acronym for "as low as reasonably achievable," i.e., making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as practical, consistent with the purpose for which the licensed activity is undertaken and taking into account the state of technology, the economics of technological improvements and of the benefits to public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest. See 10 CFR 20.1003.

Alpha particle — A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus that has a mass number of 4 and an electrostatic charge of +2. It has low penetrating power and a short range (a few centimeters in air). The most energetic alpha particle will generally fail to penetrate the dead layers of cells covering the skin and can be easily

stopped by a sheet of paper. Alpha particles are hazardous when an alpha-emitting isotope is inside the body.

Ambient Surrounding. Ambient air is usually outdoor air (as opposed to indoor air).

Aquifer An underground source of water geologically contained in a layer of rock, sand, or gravel.

Background level A typical or average level of a chemical or element in the environment. Background often refers to naturally occurring or uncontaminating levels.

Background radiation Radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material) and global fallout as it exists in the environment from the testing of nuclear explosive devices. It does not include radiation from source, by-product, or special nuclear materials regulated by the Nuclear Regulatory Commission (NRC). The typically quoted U.S. average individual exposure from background radiation is 360 mrem per yr.

Becquerel (Bq) The unit of radioactive decay equal to 1 disintegration per second. 37 billion (3.7×10^{10}) Bq = 1 curie (Ci).

Beta particle A charged particle emitted from a nucleus during radioactive decay, with a mass equal to 1/1837 that of a proton. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron. Large amounts of beta radiation may cause skin burns. Beta-emitters are harmful if they enter the body. Beta particles may be stopped by thin sheets of metal or plastic.

Boiling water reactor (BWR) A reactor in which water, used as both coolant and moderator, is allowed to boil in the core. The resulting steam can be used directly to drive a turbine and electrical generator, thereby producing electricity.

By-product material Any radioactive material, tailings or wastes (except special nuclear material) that is 1) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material (as in a reactor) and 2) produced by the extraction or concentration of uranium or thorium from ore. See 10 CFR 20.1003.

Calibration The adjustment, as necessary, of a measuring device such that it responds within the required range and accuracy to known values of input.

Certified fuel-handler A nonlicensed operator who is qualified in accordance with a fuel-handler training program approved by the NRC.

Chronic Occurring over an extended period of time, e.g., several weeks, months, or years. See Acute.

Committed dose equivalent (CDE) This is the dose to some specific organ or tissue that is received from an intake of radioactive material by an individual during the 50-yr period following the intake. See 10 CFR 20.1003.

Committed effective dose equivalent (CEDE) The sum of the committed dose equivalents for a given organ or tissue multiplied by a weighting factor (W_f) expressed in units of sieverts (Sv) or rems. See 10 CFR 20.1003.

Compact A group of two or more States formed to dispose of low-level radioactive waste on a regional basis. Forty-two States have formed nine compacts.

Contamination Undesired radioactive material or residual radioactivity that is deposited on the surface of or inside structures, areas, objects or people in excess of acceptable levels (e.g., for a release of a site or facility for unrestricted use).

Curie (Ci) The basic unit used to describe the intensity of radioactivity in a sample of material. The curie is equal to 37-billion (3.7×10^{10}) disintegrations per second, which is approximately the activity of 1 gram of radium. A curie is also a quantity of any radionuclide that decays at a rate of

37-billion disintegrations per second. It is named for Marie Curie, who discovered radium in 1898.

Decommission (decommissioning) The process of safely removing a facility from service followed by reducing residual radioactivity to a level that permits termination of the NRC license. See 10 CFR 20.1003.

DECON An option for decommissioning in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.

Decontamination The reduction or removal of contaminated radioactive material from a structure, area, object, or person. See 10 CFR 20.1003 and 20.1402.

Dermal Referring to the skin. For example, dermal absorption means absorption through the skin.

Disproportionately high and adverse environmental effects When determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable: (a) whether there is or will be an impact on the natural or physical environment that significantly (as used by NEPA) and adversely affects a minority population, low-income population, or Indian tribe - Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment, (b) whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group, and (c) whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environ-

mental hazards.

Disproportionately high and adverse human health effects

When determining whether human health effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable: (a) whether the health effects, which may be measured in risks and rates, are significant (as used by NEPA), or above generally accepted norms (adverse health effects may include bodily impairment, infirmity, illness, or death), (b) whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group, and (c) whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

Dose equivalent (dose)

The product of absorbed dose in tissue multiplied by a quality factor, and then sometimes multiplied by other necessary modifying factors at the location of interest. It is expressed numerically in rems or sieverts. See 10 CFR 20.1003.

Dosimeter

A portable instrument (e.g., a film badge, thermoluminescent, or pocket dosimeter) worn by plant personnel for measuring and recording the total accumulated dose of ionizing radiation.

Dosimetry

The theory and application of the principles and techniques involved in the measurement and recording of ionizing radiation doses.

Effective half-life

The time required for a radionuclide contained in a biological system, such as a human or an animal, to reduce its activity by one-half as a combined result of radioactive decay and biological elimination.

ENTOMB A method of decommissioning in which radioactive structures, systems, and components are encased in a structurally long-lived material, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

Exposure Contact with a chemical or element by swallowing, breathing, or direct contact (such as through the skin or eyes). Exposure may be either short-term (acute) or long- term (chronic).

External radiation Exposure to ionizing radiation when the radiation source is located outside the body.

Fissile material Any material fissionable by thermal (slow) neutrons. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239. Although sometimes used as a synonym for fissionable material, this term has acquired a more restricted meaning.

Fission (fissioning) The splitting of a nucleus into at least two other nuclei and the release of a relatively large amount of energy. Two or three neutrons are usually released during this type of transformation.

Fission gases Those fission products that exist in the gaseous state. In nuclear power reactors, this includes primarily the noble gases, such as krypton and xenon.

Fission products The nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclide formed by the fission fragments' radioactive decay.

Fissionable material Commonly used as a synonym for fissile material, the meaning of this term has been extended to include material that can be fissioned by fast neutrons, such as uranium-238.

Fuel assembly A cluster of fuel rods (or plates). Also called a fuel element. A reactor core is made up of many fuel assemblies.

Fuel cycle The series of steps involved in supplying fuel for nuclear power reactors. It can include mining, milling, isotopic enrichment, fabrication of fuel elements, use in a reactor, chemical reprocessing to recover the fissionable material remaining in the spent fuel, re-enrichment of the fuel material, refabrication into new fuel elements, and waste disposal.

Fuel rod A long, slender tube that holds fissionable material (fuel) for nuclear reactor use. Fuel rods are assembled into bundles called fuel elements or fuel assemblies, which are loaded individually into the reactor core.

Fusion reaction A reaction in which at least one heavier, more stable nucleus is produced from two lighter, less stable nuclei. Reactions of this type are responsible for enormous releases of energy, e.g., in the energy of stars.

Gamma radiation High-energy, short wave-length, electromagnetic radiation emitted from the nucleus. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or depleted uranium. Gamma rays are similar to x-rays.

Graphite A form of carbon, similar to the lead used in pencils, used as a moderator in some nuclear reactors.

Greenfield One possible end state of decommissioning in which above-ground structures have been removed and efforts made to revegetate the site. Buildings may have been removed to below-grade and then covered with soil. NRC decommissioning regulations do not require a greenfield end state.

Groundwater — The supply of fresh water found beneath the earth's surface (usually in aquifers) that is often used for supplying wells and springs.

Hazardous waste — By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appears on special EPA lists.

High decommissioning activity (HDA) — The licensee is actively dismantling, decontaminating, or performing activities that contribute to site release or license termination. Includes, but is not limited to, (1) major decommissioning activities or (2) periods of decommissioning in which the aggregate of licensee activities represents a significant change in facility configuration, increase in occupational dose, curies relocated, or decommissioning cost expenditure.

Highly enriched uranium — Uranium enriched to 20 percent or greater in the isotope Uranium-235.

High-level waste (HLW) — Consists of (1) irradiated (spent) reactor fuel, (2) liquid waste resulting from the operation of the first cycle solvent extraction system, and the concentrated wastes from subsequent extraction cycles, in a facility for reprocessing irradiated reactor fuel, or (3) solids into which such liquid wastes have been converted. Primarily in the form of spent fuel discharged from commercial nuclear power reactors, HLW also includes some reprocessed HLW from defense activities, and a small quantity of reprocessed commercial HLW. See Low-level waste and Radioactive waste.

High radiation area — Any area with dose rates greater than 1 mSv (100 mrems) in 1 hour, 30 centimeters from the source or from any surface through which the ionizing radiation penetrates. Areas at licensee facilities must be posted as "high radiation areas" and access into these areas is maintained under strict control.

Hot spot The region in a radiation/contamination area in which the level of radiation/contamination is significantly greater than in neighboring regions in the area.

Ingestion Swallowing (such as eating or drinking). Ingestion of radioactive material or other contaminants can occur via contact with contaminated food, drink, utensils, cigarettes, hands, or other surfaces. After ingestion, chemicals can be absorbed into the blood and distributed throughout the body.

Inhalation Breathing. Exposure may occur from inhaling contaminants because they can be deposited in the lungs, taken into the blood, or both.

Ion (1) An atom that has too many or too few electrons, causing it to have an electrical charge, and, therefore, be chemically active (2) An electron that is not associated (in orbit) with a nucleus.

Ionizing radiation Any radiation capable of displacing electrons from atoms or molecules, thereby producing ions. Some examples are alpha, beta, gamma, x-rays, neutrons, and ultraviolet light. High doses of ionizing radiation may produce severe skin or tissue damage.

Independent spent fuel storage installation (ISFSI) A complex designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage. The most common design for an ISFSI at this time is a concrete pad with dry casks containing spent fuel bundles.

Industrial use area An area that has been designated appropriate for industrial activities.

Irradiation Exposure to radiation.

Isotope One of two or more atoms with the same number of protons, but different numbers of neutrons in their nuclei. Thus, carbon-12, carbon-13, and carbon-14 are isotopes of the element carbon, the numbers denoting the

approximate atomic weights. Isotopes have very nearly the same chemical properties, but often different physical properties (for example, carbon-12 and carbon-13 are stable, whereas carbon-14 is radioactive).

Leaching

Residual contamination transported into the subsurface as water trickles through soils or materials that contain the contamination. The water can carry the contamination through the soil and pollute nearby groundwater or surface water.

License termination plan

The license termination plan is a document that is required by 10 CFR 50.82(a)(9). The license termination plan, submitted by the licensee at least 2 yrs before termination of the license, addresses the following items: site characterization, identification of remaining site dismantlement activities, plans for site remediation, detailed plans for final radiation surveys for release of the site, method for demonstrating compliance with the radiological criteria for license termination, updated site-specific estimate of remaining decommissioning costs, and supplement to the environmental report pursuant to 10 CFR 51.53(d). The license termination plan approval process is by license amendment.

Licensing basis

The set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The licensing basis includes the NRC regulations and appendixes, orders, license conditions, exemptions, and technical specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2, as documented in the most recent final safety analysis report (as required by 10 CFR 50.71) and the licensee's commitments remaining in effect that were made in docketed

licensing correspondence, such as licensee responses to NRC bulletins, generic letters, and enforcement actions, required certifications and submittals, NRC safety evaluations, and licensee event reports.

Light water reactor (LWR) A term used to describe reactors using ordinary water as coolant, including boiling water reactors (BWRs) and pressurized water reactors (PWRs), the most common types used in the United States.

Low decommissioning activity (LDA) Periods of decommissioning when a licensee either (1) maintains their facility in a true SAFSTOR configuration or (2) incrementally dismantles, decontaminates, or decommissions structures, systems, or components at such a low rate or small volume that there are only trivial changes to facility configuration, occupational dose, curie relocation, or decommissioning cost expenditure.

Low-income population Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another or a set of individuals (e.g., migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.

Low-level waste (LLW) A general term for a wide range of wastes. Industries, hospitals, research institutions, private or government laboratories, and nuclear fuel-cycle facilities (e.g., nuclear power reactors and fuel fabrication plants) using radioactive materials generate LLW as part of their normal operations. These wastes are generated in many physical and chemical forms and levels of contamination. LLW usually comprises the following material contaminated with radionuclides: rags, papers, filters, solidified liquids, ion-exchange resins, tools, equipment, discarded protective clothing, dirt, construction rubble, concrete, or piping. See High-level waste and Radioactive waste.

Major decommissioning activity For a nuclear power facility, any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment (for PWRs, the primary containment; for BWRs, the primary and secondary containments), or results in the dismantling of components or systems for shipment containing "greater than Class C" waste (10 CFR 61.55). The licensee is precluded by regulation from conducting major decommissioning activities until 90 days after the NRC has received the Post-Shutdown Decommissioning Activities Report and the 10 CFR 50.82(a)(1) certifications have been submitted.

Major radioactive component For a nuclear power plant, this includes the reactor vessel and internals, steam generators, pressurizer, large-bore reactor coolant system piping, and other large components that are radioactive to a comparable degree.

MARSSIM The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), which provides detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with dose- or risk-based regulation. The MARSSIM guidance focuses on the demonstration of compliance during the final status survey following scoping, characterization, and any necessary remedial actions.

Media Soil, water, air, plants, animals, or any other parts of the environment that can contain contaminants. Body tissues or fluids such as blood, bone or urine may also be media. The singular of "media" is "medium."

Minority Individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

Minority population According to the CEQ, minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully

greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. In identifying minority communities, agencies may consider as a community either a group of individuals living in geographic proximity to one another or a geographically dispersed/transient set of individuals (e.g., migrant workers or Native American), where either type of group experiences common conditions of environmental exposure or effect. The selection of the appropriate unit of geographic analysis may be a governing body's jurisdiction, a neighborhood, census tract, or other similar unit that is to be chosen so as not to artificially dilute or inflate the affected minority population. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds. NRR adopted a standard of 20 percentage points as "meaningfully greater."

Mixed waste Mixed radioactive and hazardous waste (mixed waste). (EPA 1997)

Nuclear energy The energy liberated by a nuclear reaction (fission or fusion) or by radioactive decay.

Nuclear island The nuclear island concept is used during decommissioning as a model for reducing the focus of the safeguards and security systems to the location where the fuel is being stored. For example, if the fuel is being stored in the spent fuel pool, the focus of the safeguards are on protection of only the spent fuel pool building and not the balance of the plant.

Nuclear waste See High-level waste and Low-level waste.

Operational Area The portion of the plant site where most or all of the site activities occur, such as reactor operations, materials and equipment storage, parking, substation operation, facility service and maintenance, etc. This includes all areas within the protected area fence, the intake and discharge structures, the cooling system, and other site structures,

	as well as associated paved, graveled, and maintained landscaped areas.
Partial site release	The release of a portion of an operating or decommissioning nuclear power reactor facility site for unrestricted use. The licensee maintains a license for the remainder of the site. At this time there is a proposed rulemaking to change the regulations to specifically address the criteria for a partial site release. The rulemaking ensures that any remaining residual radioactivity from licensed activities in parts of a site released fro unrestricted use will meet the radiological criteria for license termination. For more detail, see the text in Chapter 3.
Permanent cessation of power operations	The permanent cessation of power operations is a licensee determination certified to the NRC in writing in accordance with 10 CFR 50.82(a)(1)(i). Following this certification, the licensee would possess the power reactor structures, systems, and components, site, and related radioactive material, but be prohibited by regulation from operating the reactor.
Personnel monitoring	The use of portable survey meters to determine the amount of contamination on an individual, or the use of dosimetry to determine an individual's occupational radiation dose.
Possession-only license (POL)	A name for the license retained by a 10 CFR Part 50 licensee that was amended to reflect the permanent shutdown condition of the facility and the licensee's continued possession of nuclear fuel.
Post-operational phase	The interval between the final reactor shutdown and the licensee's certification that all fuel has been permanently removed from the reactor vessel. See 10 CFR 50.82(a)(1)(ii). During this phase, the licensee would establish safe shutdown conditions and could conduct activities to dismantle and decontaminate structures, systems, and components or place them in a storage configuration.

Post-shutdown decommissioning activities report (PSDAR)	The PSDAR is required by 10 CFR 50.82(a)(4). The licensee is required to submit a PSDAR to the NRC within two yrs after permanent cessation of operations. Includes a description of the planned decommissioning activities, a schedule for the completion of these activities, an estimate of expected costs, and a discussion that provides the reasons for concluding that the environmental impacts associated with the site-specific decommissioning activities will be bounded by appropriate environmental impact statements previously issued.
Pressurized water reactor (PWR)	A power reactor in which heat is transferred from the core to an exchanger by high-temperature water kept under high pressure in the primary system. Steam is generated in a secondary circuit. Many reactors producing electric power are PWRs.
Previously disturbed area	An area that has been physically moved, uncovered, destabilized, or otherwise modified from its undisturbed natural condition. This definition excludes areas restored to a natural state, such that vegetative ground cover and soil characteristics that are similar to adjacent or nearby natural conditions.
Quality assurance and quality control (QA/QC)	A system of procedures, checks, and audits to judge the quality of measurements and reduce the uncertainty of environmental data.
Rad	The special unit for radiation absorbed dose, which is the amount of energy from any type of ionizing radiation (e.g., alpha, beta, gamma, neutrons, etc.) deposited in any medium (e.g., water, tissue, air). A dose of 1 rad means the absorption of 100 ergs (a small but measurable amount of energy) per gram of absorbing tissue. 100 rad = 1 gray.
Radiation	Particles (alpha, beta, neutrons) or photons (gamma) emitted from the nucleus of unstable radioactive atoms as a result of radioactive decay.

Radiation standards Exposure standards, permissible concentrations, rules for safe handling, regulations for transportation, regulations for industrial control of radiation, and control of radioactive material by legislative means.

Radioactive contamination Deposition of radioactive material in any place where it may harm persons or equipment.

Radioactive waste Solid, liquid, and gaseous materials from nuclear operations that are radioactive or become radioactive and for which there is no further use. Wastes are generally classified as high-level (having radioactivity concentrations of hundreds of thousands of curies per gallon or foot), low-level (in the range of 1 microcurie per gallon or foot), or intermediate level (between these extremes). See 10 CFR Parts 60 and 61.

Radioactivity The spontaneous emission of radiation, generally alpha or beta particles, often accompanied by gamma rays, from the nucleus of an unstable isotope. Also, the rate at which radioactive material emits radiation. Measured in units of becquerels or disintegrations per second.

Radioisotope An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation. Approximately 5000 natural and artificial radioisotopes have been identified.

Radiologically non-impacted Areas that have no reasonable potential for radioactive residual contamination are classified as non-impacted by MARSSIM (NRC 1997).

Radiological waste See “radioactive waste.”

Radionuclide A radioisotope.

Reactor A device in which nuclear fission may be sustained and controlled in a self-supporting nuclear reaction. The varieties are many, but all incorporate features, such as fissionable material or fuel, a moderating material (unless the reactor is operated on fast neutrons), a reflector to conserve escaping neutrons, provisions for removal of

heat, measuring and controlling instruments, and protective devices. The reactor is the heart of a nuclear power plant.

Real property Includes land, improvements on the land, or both, including interests therein. All equipment or fixtures (e.g., plumbing, electrical, heating, built-in cabinets, and elevators) that are installed in a building in more or less permanent manner or that are essential to its primary purpose.

Reference man A hypothetical person with the anatomical and physiological characteristics of an average individual, used in calculations assessing internal dose (also may be called "standard man").

rem A conventional standard unit that measures the effects of ionizing radiation on humans. The international system (SI) equivalent unit is the sievert.

Restricted use A category of use of the facility after license termination. In restricted use, a licensee has demonstrated that further reductions in residual radioactivity would result in net public or environmental harm or that residual levels are as low as reasonably achievable, and that the licensee has made provisions for legally enforceable institutional controls (e.g., restrictions placed in the deed for the property describing what the land can and cannot be used for) that provide reasonable assurance that the radiological criteria set by the NRC will not be exceeded. In addition, the licensee must have provided sufficient financial assurance to an amenable independent third party to assume and carry out responsibilities for any necessary control and maintenance of the site. There are also regulations relating to the documentation of how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated in the license termination plan related to decommissioning by unrestricted use.

Risk — The probability of harm. For example, for a person who has measles, the risk of death is one in one million.

Roentgen (R) — A unit of exposure to ionizing radiation. It is the amount of gamma or x-rays required to produce ions resulting in a charge of 0.000258 coulombs/kilogram of air under standard conditions. Named after Wilhelm Roentgen, the German scientist who discovered x-rays in 1895.

Rubblization — The demolition of onsite concrete structures. Rubblizing these structures could result in material ranging from gravels to large concrete blocks, or a mixture of both.

Safety limit — A limit placed upon important process variables that are found to be necessary to reasonably protect the integrity of the physical barriers guarding against the uncontrolled release.

Safety-related structures, systems, and components — Nuclear plant structures, systems, and components that are relied upon to remain functional during and following design-basis events to ensure:

- the integrity of the reactor coolant pressure boundary
- the capability to shut down the reactor and maintain it in a safe shutdown condition, or
- the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1) or 10 CFR 100.11.

SAFSTOR — A method of decommissioning in which the nuclear facility is placed and maintained in a safe stable condition for a number of years until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel and radioactive liquids have been drained from systems and components

and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the quantity of contaminated and radioactive material that must be disposed of during decontamination and dismantlement.

Sewage — The waste and wastewater produced by residential and commercial sources and discharged into sewers.

Sewage waste — By-products of society from sewer sources.

Sewer sludge — Sludge produces at a Publicly Owned Treatment Works, the disposal of which is regulated under the Clean Water Act.

Sievert — An international system (SI) unit that measures the effects of ionizing radiation on humans. The conventional equivalent unit is the rem.

Site characterization — One of the final steps before the termination of the license. The site characterization contains a description of (1) the radiological contamination on the site before any cleanup activities associated with decommissioning took place, (2) a historical description of site operations, spills, and accidents, and (3) a map of remaining contamination levels and contamination locations. The purpose of the site characterization is to assist in planning for remediation, selection of remediation techniques, and assessment of radiological impacts and cost estimates.

Sludge — A semi-solid residue from any of a number of air or water treatment processes; can be a hazardous waste.

Spent nuclear fuel — Depleted fuel that has been removed from a nuclear reactor because it can no longer sustain power production (cannot effectively sustain a chain reaction) for economic or other reasons.

Target organ — An organ (such as the liver or kidney) that is specifically affected by a toxic chemical.

Technical specifications (TS) An appendix to the facility license that contains safety requirements, bases, safety limits, limiting conditions for operation, and administrative requirements to provide assurance that decommissioning can be conducted safely and in accordance with regulatory requirements. Terminology such as “defueled TSs” or “decommissioning TSs” has been used to describe technical specifications that have been amended to reflect the permanent shutdown condition of reactor.

Transfer Includes all real estate transfers (e.g., donation, exchange, disposal, easement, lease, permit, license).

Transuranic element An artificially made, radioactive element that has an atomic number higher than uranium in the periodic table of elements, e.g., neptunium, plutonium, americium, and others.

Transuranic waste Material contaminated with transuranic elements that is produced primarily from reprocessing spent fuel and from use of plutonium in fabrication of nuclear weapons.

Unrestricted area The area outside the owner-controlled portion of a nuclear facility (usually the site boundary). An area in which a person could not be exposed to radiation levels in excess of 2 mrem in any 1 hour from external sources. See 10 CFR 20.1003.

Unrestricted use A category of facility use after license termination. Unrestricted use means that there are no restrictions on how the site may be used. The licensee is free to continue to dismantle any remaining buildings or structures, and to use the land or sell the land for any type of application.

Vapor The gaseous form of substances that are normally in liquid or solid form.

Volatile organic compound (VOC) An organic chemical that evaporates easily. Petroleum products such as kerosene, gasoline, and mineral spirits contain VOCs.

Weighting factor (W_t) Multipliers of the equivalent dose to an organ or tissue used for radiation protection purposes to account for differ-

ent sensitivities of different organs and tissues to the induction of stochastic effects of radiation. See 10 CFR 20.1003.

Whole-body counter A device used to identify and measure the radioactive material in the bodies of human beings and animals. It uses heavy shielding to keep out naturally existing background radiation and measures radiation levels with ultra sensitive radiation detectors and electronic counting equipment.

Whole-body exposure An exposure of the body to radiation, in which the entire body, rather than an isolated part, is irradiated. Where a radioisotope is uniformly distributed throughout the body tissues, rather than being concentrated in certain parts, the irradiation can be considered as whole-body exposure.

NUREG-0586, Supplement 1
Volume 2

Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities

Supplement 1

Regarding the Decommissioning of Nuclear Power Reactors

Appendices N, O and P

Final Report

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555-0001

NUREG-0586, Supplement 1
Volume 2

Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities

Supplement 1

Regarding the Decommissioning of Nuclear Power Reactors

Appendices N, O and P

Final Report

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Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Abstract

This document is a supplement to the U.S. Nuclear Regulatory Commission (NRC) document *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* issued in 1988 (NUREG-0586, referred to here as the 1988 Generic Environmental Impact Statement [GEIS]). This Supplement was prepared because of technological advances in decommissioning operations, experience gained by licensees, and changes made to NRC regulations since the 1988 GEIS.

This Supplement updates the information provided in the 1988 GEIS. It is intended to be used to evaluate environmental impacts during the decommissioning of nuclear power reactors as residual radioactivity at the site is reduced to levels that allow for termination of the NRC license. This Supplement addresses only the decommissioning of nuclear power reactors licensed by the NRC. It updates the sections of the 1988 GEIS relating to pressurized water reactors, boiling water reactors, and multiple reactor stations. It goes beyond the 1988 GEIS to explicitly consider high-temperature gas-cooled reactors and fast breeder reactors. This document can be considered a stand-alone document for power reactor facilities such that readers should not need to refer back to the 1988 GEIS. The environmental impacts described in this Supplement supercede those described for power reactor facilities in the 1988 GEIS.

The scope of this Supplement is based on the decommissioning activities performed to remove radioactive materials from structures, systems, and components from the time that the licensee certifies that it has permanently ceased power operations until the license is terminated. The scope of the document was determined through public scoping meetings and meetings with other Federal agencies and the nuclear industry. An evaluation process was then developed to determine environmental impacts from nuclear power reactor facilities that are being decommissioned. The evaluation process involved determining the specific activities that occur during reactor decommissioning and obtaining data from site visits and from licensees at reactor facilities currently being decommissioned. The data obtained from the sites were analyzed and then evaluated against a list of variables that defined the parameters for facilities that are currently operating but which will one day be decommissioned. This evaluation resulted in a range of impacts for each environmental issue that may be used for comparison by licensees that are or will be decommissioning their facilities.

Abstract

Contents

Volume 2
Appendices N, O and P

Abstract iii

Abbreviations/Acronyms vii

Appendix N -Summary of Scoping Meetings N-1

Appendix O -Comments on the Draft Supplement and Staff Responses O-1

Appendix P -Public Meeting Transcript Excerpts and Written Comments P-1

Contents

Abbreviations/Acronyms

µGy	microGray(s)
µSv	microSieverts
ac	acre(s)
AEA	Atomic Energy Act of 1954
AEC	U.S. Atomic Energy Commission
ALI	annual limits on intake
ALARA	as low as reasonably achievable
ANPR	advance notice of proposed rulemaking
BLM	Bureau of Land Management
BMP	best management practice
Bq	Bequerel(s)
BWR	boiling water reactor
C	Celsius
CAA	Clean Air Act
CDE	committed dose equivalent
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Ci	Curie
CWA	Clean Water Act
DAC	derived air concentration
dB	decibel
dBA	A-weighted sound levels
dBC	C-weighted sound levels
DBA	design basis accident
DDREF	dose or dose rate effectiveness factor
DE	dose equivalent
DNL	day-night average sound level
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	environmental assessment

EDE	effective dose equivalent
EIS	environmental impact statement
EJ	environmental justice
EPA	U.S. Environmental Protection Agency
ER	environmental report
ESA	Endangered Species Act of 1973
ES&H	environment, safety and health
F	Fahrenheit
FAA	Federal Aviation Administration
FBR	fast breeder reactor
FES	final environmental statement
FHA	Federal Housing Administration
FR	Federal Register
FSAR	Final Safety Analysis Report
ft	foot/feet
FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
FWS	U.S. Fish and Wildlife Service
gal.	gallon(s)
GEIS	Generic Environmental Impact Statement
gpd	gallons per day
gpm	gallons per minute
GTCC	Greater-than-Class-C (waste)
Gy	gray(s)
ha	hectare(s)
HDA	high decommissioning activity
HEPA	high-efficiency particulate air (filter)
HLW	high-level waste
h	hour
HTGR	high-temperature gas-cooled reactor
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilation, and air conditioning
IAEA	International Atomic Energy Agency
in.	inch(es)
I&C	instrumentation and control
ICRP	International Commission on Radiological Protection

ISFSI	independent spent fuel storage installation
kg	kilogram(s)
km	kilometer(s)
kV	kilovolt(s)
kWh	kilowatt hour(s)
L	liter(s)
LDA	low-decommissioning activity
LER	licensee event report
LET	linear energy transfer
LLW	low-level waste
LOS	level of service
LRA	license renewal application
LTP	license termination plan
LWR	light water reactor
m	meter(s)
m^3/d	cubic meters per day
m^3/s	cubic meters per second
MARSSIM	Multi-agency Radiation Survey and Site Investigation Manual, NUREG-1575
MBTA	Migratory Bird Treaty Act of 1918
mi	mile(s)
mGy	milliGray(s)
MPC	maximum permissible concentrations
mrad	millirad(s)
mrem	millirem(s)
MRS	monitored retrievable storage
mSv	milliSievert(s)
MTHM	metric tonnes of heavy metal
MT	metric ton(s) (or tonne[s])
MTU	metric ton(s)-uranium
MW	megawatt(s)
MWd/MTU	megawatt-days per metric ton of uranium
MW(e)	megawatt(s) electric
MW(t)	megawatt(s) thermal
MWh	megawatt hour(s)
NA	not applicable
NAS	National Academy of Sciences
NBS	National Bureau of Standards

NCRP	National Council on Radiation Protection and Measurements
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966
NIST	National Institute of Standards and Technology
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxide(s)
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NWPA	Nuclear Waste Policy Act of 1982
ODCM	Offsite Dose Calculation Manual
OSHA	Occupational Safety and Health Administration
PAG	protective action guide
PCBs	polychlorobiphenyls
PEL	permissible exposure limit
POL	possession-only license
PPE	personal protective equipment
PSDAR	post-shutdown decommissioning activities report
PV	pressure vessel
PWR	pressurized water reactor
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act of 1976
RCS	reactor coolant system
ROW	right-of-way/rights-of-way
RPV	reactor pressure vessel
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Officer
SI	Systeme Internationale (international system of units)
SO_2	sulfur dioxide
SO_x	sulfur oxide(s)
SSCs	structures, systems, and components
Sv	sievert(s)

TEDE	total effective dose equivalent
THPO	Tribal Historic Preservation Officer
UNSCEAR	United Nations Scientific Committee on The Effects of Atomic Radiation
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
VRM	Visual Resource Management (system)
wk	week(s)
YNPS	Yankee Nuclear Power Station
yr	year(s)

Appendix N

Summary of Scoping Comments

Appendix N

Summary of Scoping Comments

On Tuesday, March 14, 2000, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the Federal Register (65 FR 13797), to notify the public of the staff's intent to prepare a supplement to the *Generic Environmental Impact Statement on Decommissioning Nuclear Facilities* (1988 GEIS), NUREG-0586, to support decommissioning activities at commercial power production facilities and to conduct scoping. This Supplement to the 1988 GEIS was prepared in accordance with the National Environmental Policy Act (NEPA 1969), Council on Environmental Quality guidelines, and 10 CFR Part 51. As outlined by NEPA, the NRC initiated the scoping process with the issuance of the Federal Register Notice. The NRC invited all stakeholders to participate in the scoping process by providing oral comments at the scheduled public meetings and/or submitting written suggestions and comments no later than July 15, 2000. The scoping process included four public scoping meetings, which were held in Lisle, IL, on April 27, 2000; Boston, MA, on May 17, 2000; Atlanta, GA, on June 13, 2000; and San Francisco, CA, on June 21, 2000. Approximately 60 members of the public attended the meetings. All four meetings began with NRC staff members providing a brief overview of the decommissioning and NEPA process. After the NRC's prepared statements, the meetings were open to public comments. Twenty-three attendees provided either oral or written statements that were recorded and transcribed by a certified court recorder. The corrected meeting transcripts were provided in four letters dated June 30, 2000 (NRC 2000a, 2000b, 2000c, 2000d) and are available on the NRC website at http://www.nrc.gov/NRC/REACTOR/DECOMMISSIONING/GEIS/index.html. In addition to the comments provided during the public meetings, 11 comment letters were received by the NRC in response to the Notice of Intent.

While developing this Supplement to the 1988 GEIS, the staff and its contractor considered all of the relevant issues raised during the scoping process. The full scoping summary report is accessible through NRC's Public Electronic Reading Room (ADAMS) website at http://www.nrc.gov/NRC/ADAMS/index.html; the accession number is ML011100625. Each comment that was applicable to this Supplement is summarized in this section. This information was extracted from the Scoping Summary Report, dated April 17, 2001 (65 FR 13797) and is being provided in this report for the convenience of those interested in the scoping comments applicable to this environmental review. The comments that were determined to be general or outside the scope of Supplement are not included in this Appendix.

Meetings

Location	Date
Lisle, IL	April 27, 2000
Boston, MA	May 17, 2000
Atlanta, GA	June 13, 2000
San Francisco, CA	June 21, 2000

Written Comment Letters

Name/Organization	Date
Nuclear Information and Resource Service	July 11, 2000
Pamela Blockey-O'Brien	July 12, 2000
Nuclear Information and Resource Service (submitted a supplement to the letter they originally sent)	July 13, 2000
Lynnette Hendricks (Nuclear Energy Institute)	July 14, 2000
Massachusetts Citizens for Safe Energy	July 14, 2000
Campaign for a Prosperous Georgia	July 14, 2000
Paul Gunter (Nuclear Information and Resource Service)	July 14, 2000
George Crocker (Executive Director of the North American Water Office)	July 14, 2000
Citizens Awareness Network	July 15, 2000
Glenn Carroll (Georgians Against Nuclear Power)	July 15, 2000
George A. Zinke (Director, Nuclear Safety & Regulatory Affairs, Maine Yankee Atomic Power Co.)	July 17, 2000

Generic Environmental Impact Statement - Public Scoping Meeting Comments and Responses in Scope

1. Why is the GEIS being updated?

Three commenters (five comments) inquired about the reason that the NRC decided to update the GEIS. The question was raised whether the update was based on new information such as worker exposure, volume of high- or low-level radioactive waste, differences in disposal methodologies or decommissioning options, such as options in addition to entombment and rubblization. One commenter asked if the NRC had already found new information that would make the GEIS more conservative.

Response: *The basis for this Supplement is discussed in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

One commenter (in two different comments) questioned the creation of the GEIS if decommissioning is not a major Federal action and also indicated that the GEIS and the decommissioning process are the "deregulation of decommissioning."

Response: *The update of the GEIS as related to the National Environmental Policy Act (NEPA) of 1969 is discussed in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

Four commenters expressed concern that the revisions to the GEIS would be used in negative ways such as to serve private corporate nuclear industry interests, to allow a release of unnecessary radioactive material onsite and offsite, or to reduce liability for the nuclear industry and increase environmental damage and public health. One commenter indicated that the GEIS should regulate all forms of radioactive releases.

Response: *The appropriate uses of the Supplement are discussed in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

Three commenters (four comments) agreed with the NRC's efforts to update the 1988 GEIS on decommissioning. One commenter indicated that the Supplement should be updated to incorporate and evaluate new decommissioning technologies developed over the past decade. A second commenter specified that rubblization should be considered.

Response: *One of the purposes of revising the GEIS is to incorporate and evaluate new decommissioning technologies and methods such as rubblization. This comment is within the scope of this Supplement. Technologies and methods are incorporated into the discussion and analysis in Chapter 4, Environmental Impacts.*

2. How will the GEIS be used?

One commenter inquired as to how the GEIS would be used.

Response: *The appropriate uses of this Supplement are discussed in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

One commenter encouraged the NRC to make the Supplemental GEIS user-friendly with plain English and straightforward explanations for the public.

Response: *The NRC has specific criteria that must be met in publications that are related to the usage of plain English. This comment is within the scope of this Supplement and incorporated throughout the document.*

3. Will the GEIS satisfy the NEPA process?

One commenter asked about the actions and reviews involved in determining if the environmental impact concerns considered by the NRC sufficiently satisfy the NEPA requirements.

Response: *The relationship between the GEIS and the NEPA requirements are discussed in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

One commenter asked if the NRC was planning to communicate the results of the scoping meetings and the final scope of the GEIS to the public.

Response: *The NEPA process provides for publishing and presentation of a draft report for comment before the final Supplement is issued. The comments noted in this summary report as being within the scope of the GEIS are addressed in this Supplement. Comments on the Supplement are solicited and considered before the report is finalized. This comment is within the scope of this Supplement.*

One commenter asserted that the NRC made false assumptions in the GEIS and indicated that these assumptions must be addressed and the true risk discovered before any further generic considerations are implemented.

Response: *The assumptions in the 1988 GEIS have been reconsidered in the development of this Supplement. This comment is within the scope of this Supplement and is discussed in Chapter 1, Introduction, and Chapter 4, Environmental Impacts.*

One commenter indicated that decommissioning was a Federal major action and required NEPA compliance and site-specific EISs.

Response: *Chapter 1, the introduction to this Supplement, describes the NEPA requirements for site-specific EISs and the basis for the agency's determination that decommissioning is not a Federal major action. This comment is within the scope of this Supplement.*

One commenter stated that the 1988 GEIS is a robust analysis that has stood the test of time. They supported a Supplement at this time.

Response: *A discussion of the use of the previous GEIS is provided in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

4. Reactors that will be included in the GEIS

One commenter thought the GEIS should be explicit regarding which reactors were covered. The commenter was specifically concerned about Peach Bottom and Fermi.

Response: *The applicability of this Supplement to specific reactor facilities is discussed in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

One commenter indicated that it was prudent at this time to incorporate issues that were identified through actual experience and to include issues relevant to the limited number of commercial non-light-water reactors.

Response: *The use of data from previous reactor decommissioning experience is discussed throughout this Supplement. This comment is within the scope of this Supplement.*

5. Decommissioning Activities

A. General Decommissioning Activities

One commenter inquired how the GEIS would handle two different methodologies for the same activity (such as removing steam generators as a whole or in pieces).

Response: This Supplement considers different methods for an activity to determine an acceptable envelope for that activity. If an activity results in impacts that are outside the envelope, then a site-specific assessment may be required. The process for developing this Supplement is described in Chapter 1, Introduction, further discussed in Chapter 4, Environmental Impacts, and described in more detail in Appendix E. This comment is within the scope of this Supplement.

One commenter indicated that the GEIS should provide more detail about specific decommissioning activities and technologies in order to accurately assess the associated environmental impacts. Another commenter indicated that they did not agree with the statement that decommissioning activities are not significantly different from operating the plant.

Response: *This Supplement considers specific decommissioning activities. The process for developing this Supplement is described in Chapter 1, Introduction, further discussed in Chapter 4, Environmental Impacts, and described in more detail in Appendix E. This comment is within the scope of this Supplement.*

B. Decommissioning Options

One commenter encouraged the NRC to adequately address alternatives. A second commenter inquired whether a preferred alternative would be specified in the GEIS.

Response: *Chapter 5 of this Supplement discusses alternatives to the proposed action, as required by the NEPA process. This comment is within the scope of this Supplement.*

1. DECON

No comments within scope.

2. SAFSTOR

One commenter encouraged the use of the SAFSTOR option because of the advantages in terms of exposure to workers and the public. Another reason for the commenter's support of SAFSTOR as an option was their opposition to shallow land burial of radioactive waste.

Response: *In Chapter 3, Description of Reactors, this Supplement addresses the options for decommissioning activities, including SAFSTOR and variations to SAFSTOR (such as the duration of the storage period or the use of incremental DECON, which includes incremental decontamination and dismantlement activities during the SAFSTOR period). This comment is within the scope of this Supplement.*

3. Entombment

One commenter asked what factors had changed since the 1988 GEIS that would suggest that ENTOMB was a possible option. A second commenter suggested that the lack of dumps for contaminated material made entombment a viable solution. A third commenter asked why entombment was considered not to be viable. And a fourth commenter inquired why the NRC would even be considering entombment if they already knew that the residual levels of radioactivity would be unacceptable.

Response: *This Supplement addresses varying options for decommissioning activities, including ENTOMB in Chapter 3, Description of Reactors. These comments are within the scope of this Supplement.*

One commenter encouraged the NRC to address entombment and to consider a name change to SAFSTOR II or Assured Isolation.

Response: *This Supplement addresses varying options for decommissioning activities, including ENTOMB in Chapter 3, Description of Reactors. This comment is within the scope of this Supplement.*

One commenter indicated that a Supplemental EIS must be required for the entombment option to assess the impact of what they perceive to be near-surface dumping of greater than Class C (GTCC) waste.

Response: *This Supplement addresses varying options for decommissioning activities including ENTOMB in Chapter 3, Description of Reactors. This comment is within the scope of this Supplement.*

4. Rubblization

Five commenters indicated that rubblization was an area that needed to be addressed in the revised GEIS. One commenter also added in a second comment that this included the environmental impact of residual radioactive material deeper than 6 in. below the surface, activated concrete, activated rebar, internal contamination in cracks, and sub-slab contamination. One of the commenters recommended that an additional intruder scenario be addressed.

Response: *This Supplement considers various decommissioning activities including rubblization in Chapter 4, Environmental Impacts. These comments are within the scope of this Supplement.*

Two commenters indicated that rubblization turns the reactor site into a low-level or perhaps high-level radioactive waste site and that deep monitoring wells, liners, etc., should be required and evaluated on a site-specific basis. One commenter also mentioned that salt-water corrosion should be evaluated because of the potential for some leakage from the facility if the waste is left onsite, such as occurs in rubblization.

Response: *This Supplement considers various decommissioning activities including rubblization in Chapter 4, Environmental Impacts. These comments are within the scope of this Supplement.*

5. Partial Site Release

Three commenters stated that partial site release should be addressed in the GEIS. One commenter inquired whether partial site release would be addressed in the Supplement. Another commenter stated that they opposed partial site release.

Response: *This Supplement considers partial site release and whether it can be included as a generic issue. Discussion of partial site release can be found in Chapter 1, Introduction. These comments are within the scope of this Supplement.*

C. Specific Activities to be included in the GEIS

1. Decommissioning Process

No comments within scope.

2. Post-Shutdown Decommissioning Activities Report (PSDAR)

One commenter was concerned that the only time a site-specific analysis would be conducted for a decommissioning plant would be if the facility failed the PSDAR.

Response: *This Supplement discusses the circumstances that will result in a site-specific analysis in Chapter 2, Introduction. This comment is within the scope of the GEIS.*

3. Public Meetings

No comments within scope.

4. Citizen Advisory Panels

No comments within scope.

5. Opportunity for Public Hearings

No comments within scope.

6. Inspections

No comments within scope.

7. Removal of Resident Inspectors

No comments within scope.

8. Intact Vessel Removal

Two commenters indicated that intact removal of the reactor vessel should be considered in the Supplement. One of the commenters actively advocated this alternative because of reduced worker dose, costs, and excellent isolation of the waste packages.

Response: *This Supplement considers specific decommissioning activities including intact removal of the reactor vessel. Decommissioning activities are discussed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

9. Spent Fuel

One commenter indicated that the delay in the schedule for removal of spent fuel should be reflected in the GEIS as far as decommissioning schedule, costs, and doses.

Response: *This Supplement addresses the impacts resulting from the variation in the timing of activities such as the removal of the spent fuel from the pool. This issue is addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

10. Waste Disposal

No comments within scope.

11. Waste Transport

One commenter asked what kind of transportation activities will be covered in the Supplement.

Response: *This Supplement considers impacts associated with the transportation of waste from the facility and transportation of equipment into the facility. The issue of transportation is addressed in Section 4.3.16, Transportation. This comment is within the scope of this Supplement.*

12. Offsite Cleanup

No comments within scope.

13. Site Characterization and Final Site Surveys

No comments within scope.

14. License Termination Plan - Timing of Submittal

No comments within scope.

15. License Termination Plan - Contents

No comments within scope.

16. License Termination Criteria

No comments within scope.

17. Life after License Termination

No comments within scope.

18. Reuse of Material

No comments within scope.

19. Transfer of Ownership

No comments within scope.

20. Financial Assurance

No comments within scope.

21. License Extensions

No comments within scope.

22. Safety of Decommissioning

No comments within scope.

6. Impacts that should be included or considered in the Supplement

A. Ecological Impacts

Three commenters (in four different comments) indicated that decommissioning has environmental impacts and that the GEIS should include an analysis of the environment and not just an analysis of impacts on humans.

Response: *The environmental impacts of decommissioning are addressed in this Supplement. Ecological issues are addressed in Chapter 4, Environmental Impacts. These comments are within the scope of this Supplement.*

One commenter recommended that the GEIS assess the degree to which the environmental parameters of the site may have changed during the operation of the facility.

Response: *This Supplement may include a consideration of the degree to which environmental parameters of the site may have changed during operation. Ecological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter recommended that the GEIS take into account the relevant environmental characteristics of the site and the impacts from the use of the decommissioning techniques.

Response: *Relevant characteristics of the commercial nuclear power facility sites are being considered in the development of this Supplement. The impacts from the use of decommissioning techniques are also considered. Site characteristics and decommissioning techniques are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter recommended that land use, water use, air quality, and animal and human life be included in the GEIS as environmental impacts.

Response: *Ecological impacts such as land use, water use, air quality, and the impact on animals and humans are considered in this Supplement. Ecological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

Two commenters recommended a mesh screen to prevent birds from landing and nesting on the site. Another recommended sterilizing the wildlife and containing them to allow them to die naturally in order to keep them from passing on genetic material.

Response: *The impacts of the decommissioning process on the terrestrial environment are considered in this Supplement. Mitigative actions will be considered if necessary. Ecological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

B. Groundwater

Three commenters expressed concern about contamination in ground or surface water. Commenters indicated that studies should be conducted related to leaking pipes or plumes of contamination in the groundwater. One commenter specified that protocols should be in place that would be adhered to, particularly for underwater drilling. A third commenter thought that appropriate methodologies should be included to determine groundwater contamination before decommissioning occurs.

Response: *The impact of potentially contaminated groundwater is considered in this Supplement. Water quality issues are addressed in Chapter 4, Environmental Impacts. These comments are within the scope of this Supplement.*

One commenter cautioned that impacts to groundwater specifically from rubblization should not be underestimated.

Response: *The radiological impacts of rubblization for the period beyond the license termination must meet the requirements in 10 CFR Part 20, Subpart E, before the license will be terminated. Impacts to groundwater during the decommissioning period and nonradiological impacts following the termination of the license are generically addressed in this Supplement. Water quality issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

Two commenters recommended that wells be monitored within five miles of the facility and that specific actions be taken if contamination is found.

Response: *Monitoring of effluents during decommissioning are addressed in this Supplement. Water quality issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter indicated that all plumes must be traced, blocked, pumped, and filtered. Another commenter recommended pumping groundwater through resin beds, sand filters, and charcoal filters.

Response: *An evaluation of the impact of potentially contaminated water is considered in this Supplement. Mitigative measures are discussed, as appropriate. Water quality issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of the GEIS.*

C. Surface Water

Two commenters indicated that sediment up to a mile downstream from the discharge "valves" should be removed and treated as hazardous waste.

Response: *The staff is uncertain as to the meaning of "discharge valve" but is responding to this question assuming the commenters meant the discharge structure. An evaluation of the impact of potentially contaminated sediment and its removal during the decommissioning process is considered within this Supplement. Mitigative measures are discussed as appropriate. Water quality issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter recommended routing site runoff to covered detention ponds equipped with filters, etc.

Response: *An evaluation of the impacts to surface water is considered in this Supplement. Mitigative measures are discussed as appropriate. Water quality issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

D. Radiological Concerns

One commenter requested that NRC include a definition of background radiation in the GEIS. It should be clear whether the background was measured before or after 1945.

Response: *This Supplement uses the NRC's definition of background radiation as given in 10 CFR 20.1003 as the basis for any discussion of radiological impacts. The background for a particular site would correspond to the background radiation levels determined at the time that the Final Environmental Impact Statement for the facility was issued. Radiological issues are*

addressed in Chapter 4, Environmental Impacts. This comment is within the scope of the GEIS.

E. Occupational Dose Impacts

One commenter indicated that the dose estimates for decommissioning activities should be revised and that an envelope should be used to account for attempts to use certain techniques that may not be the best way to solve the problem.

Response: *This Supplement addresses the occupational dose estimates for decommissioning. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter recommended that a good look be taken at the radiation exposure projections and that the projected exposure should be a good challenge for the industry.

Response: *This Supplement addresses the occupational dose estimates for decommissioning. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of the GEIS.*

One commenter recommended that a comparison be made of the dose estimates if the facility is decommissioned initially or if decommissioning does not start for 2 years.

Response: *The timing of activities and its impact on the anticipated radiological dose for a decommissioning facility are considered in this Supplement. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter encouraged caution in comparing risks among processes. The commenter recommended that all the aspects of different processes be considered and that the comparisons be compatible.

Response: *The comment is noted. The impacts of decommissioning activities are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter thought the scientific studies that have been performed since 1988 that show that radiation is more harmful to human health should also be included.

Response: *This Supplement will include a determination of the impacts on human health from the potential radiological dose. The discussion will be based on current scientific guidelines. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter indicated that the total dose should be a very high priority.

Response: *This Supplement includes an analysis of the dose impacts of decommissioning. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter suggested that exposure levels for workers are monitored every day and tallied every week or so and tracked against the limits given in the GEIS. A second commenter indicated that worker doses during decommissioning have been repeatedly underestimated because decommissioning is an experiment and there is a lack of experience and enforcement by the NRC. A third commenter specifically identified Connecticut Yankee as underestimating worker dose assessments and predictions.

Response: *This Supplement includes an analysis of impacts of radiation dose to workers due to decommissioning. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter recommended that the GEIS include estimates for worker inhalation of materials of high specific activity that have been vaporized and particulated by a particular decommissioning operation.

Response: *This Supplement includes an analysis of the impact of radiation dose to workers during decommissioning. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

F. Public Dose Impacts

One commenter thought the NRC did not deal with incidental contamination that affected a community, but focused instead on contamination from processes. The implication was that an analysis of incident contamination and its effect on the community should be included in the GEIS. Three other commenters specified the inadvertent release of hot particles and the routine decommissioning releases as jeopardizing health and safety of the public. One other commenter (in two comments) thought the health and safety problems needed to be taken more seriously.

Response: *The incidental contamination and inadvertent release of hot particles are unplanned releases and are handled on a site-specific basis and are not within the scope of this Supplement. An analysis of the routine decommissioning releases on the health and safety of the public are within the scope of this Supplement and are considered. Radiological issues are addressed in Chapter 4, Environmental Impacts.*

One commenter thought the dose to the public from shipment of material to other locations should be included in the consideration of dose from decommissioning a facility.

Response: *The dose to the public during transportation of radioactive material to disposal facilities are considered in this Supplement. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter indicated that the priority of the whole process was not the decommissioning of the sites, but rather the protection of public health and the environment.

Response: *The NRC's mission includes the protection of public health and safety, the common defense and security, and the protection of the environment. The NRC's mission influences the entire decommissioning process. Public safety and protection of the environment are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter expressed concern over the issue of hot particles and their impact on the community.

Response: *The inadvertent or accidental release of hot particles is handled on a site-specific basis. Analysis of contamination that is removed from the site into the public realm is considered to be an accident and would be treated as such in this Supplement. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

One commenter stated that NRC should not recalibrate and redefine background radiation levels so that they include regular plant operations, accidents, and weapons testing.

Response: *This Supplement uses the NRC's definition of background radiation as given in 10 CFR 20.1003 as a basis for any discussion of radiological impacts. Radiological issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of the GEIS.*

G. Transportation Dose Impacts

One commenter indicated that transportation doses should be considered and any site-specific issues. One commenter indicated that the changes in the transportation dose since 1988 (in the programs and methodologies that are used) warrant a revision in this area in the GEIS.

Response: *The transportation dose to the public and workers from the transport of wastes are within the scope of this Supplement. Transportation issues are addressed in Chapter 4, Environmental Impacts.*

H. Nonradiological Impacts

One commenter encouraged the incorporation of nonradiological contaminants into the GEIS. Four commenters expressed concern over nonradiological impacts of decommissioning. Two of the commenters specifically mentioned nonradiological impacts such as polychlorobiphenyls, heavy metals, and concrete. Another commenter inquired where the information would be obtained that related to nonradiological issues. Another commenter asked if nonradiological issues would be addressed in the license termination plan. (It was uncertain if this commenter thought this would also apply to the GEIS).

Response: *Nonradiological chemical hazards are regulated by the provisions of the Resource Conservation and Recovery Act (RCRA 1976). Most states have received authority from the U.S. Environmental Protection Agency (EPA) to regulate and enforce RCRA. The EPA controls hazardous waste storage, treatment, and disposal in those states that do not have this authority. Mixed waste (hazardous waste that contains radioactive material) is subject to regulation by the NRC under the Atomic Energy Act, as amended (AEA 1954), and by EPA under RCRA, as amended. Nonradiological chemical hazards are addressed in this Supplement as they relate to the radiological decommissioning of the facility. Nonradiological issues are addressed in Chapter 4, Environmental Impacts. Mixed waste (radiological contamination that is mixed with chemical contamination) are within the scope of this Supplement.*

I. Public Health Impacts (Nonradiological)

Two commenters discussed the spread of contamination into the community. One of the commenters recommended that the GEIS address health problems in the community as a result of contamination in the community.

Response: *This Supplement considers health impacts to the community as a result of radiation dose, noise, and transportation accidents. Public health issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

J. Socioeconomic Impacts

Two commenters indicated that community impacts are not adequately addressed in the GEIS and need to be looked at more carefully.

Response: *This Supplement considers socioeconomic impacts. Socioeconomic issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

K. Cultural Resource Impacts

One commenter inquired if the facilities are required to adhere to the National Park Service's requirement for Historic American Engineering Records and the Historic Architectural Building requirements.

Response: *Cultural resources are considered in this Supplement and are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

L. Cost Impacts

Two commenters recommended that the NRC take a look at the decommissioning projects or sites in detail to see if cost estimates do or do not match the final results. One of the commenters specifically addressed the variation in cost with time.

Response: *The cost of decommissioning is included in this Supplement. The variation in the cost estimates based on different start and end times of decommissioning are also considered. Cost issues are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of the Supplement.*

Two commenters thought that the storage of spent fuel should be considered as part of the decommissioning costs. One commenter also recommended that the removal of nonradioactive structures should be considered as part of the decommissioning costs.

Response: *The dismantlement of nonradioactive structures is not considered as part of the radiological decommissioning of the site unless it is necessary to remove a structure in order to complete the radiological decommissioning of the facility. However, the removal of structures that were necessary for the production of power are included in this Supplement for the sake of completeness even if the structures are not part of the radiological decommissioning of the site. Structure dismantlement issues are within the scope of this Supplement and are addressed in Chapter 4, Environmental Impacts. The management and funding for the storage of spent fuel is required by 10 CFR 50.54 and is regulated separately from the decommissioning costs. This comment is not within the scope of this Supplement.*

One commenter recommended placing the facility in SAFSTOR as a means to allow more time to gather money for decommissioning and to look at the availability of low-level waste sites.

Response: *The regulations for the accrual of funds for decommissioning are given in 10 CFR 50.75 and are not within the scope of this Supplement. However, the cost benefits of various decommissioning options are considered, and are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

M. Environmental Justice

Three commenters suggested that an analysis of the impacts of decommissioning on environmental justice be considered in the Supplement.

Response: *An analysis of environmental justice is included in this Supplement in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

N. Impacts of Fuel Storage

No comments within scope.

O. Cumulative Impacts

One commenter recommended that the whole picture be looked at with regards to the overall purpose and the environmental effects of the combined decommissioning options.

Response: *Cumulative impacts are within the scope of this Supplement and are considered in Chapter 4, Environmental Impacts.*

One commenter recommended that the GEIS include a description and analysis of cumulative impacts for each waste stream in the community, including transportation routes, NRC and DOE facilities, and proposed sites for waste management, storage, and disposition.

Response: *Cumulative impacts related to the decommissioning of the site are considered in this Supplement. Impacts related to transportation of the waste and to irretrievable commitment of land for waste storage are also considered in this Supplement. Cumulative impact, transportation, and retrieval resource impacts are addressed in Chapter 4, Environmental Impacts. Cumulative impacts from waste management, storage, and disposition facilities are not within the scope of this Supplement.*

7. Site-Specific Information versus Generic Information

Two commenters asked how impacts or site conditions will be addressed - if they would be handled generically in the GEIS or on a site-specific basis.

Response: *Ecological and environmental issues have been considered to determine if they are generic issues that should be included in this Supplement. Those issues determined not to be generic and that require a site-specific assessment are identified in this Supplement, in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

Two commenters asked how site-specific conditions such as groundwater pathways would be

considered in the Supplement. If they would be considered generically or on a site-specific basis.

Response: *Ecological and environmental issues have been considered to determine if they are a generic issue that should be included in this Supplement. Those issues determined not to be generic and that require a site-specific assessment are identified in this Supplement, in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

Eight commenters (in 16 different comments) asked about the situations and rules for triggering a site-specific environmental impact assessment. Specific examples of items that might trigger a site-specific analysis include contamination in pools and under reactor sites, coastal and flood plain issues, seismology, background radiation, pollution, reactor types, geology, operating experiences, land use, economy, synergistic effects of other toxins or industries in the area, decommissioning techniques, uniqueness of the site soil contamination, and river sediments.

Response: *This Supplement discusses the issue of site-specific versus generic environmental impacts in Chapter 4, Environmental Impacts. These comments are within the scope of this Supplement.*

Six commenters (nine comments) indicated that, in general, a site-specific impact statement or a set of guidelines that the utilities need to consider during decommissioning might be more appropriate than a GEIS because of the site-specific nature of decommissioning. One of the commenters thought that the question of what does and does not legitimately constitute site-specific factors in need of an EIS are economically driven instead of safety driven.

Response: *This Supplement will discuss the issue of site-specific versus generic environmental impacts in Chapter 4, Environmental Impacts. These comments are within the scope of this Supplement.*

8. Incorporation of Information from Previously Developed EISs

One commenter recommended that the Supplement address whether and how to incorporate findings from the EISs for plant construction and operation, analyses that have accrued during plant operations, and reports on referenced facilities.

Response: *Chapter 1, Introduction, in this Supplement discusses the interface between this Supplement for decommissioning and the EISs for plant construction, operation, and license renewal. This comment is within the scope of this Supplement.*

9. Methodology

A. Methodology - Process

One commenter recommended that decommissioning be treated as an activity separate from operations.

Response: *Environmental impacts from decommissioning activities are specifically addressed (and separately from impacts of operation) in this Supplement. Environmental impacts are considered in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

B. Determination of Boundary Conditions

One commenter asked how the boundary conditions for the GEIS would be determined. The commenter then proceeded to recommend several methods for determining boundary conditions for waste volumes.

Response: *This Supplement has been developed by collecting a reasonable range of information from the sites that are undergoing decommissioning and using that information to set boundaries for environmental impacts. Environmental Impacts are addressed in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

C. Changing the Parameters from the Initial Study

One commenter recommended that the existing GEIS be used as a baseline and that it should be supplemented in those areas where additional information is available. This would allow those licensees currently undergoing decommissioning to remain enveloped and those that are using the GEIS to evaluate a future decommissioning would have more up-to-date information.

Response: *The 1988 GEIS is being supplemented based on additional information and decommissioning experience and history. The analysis in Chapter 4, Environmental Impacts, and the corresponding appendices contain the data used for evaluating the environmental impacts. This comment is within the scope of this Supplement.*

10. Mitigation

One commenter recommended that the NRC adequately address mitigation in the GEIS or a site-specific analysis.

Response: *Mitigation is within the scope of this Supplement and is addressed in Chapter 1, Introduction, and Chapter 4, Environmental Impacts.*

11. Grandfathering

Three commenters asked about the impact of the new Supplement on facilities that have shut down and are in compliance with the 1988 GEIS.

Response: *The use of this Supplement by facilities that have previously shut down is addressed in this Supplement in Chapter 1, Introduction, and Chapter 4, Environmental Impacts.*

12. Regulations

A. Relationship to Other Regulations

One commenter thought the GEIS should address the relationship with other NRC regulations, such as site-release criteria.

Response: *The relationship between this Supplement and other NRC regulations or EISs is discussed in Chapter 1, Introduction. This comment is within the scope of this Supplement.*

One commenter recommended that NRC treat all problems and areas of concern as "site-specific problems" rather than as generic industry problems.

Response: *This Supplement identifies issues that require a site-specific analysis. Site-specific issues are addressed in Chapter 4, Environmental Impacts. This comment was within the scope of this Supplement.*

13. Scoping Meetings - Schedule, Substance, etc.

No comments within scope.

14. Comments Related to Specific Nuclear Power Plants

Three commenters addressed the use of rubblization as an activity for decommissioning at Maine Yankee. One commenter agreed that the NRC needed to fulfill their responsibilities related to NEPA. A second commenter believed that a full environmental assessment should be made to determine if a site-specific EIS is necessary. A third commenter strongly opposed any delay in a specific plant initiative based on the Supplement to the GEIS.

Response: *Rubblization is addressed by this Supplement. Specific areas or activities requiring site-specific analyses are also addressed. Rubblization and site-specific issues are considered in Chapter 4, Environmental Impacts. This comment is within the scope of this Supplement.*

N.1 References

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic licensing of production and utilization facilities."

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

65 FR 13797. "Notice of Intent to Prepare a Supplement to the Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities and to Hold Public Meetings for the Purpose of Scoping and to Solicit Public Input into the Process." Nuclear Regulatory Commission. *Federal Register*. March 14, 2000.

Atomic Energy Act of 1954, as amended, 42 USC 2011 et seq.

National Environmental Policy Act (NEPA) of 1969, as amended, 42 USC 4321 et seq.

Resource Conservation and Recovery Act (RCRA) of 1976, as amended by the Hazardous and Solid Waste Amendments Act of 1984, 42 USC 6901 et seq.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000a. Letter from NRC to "People who Requested a Copy of Meeting Transcript for GEIS Public Scoping Meeting on April 27, 2000 in Lisle, Illinois." Dated June 30, 2000.

U.S. Nuclear Regulatory Commission (NRC). 2000b. Letter from NRC to "People who Requested a Copy of Meeting Transcript for GEIS Public Scoping Meeting on May 17, 2000 in Boston, Massachusetts." Dated June 30, 2000.

U.S. Nuclear Regulatory Commission (NRC). 2000c. Letter from NRC to "People who Requested a Copy of Meeting Transcript for GEIS Public Scoping Meeting on June 13, 2000 in

Atlanta, Georgia." Dated June 30, 2000.

U.S. Nuclear Regulatory Commission (NRC). 2000d. Letter from NRC to "People who Requested a Copy of Meeting Transcript for GEIS Public Scoping Meeting on June 21, 2000 in San Francisco, California." Dated June 30, 2000.

Appendix O

Comments on the Draft Supplement and Staff Responses

Contents

Introduction O-1

O.1 Impacts O-29
O.1.1 Onsite/Offsite Land Use O-29
O.1.2 Surface and Groundwater Quality and Use O-31
O.1.3 Air Quality O-39
O.1.4 Ecology O-44
O.1.5 Threatened and Endangered Species O-53
O.1.6 Radiological O-54
O.1.7 Decommissioning Accidents O-79
O.1.8 Occupational (Nonradiological) Impacts O-84
O.1.9 Cost Impacts O-88
O.1.10 Socioeconomics O-102
O.1.11 Environmental Justice O-109
O.1.12 Cultural Resources O-111
O.1.13 Aesthetics O-112
O.1.14 Noise O-113
O.1.15 Transportation/Transportation Dose Impacts O-114
O.1.16 Conclusions O-118
O.2 NRC Experience, Role and Regulations O-126
O.2.1 NRC Experience with Decommissioning O-126
O.2.2 NRC Role O-129
O.2.3 Decommissioning Duration and Options O-146
O.2.3.1 Decommissioning Duration O-146
O.2.3.2 Decommissioning Options O-148
O.2.3.3 Entombment O-151
O.2.3.4 Rubblization O-162
O.2.4 Safety of Decommissioning O-170
O.2.4.1 Issues Related to Terrorist Events O-170
O.2.4.2 Safety of Decommissioning O-174
O.2.4.3 Risk-Informed Regulations O-176
O.3 Decommissioning Process O-177
O.4 Out-of-Scope Issues O-183
O.4.1 Reuse of Materials Offsite O-183
O.4.2 Partial Site Release O-188
O.4.3 Disposal of Low-Level Radioactive Waste O-190
O.4.4 Spent Fuel Maintenance, Storage, and Disposal O-198

O.4.5 License Extensions O-206
O.4.6 Site Characterization and Final Site Surveys O-207
O.4.7 License Termination Criteria O-212
O.4.8 Beyond License Termination O-216
O.4.9 Ownership O-223
O.4.10 Financial Assurance O-226
O.5 NEPA-Related Issues O-233
O.5.1 Process for Developing the GEIS O-233
O.5.2 Public Meetings and Public Participation O-234
O.5.3 Request for Additional Comment Period O-244
O.5.4 Determination of Scope O-245
O.5.5 Definition and Discussion of SMALL, MODERATE and LARGE Impacts O-252
O.5.6 Time Frame for Assessing Environmental Impacts O-257
O.5.7 Reactors Included in the GEIS Analysis O-258
O.5.8 Application of NEPA Process to Decommissioning O-259
O.5.9 Opposition to Use of Generic Impacts O-261
O.6 General O-266
O.6.1 Clarifications and Recommendations Related Specifically to Supplement 1 . . . . . O-266
O.6.2 Clarification Questions O-284
O.6.3 Statements for or Against Nuclear Power O-287
O.6.4 Comments in Support of Decommissioning O-289
O.6.5 General Comments O-290

Table

O.1 Comment Log O-3

Appendix O

Comments on the Draft Supplement and Staff Responses

Introduction

On November 9, 2001 a notice of availability was published by the U.S. Nuclear Regulatory Commission in the Federal Register (66 FR 56721) announcing the publication of the *Generic Environmental Impact Statement on Decommissioning Nuclear Facilities, Draft Report for Comment* (NUREG-0586, Supplement 1). The draft Supplement was published for comment by Federal, State, and local government agencies as well as interested members of the public. As part of the process to solicit public comments on the draft Supplement, the staff:

- placed a copy of the draft Supplement into the NRC's electronic Public Document Room,
- sent copies of the draft Supplement to certain Federal, State, and local agencies,
- provided a copy of the draft Supplement to any member of the public that requested one free of charge,
- sent copies of the draft Supplement to identified public interest groups and concerned citizens in the vicinity of all 22 power reactors undergoing decommissioning,
- published a notice of availability of the draft Supplement in the Federal Register on November 9, 2001 (66 FR 56721), and
- announced and held public meetings in San Francisco, California on December 4, 2001, Chicago, Illinois on December 6, 2001, in Boston, Massachusetts on December 10, 2001, and in Atlanta, Georgia on December 12, 2001 to describe the results of the environmental review and answer related questions.

During the comment period, the staff received a total of 52 comment letters in addition to the comments received during the transcribed public meetings.

The staff has reviewed the public meeting transcripts and the 52 comment letters that are part of the docket file for the application, all of which are available in the NRC's Electronic Public Document Room (ADAMS) located at http://www.nrc.gov/NRC/ADAMS/index.html. Appendix O contains the excerpted comments and the staff's responses. Related issues are grouped together. The staff chose not to edit comments, and instead reprinted the comments in this appendix without modification. Emphasis added by the authors of the comments, such as capitalization, was retained. Appendix P contains excerpts of the public meeting transcripts, the written statements provided at the public meetings, and comment letters.

Each comment identified by the staff from the transcripts and comment letters was assigned a specific alpha-numeric comment number. The comment number is typed in the margin of the transcript or letter at the beginning of the comment. Table O-1 contains a cross-reference of the comment numbers, the speaker or author of the comment, the page where the comment can be found in Appendix P, and the section of this Appendix where the comment is addressed.

The speakers at the meetings are listed in speaking order in Table O-1. The comments from the transcript are identified by the letters “SF,” "CH," "BO," or "AT," followed by a number that identifies each comment in approximate chronological order in which the comments were made. The letters "SF" indicate that the comments were made at the meeting in San Francisco, California, the letters "CH" indicate that the comments were made at the meeting in Chicago, Illinois, the letters "BO" indicate that the comments were made at the meeting in Boston, Massachusetts, and the letters "AT" indicate the comments were made in Atlanta, Georgia. The written statements (from the public meetings) and written comment letters are identified by the letters "CL," for "comment letter.”

The staff made a determination on each comment that it was one of the following:

(1) a comment that was actually a request for information, or a statement of opinion, which did not introduce new information.

(2) a comment that raised an environmental issue that was not addressed in the supplement, but is within the scope of the environmental review.

(3) a comment outside the scope of this environmental review (based on the determination of scope and purpose of this Supplement, see Section 1.3, Scope of the Supplement).

Comments without a supporting technical basis or without any new information are discussed in this Appendix, and not in other sections of this Supplement. Relevant references that address the issues within the regulatory authority of the NRC are provided where appropriate. Many of these references can be obtained from the NRC Electronic Public Document Room.

Within each section of this Appendix, similar comments are grouped together for ease of

reference, and are followed by the staff's response. Where the comment or question resulted in a change in the text of the draft Supplement, the corresponding response refers the reader to the appropriate section of the final Supplement where the change was made. Revisions to the text in this final Supplement report are designated by vertical lines beside the text.

Some numbers were initially assigned to portions of verbal or written statements that were later determined not to be comments or some comments were combined. These items were removed from the table. As a result, not all numbers in Table O-1 are sequential.

Table O.1. Comment Log

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
SF-A/1	Sokolsky, David	Meeting Transcript - San Francisco	12/4/2001	P-1	O.6.2
SF-A/2	Sokolsky, David	Meeting Transcript - San Francisco	12/4/2001	P-7	O.6.2
SF-B/1	Cabasso, Jackie	Meeting Transcript - San Francisco	12/4/2001	P-2	O.6.2
SF-B/2	Cabasso, Jackie	Meeting Transcript - San Francisco	12/4/2001	P-2	O.6.2
SF-B/4	Cabasso, Jackie	Meeting Transcript - San Francisco	12/4/2001	P-11	O.2.3.1
SF-B/5	Cabasso, Jackie	Meeting Transcript - San Francisco	12/4/2001	P-11	O.4.4
SF-C/1	Nesbitt, Dale	Meeting Transcript - San Francisco	12/4/2001	P-4	O.5.5
SF-C/2	Nesbitt, Dale	Meeting Transcript - San Francisco	12/4/2001	P-6	O.5.5
SF-C/3	Nesbitt, Dale	Meeting Transcript - San Francisco	12/4/2001	P-10	O.2.4.1
SF-C/4	Nesbitt, Dale	Meeting Transcript - San Francisco	12/4/2001	P-10	O.2.4.1
SF-C/5	Nesbitt, Dale	Meeting Transcript - San Francisco	12/4/2001	P-10	O.4.4
SF-C/6	Nesbitt, Dale	Meeting Transcript - San Francisco	12/4/2001	P-10	O.2.4.1
SF-C/7	Nesbitt, Dale	Meeting Transcript - San Francisco	12/4/2001	P-11	O.1.6
SF-D/1	Olson, Patricia	Meeting Transcript - San Francisco	12/4/2001	P-9	O.5.2
SF-D/2	Olson, Patricia	Meeting Transcript - San Francisco	12/4/2001	P-9	O.4.1
SF-D/3	Olson, Patricia	Meeting Transcript - San Francisco	12/4/2001	P-9	O.4.1
CH-A/1	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-14	O.6.2
CH-A/2	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-14	O.6.2
CH-A/3	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-16	O.3.0
CH-A/4	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-21	O.6.4
CH-A/5	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-21	O.2.3.2
CH-A/6	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-21	O.4.10
CH-A/7	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-21	O.2.4.2
CH-A/8	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-21	O.2.4.1
CH-A/9	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-22	O.2.4.1
CH-A/10	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-22	O.1.16
CH-A/11	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-22	O.2.3.4
CH-A/12	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-22	O.2.3.1
CH-A/13	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-22	O.6.1
CH-A/14	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-22	O.2.3.1
CH-A/15	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-25	O.4.10
CH-A/16	Musiker, Debbie	Meeting Transcript - Chicago	12/6/2001	P-29	O.6.2
CH-B/1	Gaynor, Paul	Meeting Transcript - Chicago	12/6/2001	P-15	O.1.4

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CH-B/3	Gaynor, Paul	Meeting Transcript - Chicago	12/6/2001	P-23	O.5.1
CH-B/4	Gaynor, Paul	Meeting Transcript - Chicago	12/6/2001	P-23	O.5.1
CH-C/1	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-17	O.2.3.3
CH-C/2	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-18	O.2.3.3
CH-C/3	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-18	O.5.4
CH-C/4	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-18	O.2.3.3
CH-C/5	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-18	O.2.3.3
CH-C/6	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-19	O.1.6
CH-C/7	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-19	O.2.3.3
CH-C/8	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-19	O.2.3.3
CH-C/9	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-19	O.2.3.3
CH-C/10	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-19	O.2.2
CH-C/11	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-20	O.2.3.3
CH-C/12	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-20	O.2.2
CH-C/14	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-27	O.2.3.3
CH-C/15	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-28	O.2.3
CH-C/16	Klebe, Michael	Meeting Transcript - Chicago	12/6/2001	P-29	O.2.3
CH-D/1	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-23	O.6.5
CH-D/2	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-23	O.1.8
CH-D/5	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-23	O.6.1
CH-D/6	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-23	O.1.9
CH-D/7	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-24	O.1.8
CH-D/8	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-24	O.1.7
CH-D/9	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-24	O.6.5
CH-D/10	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-24	O.6.5
CH-D/11	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-24	O.1.6
CH-D/12	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-24	O.5.1
CH-D/13	Goodman, Lynne	Meeting Transcript - Chicago	12/6/2001	P-30	O.5.3
BO-A/1	Dierker, Carl	Meeting Transcript - Boston	12/10/2001	P-30	O.2.3.2
BO-A/2	Dierker, Carl	Meeting Transcript - Boston	12/10/2001	P-31	O.2.3.2
BO-A/3	Dierker, Carl	Meeting Transcript - Boston	12/10/2001	P-31	O.2.3.2
BO-A/4[(a)]	Dierker, Carl	Meeting Transcript - Boston	12/10/2001	P-31	O.5.7
BO-A/6	Dierker, Carl	Meeting Transcript - Boston	12/10/2001	P-32	O.5.5
BO-B/1	Williams, Carl	Meeting Transcript - Boston	12/10/2001	P-32	O.5.4
BO-B/2	Williams, Carl	Meeting Transcript - Boston	12/10/2001	P-33	O.5.4

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
AT-A/1	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-38	O.6.2
AT-A/2	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-44	O.5.2
AT-A/3	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-44	O.5.2
AT-A/5	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-44	O.5.2
AT-A/6	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-45	O.5.3
AT-A/7	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-45	O.5.2
AT-A/8	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-45	O.6.3
AT-A/9	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-45	O.2.2
AT-A/10	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-45	O.2.4.2
AT-A/11	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-46	O.2.4.2
AT-A/12	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-46	O.2.4.1
AT-A/13	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-46	O.5.3
AT-A/14	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-46	O.2.4.1
AT-A/15	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-46	O.4.4
AT-A/16	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-46	O.4.4
AT-A/17	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-47	O.5.9
AT-A/18	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-47	O.5.5
AT-A/19	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-47	O.5.10
AT-A/20	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-47	O.5.2
AT-A/21	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-47	O.1.16
AT-A/22	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-47	O.2.2
AT-A/23	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-47	O.5.6
AT-A/24	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-48	O.4.6
AT-A/25	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-48	O.4.4
AT-A/26	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-48	O.4.5
AT-A/27	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-48	O.1.6
AT-A/29	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-48	O.1.9
AT-A/30	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-49	O.1.10
AT-A/31	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-49	O.1.9
AT-A/32	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-49	O.5.9
AT-A/33	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-49	O.1.6
AT-A/34	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-49	O.1.16
AT-A/35	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-50	O.1.16
AT-A/36	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-50	O.1.2
AT-A/37	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-50	O.2.3.4
AT-A/38	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-50	O.4.1.1
AT-A/39	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-50	O.4.8

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
AT-A/40	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-51	O.1.10
AT-A/41	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-51	O.5.9
AT-A/42	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-51	O.2.3.2
AT-A/43	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-51	O.4.3
AT-A/44	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-51	O.6.5
AT-A/45	Barczak, Sara	Meeting Transcript - Atlanta	12/12/2001	P-51	O.5.9
AT-B/1	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-38	O.1.6
AT-B/2	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-39	O.4.7
AT-B/3	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-39	O.4.7
AT-B/4	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-40	O.4.8
AT-B/5	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-55	O.5.8
AT-B/6	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-55	O.4.7
AT-B/7	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-55	O.5.2
AT-B/8	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-55	O.4.5
AT-B/9	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-55	O.6.5
AT-B/10	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-55	O.2.1
AT-B/11	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-56	O.2.4.1
AT-B/12	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-56	O.2.4.3
AT-B/13	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-56	O.5.2
AT-B/14	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-56	O.1.10
AT-B/15	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-57	O.4.7
AT-B/16	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-57	O.2.3.2
AT-B/17	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-57	O.2.3.3
AT-B/18	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-57	O.6.4
AT-B/19	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-73	O.5.2
AT-B/20	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-73	O.5.2
AT-B/21	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-73	O.2.2
AT-B/22	Zeller, Janet	Meeting Transcript - Atlanta	12/12/2001	P-73	O.2.1
AT-C/1	Martin, Ed	Meeting Transcript - Atlanta	12/12/2001	P-41	O.5.9
AT-C/2	Martin, Ed	Meeting Transcript - Atlanta	12/12/2001	P-41	O.1.9
AT-C/3	Martin, Ed	Meeting Transcript - Atlanta	12/12/2001	P-42	O.2.3.4
AT-C/4	Martin, Ed	Meeting Transcript - Atlanta	12/12/2001	P-41	O.1.9
AT-C/5	Martin, Ed	Meeting Transcript - Atlanta	12/12/2001	P-41	O.4.7
AT-C/6	Martin, Ed	Meeting Transcript - Atlanta	12/12/2001	P-41	O.1.9
AT-D/1	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.1.9
AT-D/2	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.2.4.2
AT-D/3	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.5.9
AT-D/4	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.4.4
AT-D/5	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.3.0

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
AT-D/6	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.1.15
AT-D/7	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.4.3
AT-D/8	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.6.5
AT-D/9	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-52	O.2.3.3
AT-D/10	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-53	O.6.3
AT-D/11	Kushner, Adele	Meeting Transcript - Atlanta	12/12/2001	P-53	O.2.4.2
AT-E/1	Genoa, Paul	Meeting Transcript - Atlanta	12/12/2001	P-53	O.2.3.4
AT-E/2	Genoa, Paul	Meeting Transcript - Atlanta	12/12/2001	P-72	O.2.2
AT-F/1	Zeller, Lou	Meeting Transcript - Atlanta	12/12/2002	P-58	O.2.2
AT-F/2	Zeller, Lou	Meeting Transcript - Atlanta	12/12/2002	P-58	O.2.4.1
AT-F/3	Zeller, Lou	Meeting Transcript - Atlanta	12/12/2002	P-58	O.4.4
AT-F/4	Zeller, Lou	Meeting Transcript - Atlanta	12/12/2002	P-58	O.2.4.1
AT-F/5	Zeller, Lou	Meeting Transcript - Atlanta	12/12/2002	P-58	O.2.2
AT-F/6	Zeller, Lou	Meeting Transcript - Atlanta	12/12/2002	P-59	O.1.6
AT-F/7	Zeller, Lou	Meeting Transcript - Atlanta	12/12/2002	P-60	O.1.15
AT-G/1	Carroll, Glen	Meeting Transcript - Atlanta	12/12/2001	P-60	O.2.3.3
AT-G/2	Carroll, Glen	Meeting Transcript - Atlanta	12/12/2001	P-61	O.4.3
AT-G/3	Carroll, Glen	Meeting Transcript - Atlanta	12/12/2001	P-61	O.4.1
AT-G/4	Carroll, Glen	Meeting Transcript - Atlanta	12/12/2001	P-61	O.3.0
AT-G/5	Carroll, Glen	Meeting Transcript - Atlanta	12/12/2001	P-61	O.2.3.3
AT-G/7	Carroll, Glen	Meeting Transcript - Atlanta	12/12/2001	P-71	O.1.9
AT-H/1	Ferguson, Tom	Meeting Transcript - Atlanta	12/12/2001	P-62	O.5.2
CL-01/1	Scherer, A Edward	Letter	12/27/2001	P-75	O.6.5
CL-01/2	Scherer, A Edward	Letter	12/27/2001	P-75	O.5.6
CL-01/3	Scherer, A Edward	Letter	12/27/2001	P-75	O.6.1
CL-01/4	Scherer, A Edward	Letter	12/27/2001	P-75	O.1.2
CL-01/5	Scherer, A Edward	Letter	12/27/2001	P-75	O.6.1
CL-01/6	Scherer, A Edward	Letter	12/27/2001	P-76	O.1.11
CL-01/7	Scherer, A Edward	Letter	12/27/2001	P-76	O.1.13
CL-01/8	Scherer, A Edward	Letter	12/27/2001	P-76	O.4.1.1
CL-02/1	Epstein, Eric Joseph	Letter	12/28/2001	P-79	O.1.9
CL-02/2	Epstein, Eric Joseph	Letter	12/28/2001	P-79	O.4.10
CL-02/3	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.1.9
CL-02/4	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.6.5
CL-02/5	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.4.4
CL-02/6	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.4.3
CL-02/7	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.1.9
CL-02/8	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.6.5

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-02/9	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.4.9
CL-02/10	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.2.2
CL-02/11	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.2.2
CL-02/12	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.4.10
CL-02/13	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.4.4
CL-02/14	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.6.5
CL-02/15	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.2.2
CL-02/16	Epstein, Eric Joseph	Letter	12/28/2001	P-80	O.6.5
CL-02/17	Epstein, Eric Joseph	Letter	12/28/2001	P-81	O.1.9
CL-02/18	Epstein, Eric Joseph	Letter	12/28/2001	P-84	O.2.1
CL-02/19	Epstein, Eric Joseph	Letter	12/28/2001	P-84	O.1.9
CL-02/20	Epstein, Eric Joseph	Letter	12/28/2001	P-86	O.1.9
CL-02/21	Epstein, Eric Joseph	Letter	12/28/2001	P-86	O.4.4
CL-02/22	Epstein, Eric Joseph	Letter	12/28/2001	P-87	O.1.9
CL-02/23	Epstein, Eric Joseph	Letter	12/28/2001	P-87	O.4.4
CL-02/24	Epstein, Eric Joseph	Letter	12/28/2001	P-87	O.4.4
CL-02/25	Epstein, Eric Joseph	Letter	12/28/2001	P-88	O.4.4
CL-02/26	Epstein, Eric Joseph	Letter	12/28/2001	P-88	O.4.4
CL-02/27	Epstein, Eric Joseph	Letter	12/28/2001	P-88	O.1.9
CL-02/28	Epstein, Eric Joseph	Letter	12/28/2001	P-89	O.1.9
CL-02/29	Epstein, Eric Joseph	Letter	12/28/2001	P-89	O.4.3
CL-02/30	Epstein, Eric Joseph	Letter	12/28/2001	P-90	O.4.3
CL-02/31	Epstein, Eric Joseph	Letter	12/28/2001	P-90	O.4.10
CL-02/32	Epstein, Eric Joseph	Letter	12/28/2001	P-92	O.4.9
CL-02/33	Epstein, Eric Joseph	Letter	12/28/2001	P-92	O.4.10
CL-02/34	Epstein, Eric Joseph	Letter	12/28/2001	P-92	O.1.10
CL-02/35	Epstein, Eric Joseph	Letter	12/28/2001	P-93	O.4.9
CL-02/36	Epstein, Eric Joseph	Letter	12/28/2001	P-94	O.1.9
CL-02/37	Epstein, Eric Joseph	Letter	12/28/2001	P-95	O.2.2
CL-02/38	Epstein, Eric Joseph	Letter	12/28/2001	P-95	O.2.2
CL-02/39	Epstein, Eric Joseph	Letter	12/28/2001	P-95	O.4.10
CL-02/40	Epstein, Eric Joseph	Letter	12/28/2001	P-95	O.6.1
CL-02/41	Epstein, Eric Joseph	Letter	12/28/2001	P-96	O.4.10
CL-02/42	Epstein, Eric Joseph	Letter	12/28/2001	P-96	O.4.10
CL-02/43	Epstein, Eric Joseph	Letter	12/28/2001	P-96	O.5.8
CL-02/44	Epstein, Eric Joseph	Letter	12/28/2001	P-97	O.5.5
CL-02/45	Epstein, Eric Joseph	Letter	12/28/2001	P-97	O.1.4
CL-02/46	Epstein, Eric Joseph	Letter	12/28/2001	P-98	O.1.13
CL-02/47	Epstein, Eric Joseph	Letter	12/28/2001	P-98	O.1.1

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-02/48	Epstein, Eric Joseph	Letter	12/28/2001	P-98	O.1.2
CL-02/49	Epstein, Eric Joseph	Letter	12/28/2001	P-99	O.1.2
CL-02/50	Epstein, Eric Joseph	Letter	12/28/2001	P-99	O.1.3
CL-02/51	Epstein, Eric Joseph	Letter	12/28/2001	P-100	O.1.4
CL-02/52	Epstein, Eric Joseph	Letter	12/28/2001	P-101	O.1.16
CL-02/53	Epstein, Eric Joseph	Letter	12/28/2001	P-101	O.1.4
CL-02/54	Epstein, Eric Joseph	Letter	12/28/2001	P-101	O.1.8
CL-02/55	Epstein, Eric Joseph	Letter	12/28/2001	P-101	O.1.10
CL-02/56	Epstein, Eric Joseph	Letter	12/28/2001	P-102	O.1.16
CL-02/57	Epstein, Eric Joseph	Letter	12/28/2001	P-102	O.1.9
CL-02/58	Epstein, Eric Joseph	Letter	12/28/2001	P-102	O.1.10
CL-02/59	Epstein, Eric Joseph	Letter	12/28/2001	P-103	O.1.10
CL-02/60	Epstein, Eric Joseph	Letter	12/28/2001	P-103	O.1.11
CL-02/61	Epstein, Eric Joseph	Letter	12/28/2001	P-103	O.1.12
CL-02/62	Epstein, Eric Joseph	Letter	12/28/2001	P-103	O.1.12
CL-02/63	Epstein, Eric Joseph	Letter	12/28/2001	P-103	O.1.16
CL-02/64	Epstein, Eric Joseph	Letter	12/28/2001	P-104	O.1.13
CL-02/65	Epstein, Eric Joseph	Letter	12/28/2001	P-104	O.1.15
CL-02/66	Epstein, Eric Joseph	Letter	12/28/2001	P-104	O.1.9
CL-02/67	Epstein, Eric Joseph	Letter	12/28/2001	P-105	O.5.7
CL-02/68	Epstein, Eric Joseph	Letter	12/28/2001	P-105	O.1.10
CL-02/69	Epstein, Eric Joseph	Letter	12/28/2001	P-105	O.1.10
CL-02/70	Epstein, Eric Joseph	Letter	12/28/2001	P-105	O.1.11
CL-02/71	Epstein, Eric Joseph	Letter	12/28/2001	P-106	O.1.15
CL-03/1	Scott, Collier Shannon	Letter	12/31/2001	P-108	O.4.1.1
CL-03/2	Scott, Collier Shannon	Letter	12/31/2001	P-108	O.4.1.1
CL-03/3	Scott, Collier Shannon	Letter	12/31/2001	P-108	O.4.1.1
CL-03/4	Scott, Collier Shannon	Letter	12/31/2001	P-108	O.4.1.1
CL-03/5	Scott, Collier Shannon	Letter	12/31/2001	P-109	O.1.10
CL-03/6	Scott, Collier Shannon	Letter	12/31/2001	P-109	O.4.1.1
CL-03/7	Scott, Collier Shannon	Letter	12/31/2001	P-109	O.1.10
CL-03/8	Scott, Collier Shannon	Letter	12/31/2001	P-109	O.4.1.1
CL-03/9	Scott, Collier Shannon	Letter	12/31/2001	P-110	O.4.1.1
CL-04/1	Williamson, Thomas	Letter	12/27/2001	P-111	O.6.5
CL-04/2	Williamson, Thomas	Letter	12/27/2001	P-111	O.5.4
CL-04/3	Williamson, Thomas	Letter	12/27/2001	P-111	O.1.3
CL-04/4	Williamson, Thomas	Letter	12/27/2001	P-111	O.1.4
CL-04/5	Williamson, Thomas	Letter	12/27/2001	P-111	O.1.4
CL-04/6	Williamson, Thomas	Letter	12/27/2001	P-112	O.1.5

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-04/7	Williamson, Thomas	Letter	12/27/2001	P-112	O.1.6
CL-04/8	Williamson, Thomas	Letter	12/27/2001	P-112	O.1.11
CL-04/9	Williamson, Thomas	Letter	12/27/2001	P-112	O.1.12
CL-04/10	Williamson, Thomas	Letter	12/27/2001	P-112	O.1.15
CL-04/11	Williamson, Thomas	Letter	12/27/2001	P-112	O.6.1
CL-04/12	Williamson, Thomas	Letter	12/27/2001	P-112	O.1.6
CL-04/13	Williamson, Thomas	Letter	12/27/2001	P-112	O.1.6
CL-04/14	Williamson, Thomas	Letter	12/27/2001	P-113	O.1.10
CL-04/15	Williamson, Thomas	Letter	12/27/2001	P-113	O.1.15
CL-04/16	Williamson, Thomas	Letter	12/27/2001	P-113	O.1.6
CL-04/17	Williamson, Thomas	Letter	12/27/2001	P-113	O.6.1
CL-04/18	Williamson, Thomas	Letter	12/27/2001	P-113	O.1.4
CL-04/19	Williamson, Thomas	Letter	12/27/2001	P-113	O.6.1
CL-05/1	Davis, James	Letter	12/28/2001	P-114	O.6.5
CL-05/2	Davis, James	Letter	12/28/2001	P-115	O.1.6
CL-05/3	Davis, James	Letter	12/28/2001	P-115	O.5.5
CL-05/4	Davis, James	Letter	12/28/2001	P-115	O.6.1
CL-05/5	Davis, James	Letter	12/28/2001	P-115	O.6.1
CL-05/6	Davis, James	Letter	12/28/2001	P-115	O.6.1
CL-05/7	Davis, James	Letter	12/28/2001	P-115	O.6.1
CL-05/8	Davis, James	Letter	12/28/2001	P-115	O.1.6
CL-05/9	Davis, James	Letter	12/28/2001	P-115	O.6.1
CL-05/10	Davis, James	Letter	12/28/2001	P-116	O.2.3.3
CL-05/11	Davis, James	Letter	12/28/2001	P-116	O.1.3
CL-05/12	Davis, James	Letter	12/28/2001	P-116	O.6.1
CL-05/13	Davis, James	Letter	12/28/2001	P-116	O.1.15
CL-05/14	Davis, James	Letter	12/28/2001	P-116	O.1.4
CL-05/15	Davis, James	Letter	12/28/2001	P-116	O.1.4
CL-05/16	Davis, James	Letter	12/28/2001	P-116	O.6.1
CL-05/17	Davis, James	Letter	12/28/2001	P-116	O.1.11
CL-05/18	Davis, James	Letter	12/28/2001	P-116	O.6.1
CL-05/19	Davis, James	Letter	12/28/2001	P-116	O.1.15
CL-06/1	Routh, Stephen	Letter	12/21/2001	P-117	O.1.6
CL-06/2	Routh, Stephen	Letter	12/21/2001	P-117	O.5.4
CL-06/3	Routh, Stephen	Letter	12/21/2001	P-117	O.1.7
CL-07[(a)]	Sokolsky, David	Letter	12/21/2001		
CL-08/1	Barczak, Sara	Letter	12/27/2001	P-119	O.5.2
CL-08/2	Barczak, Sara	Letter	12/27/2001	P-119	O.5.2
CL-08/3	Barczak, Sara	Letter	12/27/2001	P-119	O.2.4.1

(a) CL-07 Letter submitted by Mr. David Sokolsky–superceded by CL-15 dated 12/21/2001–duplicate comments.

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-08/4	Barczak, Sara	Letter	12/27/2001	P-119	O.5.9
CL-08/5	Barczak, Sara	Letter	12/27/2001	P-119	O.5.5
CL-08/6	Barczak, Sara	Letter	12/27/2001	P-119	O.5.6
CL-08/7	Barczak, Sara	Letter	12/27/2001	P-119	O.4.4
CL-08/8	Barczak, Sara	Letter	12/27/2001	P-119	O.4.5
CL-08/9	Barczak, Sara	Letter	12/27/2001	P-120	O.2.1
CL-08/10	Barczak, Sara	Letter	12/27/2001	P-120	O.4.10
CL-08/11	Barczak, Sara	Letter	12/27/2001	P-120	O.1.9
CL-08/12	Barczak, Sara	Letter	12/27/2001	P-120	O.4.10
CL-08/13	Barczak, Sara	Letter	12/27/2001	P-120	O.4.10
CL-08/14	Barczak, Sara	Letter	12/27/2001	P-120	O.1.9
CL-08/15	Barczak, Sara	Letter	12/27/2001	P-120	O.1.10
CL-08/16	Barczak, Sara	Letter	12/27/2001	P-120	O.4.10
CL-08/17	Barczak, Sara	Letter	12/27/2001	P-120	O.5.9
CL-08/18	Barczak, Sara	Letter	12/27/2001	P-120	O.1.16
CL-08/19	Barczak, Sara	Letter	12/27/2001	P-121	O.1.2
CL-08/20	Barczak, Sara	Letter	12/27/2001	P-121	O.2.3.4
CL-08/21	Barczak, Sara	Letter	12/27/2001	P-121	O.1.15
CL-08/22	Barczak, Sara	Letter	12/27/2001	P-121	O.2.3.4
CL-08/23	Barczak, Sara	Letter	12/27/2001	P-121	O.4.1.1
CL-08/24	Barczak, Sara	Letter	12/27/2001	P-121	O.4.8
CL-08/25	Barczak, Sara	Letter	12/27/2001	P-121	O.1.6
CL-08/26	Barczak, Sara	Letter	12/27/2001	P-121	O.1.16
CL-08/27	Barczak, Sara	Letter	12/27/2001	P-121	O.4.4
CL-08/28	Barczak, Sara	Letter	12/27/2001	P-121	O.4.9
CL-08/29	Barczak, Sara	Letter	12/27/2001	P-121	O.4.10
CL-08/30	Barczak, Sara	Letter	12/27/2001	P-121	O.2.2
CL-08/31	Barczak, Sara	Letter	12/27/2001	P-121	O.4.8
CL-08/32	Barczak, Sara	Letter	12/27/2001	P-122	O.6.3
CL-08/33	Barczak, Sara	Letter	12/27/2001	P-122	O.1.6
CL-08/35	Barczak, Sara	Letter	12/27/2001	P-122	O.5.9
CL-08/36[(a)]	Barczak, Sara	Letter	12/27/2001	P-122	
CL-09/1	O'Connor, Jr, WT	Letter	12/28/2001	P-123	O.6.5
CL-09/2	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/3	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/4	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1

(a) CL-08/36 is a comment submitted by Ms. Sara Barczak in a written statement that was read into the transcript at the Atlanta public meeting. The written statement was submitted to the NRC on December 27, 2001 along with comment letter CL-08. All the comments were duplicates of those in the transcript, except for comment CL-08/36, which has been added for completeness.

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-09/5	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/6	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/7	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/8	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/9	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/10	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/11	O'Connor, Jr, WT	Letter	12/28/2001	P-124	O.6.1
CL-09/12	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/13	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/14	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/15	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/16	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/17	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.2
CL-09/18	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/19	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.3
CL-09/20	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.3
CL-09/21	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.3
CL-09/22	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.3
CL-09/23	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.7
CL-09/24	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.7
CL-09/25	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.8
CL-09/26	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.1.8
CL-09/27	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/28	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/29	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/30	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/31	O'Connor, Jr, WT	Letter	12/28/2001	P-125	O.6.1
CL-09/32	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.6.1
CL-09/33	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.1.8
CL-09/34	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.6.1
CL-09/35	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.6.1
CL-09/36	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.6.1
CL-09/37	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.1.6
CL-09/38	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.1.6
CL-09/39	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.1.6
CL-09/40	O'Connor, Jr, WT	Letter	12/28/2001	P-126	O.1.6
CL-09/41	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.6
CL-09/42	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.6
CL-09/43	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.6.1
CL-09/44	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.6

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-09/45	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.6
CL-09/46	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.6
CL-09/47	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.6
CL-09/48	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.8
CL-09/49	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.6.1
CL-09/50	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.6.1
CL-09/51	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.7
CL-09/52	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.7
CL-09/53	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.7
CL-09/54	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.7
CL-09/55	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.1.7
CL-09/56	O'Connor, Jr, WT	Letter	12/28/2001	P-127	O.6.1
CL-09/57	O'Connor, Jr, WT	Letter	12/28/2001	P-128	O.6.1
CL-09/58	O'Connor, Jr, WT	Letter	12/28/2001	P-128	O.6.5
CL-10/1	Kushner, Adele	Letter	12/29/2001	P-129	O.2.3.2
CL-10/2	Kushner, Adele	Letter	12/29/2001	P-129	O.2.2
CL-10/3	Kushner, Adele	Letter	12/29/2001	P-129	O.3.0
CL-10/4	Kushner, Adele	Letter	12/29/2001	P-129	O.1.15
CL-10/5	Kushner, Adele	Letter	12/29/2001	P-129	O.1.7
CL-10/6	Kushner, Adele	Letter	12/29/2001	P-129	O.5.9
CL-10/7	Kushner, Adele	Letter	12/29/2001	P-129	O.2.3.2
CL-10/8	Kushner, Adele	Letter	12/29/2001	P-129	O.2.3.3
CL-10/9	Kushner, Adele	Letter	12/29/2001	P-129	O.2.3.2
CL-10/10	Kushner, Adele	Letter	12/29/2001	P-129	O.2.3.2
CL-10/11	Kushner, Adele	Letter	12/29/2001	P-129	O.1.6
CL-10/12	Kushner, Adele	Letter	12/29/2001	P-129	O.5.2
CL-11/1	Musiker, Debbie	Letter	12/31/2001	P-130	O.6.4
CL-11/2	Musiker, Debbie	Letter	12/31/2001	P-130	O.1.16
CL-11/3	Musiker, Debbie	Letter	12/31/2001	P-130	O.1.6
CL-11/4	Musiker, Debbie	Letter	12/31/2001	P-130	O.1.4
CL-11/5	Musiker, Debbie	Letter	12/31/2001	P-131	O.1.4
CL-11/6	Musiker, Debbie	Letter	12/31/2001	P-131	O.3.0
CL-11/7	Musiker, Debbie	Letter	12/31/2001	P-131	O.1.16
CL-11/8	Musiker, Debbie	Letter	12/31/2001	P-131	O.1.4
CL-11/9	Musiker, Debbie	Letter	12/31/2001	P-131	O.2.3.1
CL-11/10	Musiker, Debbie	Letter	12/31/2001	P-131	O.4.10
CL-11/11	Musiker, Debbie	Letter	12/31/2001	P-131	O.1.6
CL-11/12	Musiker, Debbie	Letter	12/31/2001	P-131	O.2.4.1
CL-11/13	Musiker, Debbie	Letter	12/31/2001	P-131	O.2.4.1
CL-11/14	Musiker, Debbie	Letter	12/31/2001	P-131	O.2.2

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-11/15	Musiker, Debbie	Letter	12/31/2001	P-131	O.2.2
CL-12/1	Martin, Ed	Letter	12/31/2001	P-133	O.5.2
CL-12/2	Martin, Ed	Letter	12/31/2001	P-133	O.5.2
CL-12/3	Martin, Ed	Letter	12/31/2001	P-133	O.5.2
CL-13/1	Shadis, Raymond	Letter	12/31/2001	P-134	O.2.4.3
CL-13/2	Shadis, Raymond	Letter	12/31/2001	P-134	O.1.6
CL-13/3	Shadis, Raymond	Letter	12/31/2001	P-134	O.1.7
CL-13/4	Shadis, Raymond	Letter	12/31/2001	P-134	O.1.7
CL-13/5	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/6	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/7	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.9
CL-13/8	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/9	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/10	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/11	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/12	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/13	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.10
CL-13/14	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.6
CL-13/15	Shadis, Raymond	Letter	12/31/2001	P-135	O.1.9
CL-13/16	Shadis, Raymond	Letter	12/31/2001	P-136	O.1.14
CL-13/17	Shadis, Raymond	Letter	12/31/2001	P-136	O.1.15
CL-13/18	Shadis, Raymond	Letter	12/31/2001	P-136	O.4.4
CL-13/19	Shadis, Raymond	Letter	12/31/2001	P-136	O.4.3
CL-14/1	Oncavage, Mark P.	Letter	12/31/2001	P-137	O.1.16
CL-14/2	Oncavage, Mark P.	Letter	12/31/2001	P-137	O.1.16
CL-14/3	Oncavage, Mark P.	Letter	12/31/2001	P-138	O.1.16
CL-14/4	Oncavage, Mark P.	Letter	12/31/2001	P-138	O.2..3.4
CL-14/5	Oncavage, Mark P.	Letter	12/31/2001	P-138	O.1.9
CL-14/6	Oncavage, Mark P.	Letter	12/31/2001	P-138	O.2.4.1
CL-14/7	Oncavage, Mark P.	Letter	12/31/2001	P-138	O.5.2
CL-15/1	Sokolsky, David	Letter	1/2/2002	P-140	O.6.2
CL-15/2	Sokolsky, David	Letter	1/2/2002	P-140	O.6.1
CL-15/3	Sokolsky, David	Letter	1/2/2002	P-140	O.6.1
CL-15/4	Sokolsky, David	Letter	1/2/2002	P-140	O.6.1
CL-15/6	Sokolsky, David	Letter	1/2/2002	P-140	O.1.6
CL-16/1	Miller, Anne Norton	Letter	12/21/2001	P-141	O.6.5
CL-16/2	Miller, Anne Norton	Letter	12/21/2001	P-141	O.6.1
CL-16/3	Miller, Anne Norton	Letter	12/21/2001	P-141	O.5.5
CL-16/4	Miller, Anne Norton	Letter	12/21/2001	P-141	O.6.1

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-16/5	Miller, Anne Norton	Letter	12/21/2001	P-141	O.1.2
CL-16/6	Miller, Anne Norton	Letter	12/21/2001	P-142	O.6.1
CL-16/7	Miller, Anne Norton	Letter	12/21/2001	P-142	O.4.6
CL-16/8	Miller, Anne Norton	Letter	12/21/2001	P-142	O.6.1
CL-16/9	Miller, Anne Norton	Letter	12/21/2001	P-142	O.2.4.1
CL-16/10	Miller, Anne Norton	Letter	12/21/2001	P-142	O.2.3.3
CL-16/11	Miller, Anne Norton	Letter	12/21/2001	P-143	O.5.6
CL-16/12	Miller, Anne Norton	Letter	12/21/2001	P-143	O.5.4
CL-16/13	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.2
CL-16/14	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.7
CL-16/15	Miller, Anne Norton	Letter	12/21/2001	P-143	O.5.5
CL-16/16	Miller, Anne Norton	Letter	12/21/2001	P-143	O.6.1
CL-16/17	Miller, Anne Norton	Letter	12/21/2001	P-143	O.3.0
CL-16/18	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.6
CL-16/19	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.2
CL-16/20	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.6
CL-16/21	Miller, Anne Norton	Letter	12/21/2001	P-143	O.6.1
CL-16/22	Miller, Anne Norton	Letter	12/21/2001	P-143	O.6.1
CL-16/23	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.1
CL-16/24	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.1
CL-16/25	Miller, Anne Norton	Letter	12/21/2001	P-143	O.1.1
CL-16/26	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.1
CL-16/27	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.1
CL-16/28	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/29	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/30	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/31	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/32	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/33	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/34	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/35	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/36	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/37	Miller, Anne Norton	Letter	12/21/2001	P-144	O.1.2
CL-16/38	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.2
CL-16/39	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.3
CL-16/40	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.3
CL-16/41	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.3
CL-16/42	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.3
CL-16/43	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.3

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-16/44	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.3
CL-16/45	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.4
CL-16/46	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.4
CL-16/47	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.4
CL-16/48	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.4
CL-16/49	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.4
CL-16/50	Miller, Anne Norton	Letter	12/21/2001	P-145	O.1.4
CL-16/51	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/52	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/53	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/54	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/55	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/56	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/57	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/58	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/59	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/60	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.4
CL-16/61	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.5
CL-16/62	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.5
CL-16/63	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.6
CL-16/64	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.6
CL-16/65	Miller, Anne Norton	Letter	12/21/2001	P-146	O.1.6
CL-16/66	Miller, Anne Norton	Letter	12/21/2001	P-147	O.1.6
CL-16/67	Miller, Anne Norton	Letter	12/21/2001	P-147	O.2.3.4
CL-16/68	Miller, Anne Norton	Letter	12/21/2001	P-147	O.6.1
CL-16/69	Miller, Anne Norton	Letter	12/21/2001	P-147	O.1.12
CL-16/70	Miller, Anne Norton	Letter	12/21/2001	P-147	O.1.15
CL-16/71	Miller, Anne Norton	Letter	12/21/2001	P-147	O.6.1
CL-16/72	Miller, Anne Norton	Letter	12/21/2001	P-147	O.6.1
CL-16/73	Miller, Anne Norton	Letter	12/21/2001	P-147	O.6.1
CL-16/74	Miller, Anne Norton	Letter	12/21/2001	P-147	O.6.1
CL-17/1	Ortciger, Thomas W.	Letter	1/7/2002	P-148	O.2.3.3
CL-17/2	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.5.4
CL-17/3	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.4.8
CL-17/4	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.2.3.3
CL-17/5	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.2.2
CL-17/6	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.4.8
CL-17/7	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.2.3.3
CL-17/8	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.2.2

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-17/9	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.4.3
CL-17/10	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.6.5
CL-17/11	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.6.5
CL-17/12	Ortciger, Thomas W.	Letter	1/7/2002	P-149	O.2.2
CL-18/1	Delezenski, Jerry	Letter	11/20/2001	P-150	O.6.1
CL-18/2	Delezenski, Jerry	Letter	11/20/2001	P-150	O.1.9
CL-18/3	Delezenski, Jerry	Letter	11/20/2001	P-150	O.6.5
CL-19/1	Byrne, Stephen A.	Letter	12/20/2001	P-151	O.2.3.3
CL-19/2	Byrne, Stephen A.	Letter	12/20/2001	P-151	O.2.3.3
CL-20/1	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-152	O.6.5
CL-20/2	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-152	O.6.3
CL-20/3	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-152	O.6.5
CL-20/4	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-152	O.2.2
CL-20/5	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-152	O.1.16
CL-20/6	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-152	O.5.5
CL-20/7	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-153	O.1.6
CL-20/8	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-153	O.1.6
CL-20/9	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-153	O.1.4
CL-20/10	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-153	O.1.4
CL-20/11	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.6.5
CL-20/12	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.4.7
CL-20/13	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.4.8
CL-20/14	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.3.0
CL-20/15	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.1.2
CL-20/17	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.4.6
CL-20/18	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.1.2
CL-20/19	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-154	O.1.2
CL-20/20	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.2.3.4
CL-20/21	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.4.3
CL-20/22	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.3.0
CL-20/23	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.3.0
CL-20/24	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.1.8
CL-20/25	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.4.4
CL-20/26	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.4.4
CL-20/27	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.4.4
CL-20/28	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.1.2
CL-20/29	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.1.2
CL-20/30	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.1.16

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-20/31	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.1.3
CL-20/32	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.3.0
CL-20/33	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-155	O.1.6
CL-20/34	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.1.6
CL-20/35	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.4.3
CL-20/36	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.1.4
CL-20/37	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.1.6
CL-20/38	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.1.4
CL-20/40	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.1.4
CL-20/41	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.4.9
CL-20/42	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.4.8
CL-20/43	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.5.4
CL-20/44	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-156	O.2.2
CL-20/45	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.2.2
CL-20/47	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.9
CL-20/48	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.9
CL-20/49	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.9
CL-20/50	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.10
CL-20/51	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.10
CL-20/52	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.6
CL-20/53	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.2.2
CL-20/54	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.6
CL-20/55	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.6
CL-20/56	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-157	O.1.6
CL-20/57	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.3.0
CL-20/58	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.3.0
CL-20/59	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.3.0
CL-20/60	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.3.0
CL-20/61	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.2.3.2
CL-20/62	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.2.3.2
CL-20/63	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.2.3.2
CL-20/64	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.6.5
CL-20/65	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.2.2
CL-20/66	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.2.2
CL-20/67	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.2.2
CL-20/68	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.1.2
CL-20/69	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.3.0

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-20/70	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.1.6
CL-20/71	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.4.3
CL-20/72	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.3.0
CL-20/73	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-158	O.4.2
CL-20/74	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.2.4.1
CL-20/75	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.3.0
CL-20/76	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.1.2
CL-20/77	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.4.3
CL-20/78	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.4.3
CL-20/79	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.2.4.1
CL-20/80	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.2.4.1
CL-20/81	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.4.4
CL-20/82	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.6.5
CL-20/83	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.5.4
CL-20/84	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-159	O.4.4
CL-20/85	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.15
CL-20/86	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.15
CL-20/87	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.5.4
CL-20/88	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.4.8
CL-20/89	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/90	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/91	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/92	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/93	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/94	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/95	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.2.2
CL-20/96	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/97	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/98	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/99	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.6
CL-20/100	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-160	O.1.7
CL-20/101	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.1.7
CL-20/102	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.1.7
CL-20/103	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.1.6
CL-20/104	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.1.6
CL-20/105	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.1.6
CL-20/106	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.1.6
CL-20/107	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.2.2
CL-20/108	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.6.5

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-20/109	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.4.1.1
CL-20/110	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.4.1.1
CL-20/111	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.4.1.1
CL-20/112	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.4.1.1
CL-20/113	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.5.2
CL-20/114	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-161	O.4.3
CL-20/115	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-162	O.6.3
CL-20/116	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-162	O.4.5
CL-20/117	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-162	O.6.5
CL-20/118	Blockey-O'Brien, Pamela	Letter	12/26/2001	P-162	O.6.5
CL-21/1	Guynup, Sharon	Letter	1/19/2002	P-163	O.2.2
CL-22/1	sublimation@webtv.net	Letter	1/19/2002	P-164	O.6.5
CL-23/1	Long, A. J. (Fred)	Letter	1/20/2002	P-165	O.4.1.1
CL-24/1	Griffiths, Rachel	Letter	1/20/2002	P-166	O.2.2
CL-24/2	Griffiths, Rachel	Letter	1/20/2002	P-166	O.5.9
CL-24/3	Griffiths, Rachel	Letter	1/20/2002	P-166	O.1.16
CL-24/4	Griffiths, Rachel	Letter	1/20/2002	P-166	O.2.3.4
CL-24/5	Griffiths, Rachel	Letter	1/20/2002	P-166	O.4.1.1
CL-24/6	Griffiths, Rachel	Letter	1/20/2002	P-166	O.2.2
CL-25/1	Russell, Edward T.	Letter	1/20/2002	P-167	O.2.2
CL-25/2	Russell, Edward T.	Letter	1/20/2002	P-167	O.1.16
CL-25/3	Russell, Edward T.	Letter	1/20/2002	P-167	O.4.9
CL-25/4	Russell, Edward T.	Letter	1/20/2002	P-167	O.4.4
CL-25/5	Russell, Edward T.	Letter	1/20/2002	P-167	O.5.9
CL-25/6	Russell, Edward T.	Letter	1/20/2002	P-167	O.1.16
CL-25/7	Russell, Edward T.	Letter	1/20/2002	P-167	O.4.8
CL-25/8	Russell, Edward T.	Letter	1/20/2002	P-167	O.1.6
CL-25/9	Russell, Edward T.	Letter	1/20/2002	P-167	O.5.8
CL-25/10	Russell, Edward T.	Letter	1/20/2002	P-167	O.2.2
CL-25/11	Russell, Edward T.	Letter	1/20/2002	P-167	O.4.1.1
CL-25/12	Russell, Edward T.	Letter	1/20/2002	P-167	O.6.5
CL-26/1	Matthews, Dave	Letter	1/21/2002	P-168	O.1.16
CL-26/2	Matthews, Dave	Letter	1/21/2002	P-168	O.2.3.4
CL-26/3	Matthews, Dave	Letter	1/21/2002	P-168	O.4.2
CL-26/4	Matthews, Dave	Letter	1/21/2002	P-168	O.2.3.3
CL-26/5	Matthews, Dave	Letter	1/21/2002	P-168	O.4.8
CL-26/6	Matthews, Dave	Letter	1/21/2002	P-168	O.4.7
CL-26/7	Matthews, Dave	Letter	1/21/2002	P-168	O.1.6
CL-26/8	Matthews, Dave	Letter	1/21/2002	P-168	O.1.6

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-26/9	Matthews, Dave	Letter	1/21/2002	P-168	O.1.6
CL-26/10	Matthews, Dave	Letter	1/21/2002	P-168	O.5.8
CL-26/11	Matthews, Dave	Letter	1/21/2002	P-168	O.5.2
CL-26/12	Matthews, Dave	Letter	1/21/2002	P-168	O.5.5
CL-26/13	Matthews, Dave	Letter	1/21/2002	P-168	O.2.2
CL-26/14	Matthews, Dave	Letter	1/21/2002	P-168	O.5.2
CL-26/15	Matthews, Dave	Letter	1/21/2002	P-168	O.4.1.1
CL-27/1	Schumann, Klaus	Letter	1/21/2002	P-169	O.5.9
CL-27/2	Schumann, Klaus	Letter	1/21/2002	P-169	O.5.2
CL-27/3	Schumann, Klaus	Letter	1/21/2002	P-169	O.2.4
CL-28/1	Larson, Dennis	Letter	1/21/2002	P-170	O.5.10
CL-29/1	Kellerman, Martin	Letter	1/21/2002	P-171	O.4.8
CL-29/2	Kellerman, Martin	Letter	1/21/2002	P-171	O.2.3.4
CL-29/3	Kellerman, Martin	Letter	1/21/2002	P-171	O.4.1.1
CL-30/1	Heider, Kenneth J.	Letter	12/26/2001	P-172	O.6.5
CL-30/2	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/3	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/4	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.2.3.4
CL-30/5	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/6	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/7	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/8	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/9	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/10	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/11	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/12	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-30/13	Heider, Kenneth J.	Letter	12/26/2001	P-173	O.6.1
CL-31/1	Gallagher, Michael P.	Letter	12/28/2001	P-174	O.6.5
CL-31/2	Gallagher, Michael P.	Letter	12/28/2001	P-174	O.6.5
CL-31/3	Gallagher, Michael P.	Letter	12/28/2001	P-174	O.2.3.3
CL-31/4	Gallagher, Michael P.	Letter	12/28/2001	P-174	O.2.3.4
CL-31/5	Gallagher, Michael P.	Letter	12/28/2001	P-174	O.2.3.2
CL-31/6	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.6.1
CL-31/7	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.9
CL-31/8	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.2
CL-31/9	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.3
CL-31/10	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.6
CL-31/11	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.6
CL-31/12	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.9

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-31/13	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.9
CL-31/14	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.6.1
CL-31/15	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.1.7
CL-31/16	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.6.1
CL-31/17	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.6.1
CL-31/18	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.2.3.3
CL-31/19	Gallagher, Michael P.	Letter	12/28/2001	P-175	O.6.1
CL-32/1	Clark, Susan	Letter	1/24/2002	P-176	O.2.2
CL-32/2	Clark, Susan	Letter	1/24/2002	P-176	O.2.3.3
CL-32/3	Clark, Susan	Letter	1/24/2002	P-176	O.1.6
CL-33/1	Nagel, Margaret	Letter	1/24/2002	P-177	O.2.2
CL-33/2	Nagel, Margaret	Letter	1/24/2002	P-177	O.6.3
CL-33/3	Nagel, Margaret	Letter	1/24/2002	P-177	O.1.6
CL-33/4	Nagel, Margaret	Letter	1/24/2002	P-177	O.1.6
CL-33/5	Nagel, Margaret	Letter	1/24/2002	P-177	O.2.2
CL-33/6	Nagel, Margaret	Letter	1/24/2002	P-177	O.2.2
CL-33/7	Nagel, Margaret	Letter	1/24/2002	P-177	O.2.3.4
CL-33/8	Nagel, Margaret	Letter	1/24/2002	P-177	O.4.2
CL-33/9	Nagel, Margaret	Letter	1/24/2002	P-177	O.4.8
CL-33/10	Nagel, Margaret	Letter	1/24/2002	P-177	O.1.6
CL-33/11	Nagel, Margaret	Letter	1/24/2002	P-177	O.1.6
CL-33/12	Nagel, Margaret	Letter	1/24/2002	P-177	O.1.6
CL-33/13	Nagel, Margaret	Letter	1/24/2002	P-177	O.5.8
CL-33/14	Nagel, Margaret	Letter	1/24/2002	P-177	O.1.16
CL-33/15	Nagel, Margaret	Letter	1/24/2002	P-177	O.5.2
CL-33/16	Nagel, Margaret	Letter	1/24/2002	P-177	O.5.5
CL-33/17	Nagel, Margaret	Letter	1/24/2002	P-177	O.2.2
CL-33/18	Nagel, Margaret	Letter	1/24/2002	P-177	O.5.2
CL-33/19	Nagel, Margaret	Letter	1/24/2002	P-177	O.5.4
CL-33/20	Nagel, Margaret	Letter	1/24/2002	P-177	O.4.7
CL-34/1	Casten, Liane	Letter	1/24/2002	P-178	O.6.5
CL-34/2	Casten, Liane	Letter	1/24/2002	P-178	O.1.6
CL-34/3	Casten, Liane	Letter	1/24/2002	P-178	O.6.3
CL-34/4	Casten, Liane	Letter	1/24/2002	P-178	O.4.8
CL-34/5	Casten, Liane	Letter	1/24/2002	P-178	O.6.5
CL-35/1	Kim, Mary	Letter	1/25/2002	P-179	O.5.2
CL-36/1	Miller, Suzanne	Letter	1/25/2002	P-180	O.5.2
CL-36/2	Miller, Suzanne	Letter	1/25/2002	P-180	O.2.2
CL-36/3	Miller, Suzanne	Letter	1/25/2002	P-180	O.5.9

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-36/4	Miller, Suzanne	Letter	1/25/2002	P-180	O.2.2
CL-36/5	Miller, Suzanne	Letter	1/25/2002	P-180	O.4.8
CL-36/6	Miller, Suzanne	Letter	1/25/2002	P-180	O.2.4.2
CL-36/7	Miller, Suzanne	Letter	1/25/2002	P-180	O.4.1.1
CL-36/8	Miller, Suzanne	Letter	1/25/2002	P-180	O.6.3
CL-37/1	Nordlund, James M.	Letter	1/25/2002	P-181	O.4.1.1
CL-38/1	Woelker, Roger	Letter	1/27/2002	P-182	O.2.3.4
CL-38/2	Woelker, Roger	Letter	1/27/2002	P-182	O.5.9
CL-38/3	Woelker, Roger	Letter	1/27/2002	P-182	O.2.3.4
CL-38/4	Woelker, Roger	Letter	1/27/2002	P-182	O.5.5
CL-38/5	Woelker, Roger	Letter	1/27/2002	P-182	O.1.6
CL-38/6	Woelker, Roger	Letter	1/27/2002	P-182	O.4.3
CL-38/7	Woelker, Roger	Letter	1/27/2002	P-182	O.4.1.1
CL-39/1	Moore, Anne	Letter	1/28/2002	P-183	O.6.5
CL-39/2	Moore, Anne	Letter	1/28/2002	P-183	O.4.2.
CL-39/3	Moore, Anne	Letter	1/28/2002	P-183	O.4.1.1
CL-39/4	Moore, Anne	Letter	1/28/2002	P-183	O.4.8
CL-39/5	Moore, Anne	Letter	1/28/2002	P-183	O.2.2
CL-39/6	Moore, Anne	Letter	1/28/2002	P-183	O.1.6
CL-40/1	Runkle, John	Letter	1/28/2002	P-184	O.1.16
CL-40/2	Runkle, John	Letter	1/28/2002	P-184	O.1.6
CL-40/3	Runkle, John	Letter	1/28/2002	P-184	O.4.8
CL-40/4	Runkle, John	Letter	1/28/2002	P-184	O.4.1.1
CL-41/1	Schlau, Benjamin	Letter	1/29/2002	P-185	O.6.5
CL-41/2	Schlau, Benjamin	Letter	1/29/2002	P-185	O.4.5
CL-42/1	Ferguson, Tom	Letter	1/29/2002	P-186	O.2.3.3
CL-42/2	Ferguson, Tom	Letter	1/29/2002	P-186	O.4.4
CL-42/3	Ferguson, Tom	Letter	1/29/2002	P-186	O.2.4.1
CL-42/4	Ferguson, Tom	Letter	1/29/2002	P-186	O.6.3
CL-42/5	Ferguson, Tom	Letter	1/29/2002	P-186	O.6.3
CL-43/1	Reed, Mary S.	Letter	1/29/2002	P-187	O.2.3.4
CL-43/2	Reed, Mary S.	Letter	1/29/2002	P-187	O.4.2
CL-43/3	Reed, Mary S.	Letter	1/29/2002	P-187	O.2.3.3
CL-43/4	Reed, Mary S.	Letter	1/29/2002	P-187	O.4.8
CL-43/5	Reed, Mary S.	Letter	1/29/2002	P-187	O.1.6
CL-43/6	Reed, Mary S.	Letter	1/29/2002	P-187	O.1.6
CL-43/7	Reed, Mary S.	Letter	1/29/2002	P-187	O.5.8
CL-43/8	Reed, Mary S.	Letter	1/29/2002	P-187	O.1.16
CL-43/9	Reed, Mary S.	Letter	1/29/2002	P-187	O.5.2

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-43/10	Reed, Mary S.	Letter	1/29/2002	P-187	O.5.5
CL-43/11	Reed, Mary S.	Letter	1/29/2002	P-187	O.2.2
CL-43/12	Reed, Mary S.	Letter	1/29/2002	P-187	O.5.2
CL-43/13	Reed, Mary S.	Letter	1/29/2002	P-187	O.4.7
CL-43/14	Reed, Mary S.	Letter	1/29/2002	P-187	O.4.7
CL-43/15	Reed, Mary S.	Letter	1/29/2002	P-187	O.5.9
CL-43/16	Reed, Mary S.	Letter	1/29/2002	P-187	O.5.2
CL-44/1	Borchamann, Patricia	Letter	1/29/2002	P-188	O.1.16
CL-44/2	Borchamann, Patricia	Letter	1/29/2002	P-188	O.1.16
CL-44/3	Borchamann, Patricia	Letter	1/29/2002	P-188	O.1.16
CL-44/5	Borchamann, Patricia	Letter	1/29/2002	P-189	O.2.3.4
CL-44/6	Borchamann, Patricia	Letter	1/29/2002	P-189	O.4.2
CL-44/7	Borchamann, Patricia	Letter	1/29/2002	P-189	O.1.6
CL-44/8	Borchamann, Patricia	Letter	1/29/2002	P-189	O.5.9
CL-44/9	Borchamann, Patricia	Letter	1/29/2002	P-189	O.2.2
CL-44/10	Borchamann, Patricia	Letter	1/29/2002	P-189	O.5.5
CL-44/11	Borchamann, Patricia	Letter	1/29/2002	P-189	O.2.2
CL-44/12	Borchamann, Patricia	Letter	1/29/2002	P-189	O.4.7
CL-44/13	Borchamann, Patricia	Letter	1/29/2002	P-189	O.4.7
CL-44/14	Borchamann, Patricia	Letter	1/29/2002	P-189	O.2.2
CL-44/15	Borchamann, Patricia	Letter	1/29/2002	P-189	O.5.2
CL-44/16	Borchamann, Patricia	Letter	1/29/2002	P-189	O.1.9
CL-45/1	McKeown, Diana S.	Letter	1/30/2002	P-190	O.5.2
CL-45/2	McKeown, Diana S.	Letter	1/30/2002	P-190	O.1.6
CL-45/3	McKeown, Diana S.	Letter	1/30/2002	P-190	O.1.16
CL-46/1	Ferguson, Tom	Letter	1/30/2002	P-191	O.5.2
CL-46/2	Ferguson, Tom	Letter	1/30/2002	P-191	O.5.2
CL-46/3	Ferguson, Tom	Letter	1/30/2002	P-191	O.4.4
CL-46/4	Ferguson, Tom	Letter	1/30/2002	P-191	O.1.7
CL-46/5	Ferguson, Tom	Letter	1/30/2002	P-191	O.6.3
CL-46/6	Ferguson, Tom	Letter	1/30/2002	P-191	O.6.3
CL-47/1	Ritter, David	Letter	1/30/2002	P-192	O.6.5
CL-47/2	Ritter, David	Letter	1/30/2002	P-192	O.6.5
CL-47/3	Ritter, David	Letter	1/30/2002	P-192	O.6.4
CL-47/4	Ritter, David	Letter	1/30/2002	P-192	O.5.2
CL-47/5	Ritter, David	Letter	1/30/2002	P-192	O.6.4
CL-47/6	Ritter, David	Letter	1/30/2002	P-192	O.2.4.2
CL-47/7	Ritter, David	Letter	1/30/2002	P-192	O.4.3

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-47/8	Ritter, David	Letter	1/30/2002	P-192	O.2.2
CL-47/9	Ritter, David	Letter	1/30/2002	P-192	O.2.3.4
CL-47/10	Ritter, David	Letter	1/30/2002	P-193	O.5.9
CL-47/11	Ritter, David	Letter	1/30/2002	P-193	O.5.9
CL-47/12	Ritter, David	Letter	1/30/2002	P-193	O.5.2
CL-47/13	Ritter, David	Letter	1/30/2002	P-193	O.5.5
CL-47/14	Ritter, David	Letter	1/30/2002	P-193	O.2.3.4
CL-47/15	Ritter, David	Letter	1/30/2002	P-193	O.2.3.4
CL-47/16	Ritter, David	Letter	1/30/2002	P-193	O.4.1.1
CL-47/17	Ritter, David	Letter	1/30/2002	P-193	O.1.9
CL-47/18	Ritter, David	Letter	1/30/2002	P-194	O.5.4
CL-48/1	Gunter, Paul	Letter	1/30/2002	P-195	O.5.2
CL-48/2	Gunter, Paul	Letter	1/30/2002	P-195	O.2.2
CL-48/3	Gunter, Paul	Letter	1/30/2002	P-195	O.1.16
CL-48/4	Gunter, Paul	Letter	1/30/2002	P-195	O.5.2
CL-48/5	Gunter, Paul	Letter	1/30/2002	P-195	O.2.1
CL-48/6	Gunter, Paul	Letter	1/30/2002	P-195	O.5.9
CL-48/7	Gunter, Paul	Letter	1/30/2002	P-196	O.6.4
CL-48/8	Gunter, Paul	Letter	1/30/2002	P-196	O.6.4
CL-48/9	Gunter, Paul	Letter	1/30/2002	P-196	O.1.9
CL-48/10	Gunter, Paul	Letter	1/30/2002	P-196	O.4.3
CL-48/11	Gunter, Paul	Letter	1/30/2002	P-196	O.5.4
CL-48/12	Gunter, Paul	Letter	1/30/2002	P-196	O.5.4
CL-48/13	Gunter, Paul	Letter	1/30/2002	P-196	O.5.4
CL-48/14	Gunter, Paul	Letter	1/30/2002	P-196	O.1.6
CL-48/15	Gunter, Paul	Letter	1/30/2002	P-196	O.4.6
CL-48/16	Gunter, Paul	Letter	1/30/2002	P-197	O.4.6
CL-48/17	Gunter, Paul	Letter	1/30/2002	P-197	O.4.1.1
CL-48/18	Gunter, Paul	Letter	1/30/2002	P-197	O.1.9
CL-48/19	Gunter, Paul	Letter	1/30/2002	P-197	O.2.1
CL-48/20	Gunter, Paul	Letter	1/30/2002	P-197	O.1.9
CL-48/21	Gunter, Paul	Letter	1/30/2002	P-197	O.1.9
CL-48/22	Gunter, Paul	Letter	1/30/2002	P-197	O.4.10
CL-48/23	Gunter, Paul	Letter	1/30/2002	P-197	O.4.10
CL-48/24	Gunter, Paul	Letter	1/30/2002	P-197	O.1.9
CL-48/25	Gunter, Paul	Letter	1/30/2002	P-197	O.5.9
CL-48/26	Gunter, Paul	Letter	1/30/2002	P-197	O.5.5
CL-48/27	Gunter, Paul	Letter	1/30/2002	P-197	O.5.2
CL-48/28	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.2

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-48/29	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.4
CL-48/30	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.4
CL-48/31	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.4
CL-48/32	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.3
CL-48/33	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.4
CL-48/34	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.4
CL-48/35	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.4
CL-48/36	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.4
CL-48/37	Gunter, Paul	Letter	1/30/2002	P-198	O.4.2
CL-48/38	Gunter, Paul	Letter	1/30/2002	P-198	O.2.3.3
CL-48/39	Gunter, Paul	Letter	1/30/2002	P-198	O.1.6
CL-48/40	Gunter, Paul	Letter	1/30/2002	P-198	O.1.6
CL-48/41	Gunter, Paul	Letter	1/30/2002	P-198	O.1.6
CL-48/42	Gunter, Paul	Letter	1/30/2002	P-199	O.5.8
CL-48/43	Gunter, Paul	Letter	1/30/2002	P-199	O.5.9
CL-48/44	Gunter, Paul	Letter	1/30/2002	P-199	O.5.2
CL-48/45	Gunter, Paul	Letter	1/30/2002	P-199	O.5.5
CL-48/46	Gunter, Paul	Letter	1/30/2002	P-199	O.2.2
CL-48/47	Gunter, Paul	Letter	1/30/2002	P-199	O.5.2
CL-48/48	Gunter, Paul	Letter	1/30/2002	P-199	O.4.7
CL-48/49	Gunter, Paul	Letter	1/30/2002	P-199	O.4.1.1
CL-49/1	Greene, Eileen	Letter	1/31/2002	P-200	O.1.6
CL-49/2	Greene, Eileen	Letter	1/31/2002	P-200	O.1.6
CL-50/1	Katz, Deb	Letter	1/31/2002	P-201	O.2.2
CL-50/2	Katz, Deb	Letter	1/31/2002	P-201	O.2.2
CL-50/3	Katz, Deb	Letter	1/31/2002	P-201	O.5.8
CL-50/4	Katz, Deb	Letter	1/31/2002	P-202	O.5.4
CL-50/5	Katz, Deb	Letter	1/31/2002	P-202	O.2.2
CL-50/6	Katz, Deb	Letter	1/31/2002	P-202	O.2.2
CL-50/7	Katz, Deb	Letter	1/31/2002	P-202	O.3.0
CL-50/8	Katz, Deb	Letter	1/31/2002	P-202	O.5.2
CL-50/9	Katz, Deb	Letter	1/31/2002	P-202	O.5.2
CL-50/10	Katz, Deb	Letter	1/31/2002	P-202	O.1.6
CL-50/11	Katz, Deb	Letter	1/31/2002	P-202	O.4.6
CL-50/12	Katz, Deb	Letter	1/31/2002	P-202	O.2.1
CL-50/13	Katz, Deb	Letter	1/31/2002	P-202	O.4.6
CL-50/14	Katz, Deb	Letter	1/31/2002	P-202	O.4.6
CL-50/15	Katz, Deb	Letter	1/31/2002	P-202	O.3.0
CL-50/16	Katz, Deb	Letter	1/31/2002	P-202	O.1.6

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-50/17	Katz, Deb	Letter	1/31/2002	P-202	O.1.6
CL-50/18	Katz, Deb	Letter	1/31/2002	P-202	O.3.0
CL-50/19	Katz, Deb	Letter	1/31/2002	P-202	O.4.2
CL-50/20	Katz, Deb	Letter	1/31/2002	P-203	O.1.6
CL-50/21	Katz, Deb	Letter	1/31/2002	P-203	O.2.3.4
CL-50/22	Katz, Deb	Letter	1/31/2002	P-203	O.2.2
CL-50/23	Katz, Deb	Letter	1/31/2002	P-203	O.4.4
CL-50/24	Katz, Deb	Letter	1/31/2002	P-203	O.5.2
CL-50/25	Katz, Deb	Letter	1/31/2002	P-203	O.1.7
CL-50/26	Katz, Deb	Letter	1/31/2002	P-203	O.4.6
CL-50/27	Katz, Deb	Letter	1/31/2002	P-203	O.5.2
CL-50/28	Katz, Deb	Letter	1/31/2002	P-203	O.2.4.1
CL-51/1	Drey, Kay	Letter	1/30/2002	P-204	O.1.16
CL-51/2	Drey, Kay	Letter	1/30/2002	P-204	O.4.6
CL-51/3	Drey, Kay	Letter	1/30/2002	P-204	O.4.6
CL-51/4	Drey, Kay	Letter	1/30/2002	P-204	O.4.6
CL-51/5	Drey, Kay	Letter	1/30/2002	P-205	O.5.1
CL-51/6	Drey, Kay	Letter	1/30/2002	P-205	O.6.1
CL-51/7	Drey, Kay	Letter	1/30/2002	P-205	O.2.3.4
CL-51/8	Drey, Kay	Letter	1/30/2002	P-205	O.2.3.4
CL-51/9	Drey, Kay	Letter	1/30/2002	P-205	O.1.3
CL-51/10	Drey, Kay	Letter	1/30/2002	P-205	O.1.6
CL-51/11	Drey, Kay	Letter	1/30/2002	P-205	O.1.8
CL-51/12	Drey, Kay	Letter	1/30/2002	P-205	O.2.3.4
CL-51/13	Drey, Kay	Letter	1/30/2002	P-205	O.1.6
CL-51/14	Drey, Kay	Letter	1/30/2002	P-205	O.2.3.4
CL-51/15	Drey, Kay	Letter	1/30/2002	P-205	O.1.2
CL-51/16	Drey, Kay	Letter	1/30/2002	P-205	O.4.8
CL-51/17	Drey, Kay	Letter	1/30/2002	P-205	O.4.8
CL-51/18	Drey, Kay	Letter	1/30/2002	P-205	O.4.8
CL-51/19	Drey, Kay	Letter	1/30/2002	P-205	O.4.10
CL-51/20	Drey, Kay	Letter	1/30/2002	P-205	O.2.2
CL-51/21	Drey, Kay	Letter	1/30/2002	P-206	O.2.4.1
CL-51/22	Drey, Kay	Letter	1/30/2002	P-206	O.4.3
CL-51/23	Drey, Kay	Letter	1/30/2002	P-206	O.4.8
CL-51/24	Drey, Kay	Letter	1/30/2002	P-206	O.2.2
CL-51/25	Drey, Kay	Letter	1/30/2002	P-206	O.4.8
CL-51/26	Drey, Kay	Letter	1/30/2002	P-206	O.2.2
CL-51/27	Drey, Kay	Letter	1/30/2002	P-206	O.6.5

Table O.1. (contd)

Comment No.	Speaker or Author	Source	Date	Comment Page in Appendix P	Section of Appendix O where comment is addressed
CL-51/28	Drey, Kay	Letter	1/30/2002	P-206	O.2.2
CL-52/1	Johnsrud, Judith	Letter	2/21/2002	P-207	O.6.5
CL-52/2	Johnsrud, Judith	Letter	2/21/2002	P-207	O.5.4
CL-52/3	Johnsrud, Judith	Letter	2/21/2002	P-207	O.5.4
CL-52/4	Johnsrud, Judith	Letter	2/21/2002	P-207	O.2.2
CL-52/5	Johnsrud, Judith	Letter	2/21/2002	P-207	O.2.2
CL-52/6	Johnsrud, Judith	Letter	2/21/2002	P-207	O.5.2
CL-52/7	Johnsrud, Judith	Letter	2/21/2002	P-207	O.5.2
CL-52/8	Johnsrud, Judith	Letter	2/21/2002	P-207	O.5.9
CL-52/9	Johnsrud, Judith	Letter	2/21/2002	P-207	O.5.4
CL-52/10	Johnsrud, Judith	Letter	2/21/2002	P-207	O.5.4
CL-52/11	Johnsrud, Judith	Letter	2/21/2002	P-207	O.4.8
CL-52/12	Johnsrud, Judith	Letter	2/21/2002	P-207	O.1.6
CL-52/13	Johnsrud, Judith	Letter	2/21/2002	P-208	O.1.6
CL-52/14	Johnsrud, Judith	Letter	2/21/2002	P-208	O.4.7
CL-52/15	Johnsrud, Judith	Letter	2/21/2002	P-208	O.4.1.1
CL-52/16	Johnsrud, Judith	Letter	2/21/2002	P-208	O.4.1.1
CL-52/17	Johnsrud, Judith	Letter	2/21/2002	P-208	O.4.1.1
CL-52/18	Johnsrud, Judith	Letter	2/21/2002	P-208	O.4.1.1
CL-52/19	Johnsrud, Judith	Letter	2/21/2002	P-208	O.1.6
CL-52/20	Johnsrud, Judith	Letter	2/21/2002	P-208	O.1.6
CL-52/21	Johnsrud, Judith	Letter	2/21/2002	P-208	O.1.6
CL-52/22	Johnsrud, Judith	Letter	2/21/2002	P-208	O.2.4.3
CL-52/23	Johnsrud, Judith	Letter	2/21/2002	P-208	O.2.2
CL-52/24	Johnsrud, Judith	Letter	2/21/2002	P-208	O.2.2
CL-52/25	Johnsrud, Judith	Letter	2/21/2002	P-208	O.6.5
CL-53/1	Becker, Rochelle	Letter	2/2/2002	P-209	O.5.2
CL-53/2	Becker, Rochelle	Letter	2/2/2002	P-209	O.2.4.1
CL-53/3	Becker, Rochelle	Letter	2/2/2002	P-209	O.5.9
CL-53/4	Becker, Rochelle	Letter	2/2/2002	P-209	O.4.4
CL-53/5	Becker, Rochelle	Letter	2/2/2002	P-209	O.5.2
CL-53/6	Becker, Rochelle	Letter	2/2/2002	P-209	O.5.2

O.1 Impacts

O.1.1 Onsite/Offsite Land Use

Comment: Page 4-6, Section 4.3.1.2, Lines 15-16. This section defines a previously disturbed area as an area where land disturbance occurred "during construction or operation of the site." This definition may allow licensees to undertake decommissioning activities resulting in adverse environmental impacts without first performing a site-specific analysis of those impacts. For example, it might allow a licensee to disturb an area that was disturbed several decades ago during plant construction even if that area was not used during plant operation and has essentially returned to its original condition, i.e. native species have fully returned. The Supplement should define what constitutes a "previous" disturbance, e.g., by specifying a time frame, so such adverse impacts are not permitted to occur. (**CL-16/23**)

Comment: Page 4-6, Section 4.3.1.2, Lines 25-29. The following terms are too broad or too vague to provide licensees sufficient guidance about when a site-specific analysis is necessary with regard to SMALL impacts, "very little new development" and "minimal changes;" with regard to MODERATE impacts, "considerable new development" and "some changes;" and with regard to LARGE impacts, "large-scale new development" and "major change." Providing specific examples from decommissioning or decommissioned facilities would be very useful. (**CL-16/24**)

Response: *Section 4.3.1 was revised to clarify that offsite changes to land use can not be evaluated generically and would require a site-specific analysis. The concept of "previously disturbed land", "very little new development," "minimal changes," etc. no longer is the criteria for initiating a site-specific analysis.*

Comment: Page 4-6, Section 4.3.1.3, Lines 33-41. Using NUREG-1437's estimate that ~1 to ~4 ha (~2.5 to 10 ac) of land is needed for steam generator replacement activities, the document assumes that the land use impacts of major component removal during decommissioning "should be similar or less," and that the land used during major component removal "[g]enerally ... has been previously disturbed during construction of the facility." Does this mean that a licensee must perform a site-specific analysis of impacts if the land use impacts of major component removal may or will be greater than the estimated impacts of steam generator replacement, or if the land used during major component removal has not been previously disturbed during construction of the facility? (**CL-16/25**)

Response: *Section 4.1.3 was revised. A site-specific analysis of onsite land use is not required because this level of impact has already been examined within the context of the operating license and is within the land use allowed by existing zoning. The estimate of land needed for major component removal is for illustration only and does not constitute a limit.*

Comment: Page 4-7, Section 4.3.1.3, Lines 1-2. The Supplement notes that "almost all of the sites" will use land previously disturbed during construction; should one assume that a facility using land not previously disturbed will need to conduct a site-specific analysis? Similarly, under "Conclusions" on that page, it states that impacts for "offsite land use" are considered small unless "major transportation upgrades are necessary." The examples given are establishing water, rail or road transportation links. Is one to assume that any establishment of offsite transportation would require a site-specific analysis? Would impacts only be to off-site land uses or to on-site as well? Specific examples would help here. (**CL-16/26**)

Response: *Section 4.3.1 was revised. The staff has revised Section 4.3.1 to state that offsite changes in land use cannot be evaluated generically. Onsite, no additional analysis is required because no change in land use is required. A licensee should perform a site-specific analysis for all new offsite land use including major transportation upgrades because of the potential for MODERATE or LARGE impacts.*

Comment: Page 4-7, Section 4.3.1.3, Lines 10-12. Please explain the basis for the assumption that where previously disturbed areas are not large enough to support decommissioning activities, "it is likely" that the impact of disturbing previously undisturbed areas would be "temporary and SMALL." (**CL-16/27**)

Response: *Section 4.3.1 was revised. The largest land disturbances associated with decommissioning appear to be about the same size or smaller than those needed for steam generator replacement, 1 to 4 ha (2.5 to 10 acres). This amount of land, even if previously undisturbed, could be returned to a near-natural state in 1 to 5 years and represents only about 2.5% of even relatively small (400 ha) sites. While it is possible for disturbances even this minor to cause adverse ecological consequences (disturbance of a wetland, for example), it is unlikely that such ecologically valuable land would be disturbed. In addition, this amount of land does not represent an impact on overall land use.*

Comment: The Staff should visit TMI and then travel to Clinton Lake to examine how perceptions and reality affect "off site land use." The GEIS must acknowledge the potential for adverse economic impacts on a community during decommissioning. (**CL-02/47**)

Response: *Land use and socioeconomics are addressed in Section 4.3.1 of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.2 Surface and Groundwater Quality and Use

Comment: Page 3-11, Section 3.1.3, Lines 17-18. Please revise the document to clarify that Resource Conservation and Recovery Act hazardous waste disposal permits and Clean Water Act NPDES permits are administered either by EPA or, where EPA has authorized the state RCRA program or the state has assumed the NPDES program, by the state. (See NUREG 1628, Question 4.2.2) Also, the text should briefly discuss the management of PCBs and PCB-containing materials under the Toxic Substances Control Act. (**CL-16/19**)

Response: *Section 3.1.3 was revised to clarify the regulation and administration of the Resource Conservation and Recovery Act (RCRA) and NPDES permits.*

Comment: Page 4-9, Section 4.3.2.2, Lines 12-14. The Supplement should briefly describe the "common engineering practices to limit water use impacts." When describing how water impacts were evaluated (Section 4.3.2.3.), it would be helpful to include the average and maximum water usage pre- and post-operation of those plants that have ceased operation. (**CL-16/28**)

Response: *Section 4.3.2.2 was revised. The phrase "common engineering practice to limit water use impacts" was removed and estimates of the average and maximum water usage were provided.*

Comment: Section 4.3.3.3, p 4-12, line 23 – pH would not necessarily (normally) be measured per the LTP. Also, while considerable attention is placed on minimizing spills during decommissioning, hazardous spills have occurred at decommissioning sites. The same types of activities as performed at operating units, which have resulted in spills at operating units, can lead to spills at decommissioning units. The likelihood is less since less water treatment and so less bulk chemical handling is typically performed at decommissioning sites. (**CL-09/17**)

Response: *Section 4.3.3.3 was revised eliminating the implication that non-radiological groundwater parameters (such as pH) would be measured during LTP groundwater monitoring.*

Comment: Pages 4-10 through 4-12, Section 4.3.3. This section focuses primarily on the water quality impacts of nonradiological discharges from point sources to surface water (and the regulation of such discharges under the NPDES program). It should more fully discuss the water quality impacts of both nonradiological discharges to groundwater (and their possible

regulation under state programs) and non-point source pollution, and if necessary should indicate that one or both of these types of impacts require site-specific analysis. All of these types of discharges have potential water quality impacts that need to be evaluated. (**CL-16/29**)

Comment: Pages 4-10 to 4-11, Section 4.3.3.1. This subsection on water quality regulations should distinguish between "intentional" and "unintentional" nonradiological discharges to both surface water and groundwater. As currently drafted, the section blurs these distinct types of discharges and the regulatory schemes relevant to each. (**CL-16/30**)

Comment: Page 4-10, Section 4.3.3.1, Line 42. The Supplement refers to a "permitting authority" before it identifies what type of permit is at issue. As a result, the reader does not know who the permitting authority is. It would be helpful to note that "intentional releases of non-radiological discharges" to surface waters are regulated under EPA or state wastewater discharge permitting programs, and such discharges to groundwater may be regulated under state programs. (**CL-16/31**)

Comment: Page 4-10, Section 4.3.3.1, Lines 41-44 and Page 4-11, Lines 1-2. This paragraph is confusing in light of the statement on Page 4-12 "that the issue of surface or groundwater quality for all decommissioning activities is generic and that the environmental impacts for these activities will be SMALL." As currently written, it suggests that NRC will obtain a permitting authority's "environmental assessment of aquatic impacts" and "consider the assessment in its determination of the magnitude of the environmental impacts" of decommissioning activities at individual sites. It also suggests that NRC will "establish its own impact determination[s]" on a site-specific basis in the absence of such environmental assessments. Please clarify. (**CL-16/32**)

Comment: Page 4-11, Section 4.3.3.1, Lines 4-5. Please revise the Supplement to indicate that the NPDES program only regulates point source discharges to surface waters, not discharges to groundwater or non-point source pollution. (See also Section 4.3.3.4.) As noted above, the document should note that point source discharges to surface waters also may be regulated under state wastewater discharge permitting programs, and discharges to groundwater may be regulated under state programs. (**CL-16/33**)

Comment: Page 4-11, Section 4.3.3.1, Lines 7-9 and Section 4.3.3.2, Line 16. The document assumes that facilities' NPDES permit limits during decommissioning "are generally the same limits that are enforced for an operating plant," that facilities' permits "may require a monitoring program," and that "these monitoring programs are usually continued through the decommissioning period." Should the reader assume that a licensee must perform a site-specific

analysis of water quality impacts if any one of these conditions is not met? If not, why not? (See also Section 4.3.3.4: is a site-specific analysis required where discharges to surface water may or will exceed the NPDES-permitted levels? Again, if not, why not?) (**CL-16/34**)

Comment: Page 4-11, Section 4.3.3.2, Lines 17-18, 21-23. This language could be interpreted erroneously to indicate that discharges to groundwater are monitored under NPDES permits. The Supplement should address the water quality impacts of decommissioning activities on groundwater separately from the impacts on surface water. In lines 34-35, the Supplement should describe the conditions in which nonradiological impacts to groundwater and from non-point source pollution may be considered SMALL, MODERATE or LARGE. (**CL-16/35**)

Comment: Page 4.12, Section 4.3.3.4. As noted above, the NPDES program only regulates nonradiological discharges to surface waters from point sources, not discharges to groundwater. This subsection should also draw conclusions about the potential water quality impacts of nonradiological discharges to groundwater and non-point source pollution during decommissioning. (**CL-16/38**)

Comment: I cannot stress enough that the groundwater issues are not adequately addressed. (**CL-20/68**)

Response: *Section 4.3.3 was extensively revised and reorganized to address the above comments*.

Comment: The Supplement should provide a more robust discussion of ground water impacts. Further detail on EPA's concerns is found in the enclosed "Detailed comments." (**CL-16/5**)

Response: *Section 4.3.3 was extensively revised and reorganized to respond to the specific comments.*

Comment: Pages 4-11 to 4-12, Section 4.3.3.3. The discussion in this section could support a requirement for licensees to perform site-specific analyses of the potential water quality impacts of their decommissioning activities under certain circumstances; notably, language such as performing these activities in different orders can have a "significantly different impact on water quality," that the SAFSTOR option "may exacerbate water quality issues," and that certain activities "may result in changes in local water chemistry" implies the potential need for site-specific analysis.

In particular, the statement that rubblization may affect groundwater pH and thereby "affect the transport properties of radioactive and nonradioactive chemicals in the subsurface" appears to require a site-specific analysis. The document notes in other places (e.g., Page 1-7, Lines 26-33) that the nonradiological impacts of rubblization, including concrete leaching into groundwater, can be evaluated generically. Section 4.3.3.3 does not support this conclusion. (**CL-16/36**)

Response: *Although the decommissioning activities themselves and the order in which the activities are performed control the impacts to water quality the staff concluded that the impacts on the nonradioactive aspects of water quality are SMALL (neither detectable or destabilizing), easily mitigated and could be evaluated generically. The staff also concluded that if a licensee chose to dispose of slightly contaminated building debris below ground in a manner that is consistent with the radiological site release criteria and solid waste disposal requirements the non-radiological impacts on the groundwater would be easily mitigated, small, and could be evaluated generically. The staff agrees with the commentor with respect to the evaluation of the radiological impacts to groundwater. A site specific analysis would be required, see Section 4.3.3.3. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 4-12, Section 4.3.3.3, Lines 16-17. The Supplement states that unintentional releases of hazardous substances historically have been infrequent at decommissioning facilities, and that except for a few substances, hazardous substances spills are "localized, quickly detected, and relatively easy to remediate." Does this mean that a licensee must perform a site-specific analysis of potential water quality impacts if a hazardous substance is spilled or otherwise released to the environment during decommissioning. How is "hazardous substance" defined? Examples or a better definition of "localized," "quickly detected," and "ease of remediation" should also be provided. (**CL-16/37**)

Response: *As the commentor stated, unintentional releases of hazardous substances during decommissioning have been infrequent and when they have occurred the spills are localized, quickly detected, and remediated. The expectation is that the occurrence of such events will continue to be infrequent. A site specific evaluation of the significance and consequences of the event is appropriate at the time of the occurrence of the spill. The results of that evaluation dictate the response to the spill. Even a site specific evaluation in advance of decommissioning would not evaluate the impact of all potential hazardous waste spills under all conditions. Rather than evaluating the impact of all potential onsite hazardous spills, licensees should take specific measures to reduce the likelihood and magnitude of the spill using administrative procedures, best management practices, and training. Should a spill occur, the licensee has emergency procedures in place to rapidly respond to the spill and assess its consequences. Therefore the staff concludes that a detailed site specific assessment of potential spills before*

the commencement of decommissioning activities would be of little value in protecting the groundwater. Accidental spills are infrequent and the focus should continue to be on prevention. If a spill should occur then evaluation and remediation of the consequences of the spill are required. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Under Water Quality p.4-10, 4-11 the NRC must stop giving the impression that it is sheer chance that nuclear reactors are located on water, when in fact they require millions of gallons of water a day to operate. NRC assumes compliance with NPDES discharge permits for non-radioactive contaminants (NPDES and the Clean Water Act do not cover most radioactive contaminants, this was purposeful, so industry and the armaments crowd could do what they liked,) however, NPDES permits are often violated or bypassed. (**CL-20/28**)

Response: *The Supplement does not intentionally mislead the reader in the requirements for large quantities of water necessary for cooling. See the explanation in Section 3.1.3, "Cooling and Auxiliary Water Systems", for a detailed account of once-through and closed cycle cooling systems and water requirements. Point source discharges to surface waters are regulated by the NPDES permit system. Licensees are required to comply with the requirements of their permit. This Supplement does not evaluate the potential impacts associated with non-compliance of the NPDES permit. Radiological releases to surface waters are regulated by 10 CFR Part 20. Licensees are required to stay within the 10 CFR Part 20 Appendix B guidelines for the release of radioisotopes. Again this Supplement does not evaluate the potential impacts associated with noncompliance with the regulations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: On Page 4-9 the NUREG concludes (Section 4.3.2.4) that the environmental impact of water usage will be small. In the evaluation they consider the anticipated reduction in water usage for cooling in the condenser. This conclusion appears reasonable, however the analysis should also consider the environmental effects of the loss of heat provided by cooling water discharged to a closed lake or pond system that is a habitat for aquatic animals and vegetation. Many nuclear facilities are on natural or man-made bodies of water making this environmental effect generic in nature. (**CL-31/8**)

Response: *The impacts of loss heat are not within the scope of this Supplement because the impacts are caused by the cessation of operations, not by decommissioning activities. The decision to cease operations is the decision of the licensee, not the NRC. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: (4.3.2.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Water Use - Conclusions: (The discussion 4.3.1.4 is also relevant)

The GEIS stated, "The overall water use of a nuclear facility will dramatically decrease once the reactor has stopped operating and the demand for cooling and makeup water ceases." (4.9-4.10) On the surface, this statement appears to be correct. However, at Three Mile Island, a considerable amount of "cleanup water" was created after the plant was shut down:

In 1980, the Susquehanna Valley Alliance, based in Lancaster, successfully prevented Met Ed (GPU) from dumping 700,000 gallons of radioactive water into the Susquehanna River. Ten years later (December, 1990), despite legal objections, GPU began evaporating 2.3 million gallons of accident-generated radioactive water (AGW).

.... Can anyone at the NRC point to an official document that classifies 700,000 gallons of radioactive water (which later grew to 2.3 million gallons) as "SMALL"?

The people who live and work around TMI have found that the risks associated with additional cleanup water are not "SMALL." (**CL-02/48**)

Comment: (4.3.3.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS;

Water Quality - Conclusions:

"The staff concludes that the issue of surface or ground water quality for all decommissioning activities is generic and that the environmental impacts for these activities will be SMALL" (4-12). Persistent "water quality" problems continue to plague TMI, a prematurely shut down reactor:

On November 2, 1993, in a letter to the NRC, GPU Nuclear acknowledged: "During the TMI-2 accident, the cork seam located in the Auxiliary Building Seal Injection Valve Room (SIVR) was contaminated with radioactive water. Attempts to contain the contamination within the room have been unsuccessful. During the past 14 years, radioactive material has spread along the joint in one direction into the Annulus, and in the other direction into the Auxiliary Building, Service Building and Control Building West (R. L. Long, GPU Nuclear, Director, Services Division TMI-2)."

On June 4, 1998, "GPUN found several pipes penetrating the wall between the turbine building basement and the control building in Unit-2 to be open on both sides of the wall. This condition was contrary to the Unit-2 post-defueling monitored storage safety analysis report (PDMS-SAR) which requires entrances to the control building area to be watertight or provided with flood panels and openings that are potential leak baths to be sealed." (NRC Inspection Report, 50-289/98-08.) Less than a month later, on July 2, 1998, an LER was necessary due to the breaching of flood barriers "between the turbine building and the control building area due to inadequate fieldwork documents."

As recently as January 9 and 19, 1999, elevated tritium levels and potential leaks from the waste evaporator condensate storage tank for the months of January, February and March 1999 were reported.

Based on the above documented water quality problems the staff should revisit the rating of "water quality." (**CL-02/49**)

Response: *Table 1-1 of this Supplement lists activities at facilities that have been permanently shutdown by a major accident as out of scope. In addition, the problems discussed by these comments are not relevant to a generic assessment. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The water quality (Section 4.3.3) discussion does not address the potential impact of dewatering on the quality of ground water. If, for example, the ground water is a source of potable water and the facility is located near an ocean, dewatering could impact the quality (salinity) of the potable water. The NRC should revise the Supplement to clarify that the NRC will rely on the licensee's compliance with the NPDES permit for dewatering to conclude that the impact is SMALL. (**CL-01/4**)

Response: *Groundwater withdrawal, such as dewatering, is regulated by the state and not through the NPDES Permit. Furthermore, any groundwater dewatering required during decommissioning would be temporary and experience to date has revealed that it is minimal in volume and impact. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Discharges should never have been allowed without prior cleanup and should not be now. (**CL-20/29**)

Response: *The staff agrees with the comment. Discharges are only permitted within regulatory limits. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Additionally, a thorough analysis of groundwater impacts seems lacking. Given Georgia's current concern over the Floridian aquifer, it is again hard to believe that something fundamental to life, water, is being analyzed generically. (**AT-A/36**)

Comment: Additionally, a thorough analysis of groundwater impacts seems lacking. Given Georgia's current concern over the Floridan aquifer, we request that a site-specific assessment of groundwater quality be conducted prior to decommissioning. Also, we request that a more thorough analysis of groundwater issues be researched prior to issuing the final EIS. As an example, the NRC should request the most recent data from State agencies, such as the Georgia Environmental Protection Division, that are involved in negotiations regarding "water wars" between states—as in the ongoing dispute facing Georgia, Florida, and Alabama. (**CL-08/19**)

Response: *The use of groundwater is reduced significantly once the plant permanently ceases operation and is not expected to detectably change or destabilize the aquifer at any NRC licensed site. Therefore, the staff concludes that the impact to groundwater for decommissioning is SMALL and no further mitigation is required. NRC uses groundwater data from States and other agencies where NRC licensed facilities are sited to determine if changes in groundwater use at decommissioning sites are detectable or its use might destabilize groundwater sources. Furthermore, during the review of the LTP, the licensee has to demonstrate, on a site-specific basis, that operation and decommissioning of the facility has not revealed groundwater contamination in excess of the regulatory limits. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Page 1-7, Section 1.3, Lines 30-33. The document needs to explain the grounds for the determination that the environmental impacts of concrete leaching into site groundwater as the result of rubblization can be evaluated generically. See also groundwater comments below. (**CL-16/13**)

Comment: THIS GROUNDWATER CONTAMINATION ISSUE IS ANOTHER REASON WHY "RUBBLIZATION" MUST BE FORBIDDEN, THE CONTAMINATION IN WHAT THEY WANT TO RUBBLIZE AND BURY WILL LEACH TO THE GROUNDWATER AND DIRECTLY IRRADIATE SOIL AND MICROORGANISMS. (**CL-20/19**)

Comment: Would a leachate collection system be required where the rubble is stored in order

to monitor for potential impacts on the groundwater? (**CL-51/15**)

Response: *The staff has determined that long term radiological aspects of rubblization, or onsite disposal of slightly contaminated material would require a site-specific analysis and would be addressed at the time the license termination plan is submitted. The nonradiological impacts would be nondetectable (see Section 4.3.3.3). They are considered to be generic for all sites. The NRC has neither considered or approved rubblization for any plant nor provided guidance on rubblization methods or practices including the requirement for a leachate collection system. This Supplement evaluates potential environmental impacts of decommissioning. It does not set requirements for decommissioning activities or methods. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Groundwater is used by countless communities, groundwater is eventually released to surface and other water bodies and, as groundwater onsite is usually radioactively contaminated, it is a SERIOUS issue that MUST be dealt with, groundwater that is contaminated MUST be pumped out etc. (**CL-20/18**)

Response: *Groundwater in the vicinity of the facility is monitored during operation and decommissioning. Any mitigation of groundwater contamination will be evaluated at the time of the license termination plan review. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: As all landfills leak, it will go to the groundwater and migrate offsite. (**CL-20/76**)

Comment: Furthermore, the way the environmental and water issues were looked at during the time of plant licensing were often equally awful. It all needs reconsidering. (**CL-20/15**)

Response: *The comments can not be evaluated because they did not provide specific information. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.1.3 Air Quality

Comment: 4.3.4 Air Quality, (4.2.4.2) pg. 4-14, last para., last full sentence: This statement indicates that in most cases the number of shipments of other materials (non-radioactive materials) will be small compared to those for LLW. This is not necessarily the case for a plant which is removing all above grade facilities. However, this fact should not affect the conclusion that the air quality related environmental impacts for these activities will be small. (**CL-04/3**)

Response: *The statement in the Supplement is correct given sizes and contents of reactor building and other structures required for plant operation. The Supplement only addresses the impacts of the removal of radioactive structures and structures that were required for operation of the plant. It does not include removal of other structures, including training facilities and administration buildings. Table 1-1 provides a list of areas that were not considered within the scope of the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 4.3.4.2, p 4-14, 2nd paragraph - not all decommissioning sites have or will have building ventilation systems, especially those that are in SAFSTOR for many years. Temporary systems will be established, as needed, for gaseous effluents during decommissioning if installed systems are no longer functional. Monitoring of air quality is not necessarily performed during the storage period, depending on activities, storage period and source term. (**CL-05/11**)

Comment: Section 4.3.4.2, p 4-14, lines 11-24 – Not all decommissioning sites have or will have building ventilation systems, especially those are in SAFSTOR for many years. Temporary systems will be established, as needed, for gaseous and particulate effluents during decommissioning if installed systems are no longer functional. (**CL-09/19**)

Comment: Monitoring of air quality is not necessarily performed during the storage period, depending on activities, storage period and source term (**CL-09/20**)

Comment: Page 4-14, Section 4.3.4.2, Lines 10-24. The Supplement states that most decommissioning activities are conducted in facility buildings with systems that are "typically maintained and periodically operated" during decommissioning to minimize airborne contamination. As a result, "materials released when systems are dismantled and equipment is removed are not likely to be released to the environment in significant quantities." Again, does the reader assume that a licensee must perform a site-specific analysis of potential air quality impacts if a certain level (definition?) of decommissioning activity may or will not be conducted in facility buildings, or if the systems used to minimize airborne contamination may or will not be maintained and/or operated according to a certain level of effort? How is "significant quantity" defined? (**CL-16/40**)

Response: *Section 4.3.4.2 was revised to address the above comments and to provide a better explanation of the process and terminology. The staff has determined that potential air quality impacts are SMALL and generic and no site-specific analysis is needed.*

Comment: Section 4.3.4.3, p 4-15 – other activities during decommissioning could result in release of particulate matter. This includes temporary suspension of particles during cutting activities and production of particulates from processing of sodium and NaK at an FBR. Such particulate matter is filtered, as necessary, prior to release, to avoid or minimize adverse air quality impacts. While this is recognized on p 4-14, it should also be included in the section on "Results of Evaluation." (**CL-09/21**)

Response: *Section 4.3.4.3 was revised to address this comment.*

Comment: Section 4.3.4.4, p 4-16, line 11 – add the following sentence to the end of the paragraph: "Particulates produced by decommissioning activities within buildings will be filtered as needed so that air quality impacts will be minimal (**CL-09/22**)

Response: *Section 4.3.4.4 was revised to address this comment*

Comment: Page 4-14, Section 4.3.4.2, Lines 6-8. The Supplement states that emissions from workers' vehicles "should be lower" during decommissioning than during plant construction or outages and are "usually lower" than during plant operation. Is there any data from decommissioned plants to support these statements? Also, does one assume that a site-specific analysis of potential air quality impacts is required if such emissions may or will be higher than during plant construction, outages or operation? (**CL-16/39**)

Response: *Assuming that the mix of vehicles driven by the decommissioning work force is the same as the mix of vehicles driven by the onsite work force during plant construction and operation, the staff concludes that total emissions from all workers' vehicles should decrease due to the decrease in the work force following cessation of plant operations, and should not be a problem during decommissioning of any plant. Section 4.3.4 was changed to address this comment.*

Comment: Page 4-14, Section 4.3.4.2, Lines 26-33. The Supplement states that fugitive dust emissions during movement of equipment outside of facility buildings are "likely ... to be confined to the immediate vicinity of the equipment," "in general ... limited to a small number of events" and "of relatively short duration." Again, is the reader to assume that a licensee must perform a site-specific analysis of potential air quality impacts where one of these conditions is not met? Also, how are "immediate", "small number of events" and "relatively short duration" defined? Further, must the facility employ mitigation measures to minimize dust; if so, where are these specified? (**CL-16/41**)

Comment: Page 4-14, Section 4.3.4.2, Lines 40-43 and Page 4-15, Section 4.3.4.2, Lines 1-2.

The Supplement states that there is an average of less than one shipment per day of low-level waste (LLW) from a decommissioning plant; that, "in most cases, the number of shipments of other materials to and from a decommissioning facility will be less than that for LLW;" and that therefore emissions associated with the transportation of materials from such a plant "are not expected to have a significant impact on air quality." Again, is the reader to assume that a licensee must perform a site-specific analysis of potential air quality impacts if the number of shipments of materials to or from its decommissioning facility will exceed the level of less than one shipment per day? (**CL-16/42**)

Response: *Section 4.3.4 was revised to address the above comments and to provide a better explanation of the process and the terminology. The experience to date at plants undergoing decommissioning has not resulted in air quality issues related to fugitive dust. Furthermore, the licensee must evaluate impacts resulting from decommissioning activities against previously issued environment assessments (10 CFR 50.82 (a)(b)(ii). If the evaluation determines that the impacts are greater that previously assessed then the impact is outside the envelope established by this GEIS.*

Comment: Page 4-15, Section 4.3.4.2, Lines 4-7. The definition of what constitutes SMALL, MODERATE and LARGE air quality impacts would be helped by providing specific examples from decommissioning or decommissioned facilities. (**CL-16/43**)

Response: *Section 4.3.4 was revised to address this comment. The criteria for defining destabilization and detectibility was clarified in Section 4.3.4.2.*

Comment: Page 4-15, Section 4.3.4.3, Lines 21-23. This section states that "[n]o anticipated new methods of conducting decommissioning and no peculiarities of operating plant sites are anticipated to affect this pattern" of managing fugitive dust. Is the reader to assume that a licensee who proposes using a new decommissioning method must perform a site-specific analysis of potential impacts? (**CL-16/44**)

Response: *The staff expects licensees to continue to use dust control measures appropriate for the activity being performed and the site. The staff assumes that if a new method of decommissioning is contemplated by a licensee then the licensee would evaluate the impact of the new methodology on all the environmental issues including fugitive dust. If the evaluation concludes that the amount of fugitive dust released by the new activity is significantly greater than what would be expected using the current technology and the impact would not be SMALL, then the licensee would be outside the envelope of impacts given in this Supplement. The comment did not provide new information relevant to the supplement and will not be evaluated further. The comment did not result in a change to the supplement.*

Comment: Air quality issues, Page 4-12, etc., do not address the fact the HEPA filters are

about as good as useless for radioactive particulate holdup and sand filters should be added as well. (**CL-20/31**)

Response: *Well established technology exists for filtering airborne radionuclides. Airborne releases are required to be within regulatory limits given in 10 CFR Part 20. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: On Page 4-16 the NUREG concludes (Section 4.3.4.4) the environmental impact of air emissions will be small. In the evaluation they did not consider that many sites use extraction steam to provide plant heat in the winter months. The shutdown of the reactor means that Aux Boilers will be operated for longer periods to provide heating steam. This needs to be considered in the NUREG or many facilities will need to address this issue in the PSDAR. (**CL-31/9**)

Response: *The staff has concluded that impacts on air quality, including the increased use of auxiliary boilers for heating, could be evaluated generically and is considered to be SMALL and will not require a site-specific analysis. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: This is of special significance if explosives are to be used for demolition, which will generate radioactive fugitive dust. (**CL-51/9**)

Response: *Control measures will be required during demolition to keep releases, including those associated with fugitive dust, within regulatory limits regardless of the methods used during demolition. The NRC license will not be terminated until the residual radioactivity at the site is below regulatory limits. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: (4.3.1.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS;

Air Quality - Conclusions:

"Fugitive dust from those activities performed outside of the building is temporary, can be controlled mitigative measures, and will generally not be noticeable off site." Once again the experience of TMI-2 is instructive:

In June-July, 1980, for 11 days, Met Ed vented 43,000 curies of radioactive Krypton-85

(10-year half-life; beta and gamma) and other radioactive gasses into the environment without having scrubbers in place. Yet in November 1980, the U.S. Court of Appeals for the District of Columbia ruled that the krypton venting was illegal.

From July 24-27, 1984, during the reactor head lift, which was delayed to brake failure on the polar crane, GPU vented radioactive gasses into the environment.

On September 25, 1989, two cleanup workers received radiation exposures while handling a "small piece of reactor core debris'' in the decontamination area.

After ten years of defueling activities, 5,000 TMI workers had received "measurable doses" of radiation exposure. The NRC staff should reconsider the placement and value of the terms "temporary" and "fugitive'', and rethink the adverse affects of "air quality" on workers. (**CL-02/50**)

Response: *Table 1-1 of this Supplement lists activities at facilities that have been permanently shutdown by a major accident as being out of scope. Venting of radioactive gas related to a serious accident or accidental handling of core debris are activities that would not occur at a facility that is undergoing decommissioning. The term "fugitive dust" refers to particles that are resuspended from surfaces, such as the ground as a result of wind or mechanical action. The term does not imply contamination. Construction activities of any sort have the potential to impact air quality by releasing fugitive dust. As a result, mitigation measures have been developed and are routinely used to control fugitive dust at construction sites. When used properly, fugitive dust mitigation measures are effective. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.4 Ecology

Comment: Section 4.3.5, Page 4-19, 1st paragraph - This conclusion would result in site-specific analyses for the use of areas beyond the previously disturbed areas if a potential to impact the aquatic environment exists. The vagueness of the condition "potential to impact" could result in a site-specific analysis for any potential no matter how remotely possible. The NRC should consider rewording the condition to say ‘there is expected to be or likely to be an impact" Also on the previous page (Page 4-18 last paragraph in Section 4.3.5.2,) it appears that a site-specific assessment would be required merely if the aquatic environment has not been characterized. NRC should clarify that a site-specific EIS is not necessary just because the lack aquatic environment characterization, but rather, if an area beyond the previously disturbed area is to be used and no associated characterization of the aquatic environment, if applicable, exists, then such a characterization should be conducted. Then as stated above, if there is expected to be or likely to be an impact to the aquatic environment, then a site-specific

analysis should be conducted. (**CL-05/14**)

Comment: Section 4.3.6, p. 4-23, last paragraph - This section should be reworded as in section 4.3.5.4, as modified by the comment above. **(CL-05/15)**

Comment: 4.3.5 Aquatic Ecology (4.3.5.4) pg. 4-19, 1st para., last sentence. This conclusion would result in site-specific analyses for the use of areas beyond the previously disturbed areas if there is a potential to impact the aquatic environment. The vagueness of the condition "potential to impact" could result in a site-specific analysis for any potential no matter how remotely possible. The NRC should consider rewording the condition to say "there is expected to be or likely to be an impact." Also on the previous page (pg. 4-18 last para. in Section 4.3.5.2,) it appears that a site-specific assessment would be required merely if the aquatic environment has not been characterized. NRC should clarify that a site-specific EIS is not necessary just because the lack of environment characterization, but rather, if an area beyond the previously disturbed area is to be used and no associated characterization of the aquatic environment, if applicable, exists, then such a characterization should be conducted. Then, as stated above, if there is expected to be or likely to be an impact to the aquatic environment, then a site-specific analysis should be conducted. (**CL-04/4**)

Comment: 4.3.6 Terrestrial Ecology (4.3.6.4), pg. 4-23, last para. in Section 4.3.6.4, last sentence. This should be reworded to be the same as Section 4.3.5.4 as modified in the comment above. (**CL-04/5**)

Comment: Page 4-17, Section 4.3.5.2, Line 38 and page 4-18, Section 4.3.5.2, Lines 4 and 14. The term "previously disturbed" needs definition. (**CL-16/46**)

Comment: Page 4-18, Section 4.3.5.2, Lines 14-17. The Supplement should provide specific guidance on how to weigh the primary factors to be considered in evaluating the adverse impacts of decommissioning activities in "previously disturbed" areas. How much habitat can be disturbed before a site-specific analysis is required? How much time can have passed since the initial disturbance? How is a licensee to evaluate the successional patterns of the aquatic communities? (**CL-16/47**)

Comment: Page 4-21, Section 4.3.6.2, Lines 15-17. The Supplement should provide specific guidance on how to weigh the primary factors to be considered in evaluating the adverse impacts of decommissioning activities in "previously disturbed" areas. How much habitat can be disturbed before a site-specific analysis is required? How much time can have passed since the initial disturbance? How is a licensee to evaluate the successional patterns of the native communities? (**CL-16/53**)

Comment: Page 4-19, Section 4.3.5.4, Lines 4-6. This subsection appears to define a "previously disturbed area" as "within the security fences or surrounding paved, graveled, or otherwise developed areas without removal of near-shore or in-water structures." Does this definition also apply to land use activities on page 4-6, Section 4.3.1.2, Lines 15-16? Does the

definition mean that a licensee who plans to remove near-shore or in-water structures in "previously disturbed areas" must perform a site-specific analysis of the potential aquatic ecology impacts? (**CL-16/49**)

Comment: Page 4-19, Section 4.3.5.2, Lines 8-11. How is "previous" defined? What is the relationship between these "previous ecological surveys that indicate a low probability of adversely affecting ecological resources" and the aquatic environment characterizations referred to on Page 4-18, Lines 17-23? This subsection suggests that the aquatic ecology impacts of decommissioning activities conducted in areas that were not "previously disturbed" will be SMALL if a previous survey has demonstrated a low probability of adverse effects on the ecosystem, while Section 4.3.4.2 suggests that the aquatic ecology impacts of decommissioning activities in such areas will be SMALL if a characterization has demonstrated the possibility of some adverse effects to "sensitive resources," but the facility will manage those resources for their protection during decommissioning activities. (**CL-16/50**)

Comment: Page 4-19, Section 4.3.5.2, Lines 11-16. The Supplement should define more precisely the circumstances under which a site-specific analysis of potential aquatic ecology impacts in previously undisturbed areas is required. How is the licensee to determine whether an activity has the potential to impact the environment? How should the magnitude of potential impacts be determined? Also, can a licensee avoid doing a site-specific analysis by implementing a protection plan to protect the aquatic environment? (**CL-16/51**)

Comment: Page 4-21, Section 4.3.6.2, Lines 1, 15 and 24. The term "previously disturbed" should be defined or examples provided. (**CL-16/52**)

Comment: Page 4-22, Section 4.3.6.2, Line 43 and Page 4-23, Section 4.3.6.2, Lines 1-5. The Supplement should better define or provide examples of circumstances under which a site-specific analysis of potential terrestrial ecology impacts in previously undisturbed areas is required. What constitutes a "potential of adverse impact to important terrestrial resources"? What is an "important" terrestrial resource? The document should provide criteria by which a licensee can determine whether an activity has this "potential," as opposed to merely a "low probability of adversely affecting ecological resources." The Supplement should also clarify whether a licensee can avoid doing a site-specific analysis by implementing a protection plan to protect the terrestrial environment. (**CL-16/60**)

Comment: Page 4-21, Section 4.3.6.2, Lines 25-29. The document states that the potential impact of disturbing areas beyond the original construction area is SMALL and can be characterized generically if "the terrestrial environment has been characterized." Moreover, a site-specific analysis is needed if "decommissioning activities occur in terrestrial environments

that have not been characterized." What must this characterization consist of, and when/how recently must it have been performed, to allow a licensee to conclude that it is sufficient and can properly support the conclusion that potential impacts are SMALL? (**CL-16/55**)

Comment: Page 4-22, Section 4.3.6.4, Lines 37-39. This subsection appears to define a "previously disturbed area" as "within the security fences or surrounding paved, graveled, or otherwise developed areas." How does this definition relate to the definition provided on Page 4-6, Section 4.3.1.2, lines 15-16? (**CL-16/58**)

Comment: Page 4-22, Section 4.3.6.4, Lines 40-43. This subsection suggests that the terrestrial ecology impacts of decommissioning activities conducted in areas that were not previously disturbed will be SMALL if a "previous" survey has demonstrated a low probability of adverse effects on the ecosystem. How recent must the "previous" survey have been? (**CL-16/59**)

Comment: My question is with regard to the site-specific issues. One of the site-specific issues is threatened, I'm sorry, aquatic and terrestrial ecology. And it says, the rationale, activities occurring beyond previously disturbed areas. And I'm wondering what the definition of a previously disturbed area is. Is there a time frame, or how that is defined? (**CH-B/1**)

Response: *Section 4.3.5 Aquatic Ecology, and Section 4.3.6, Terrestrial Ecology, have been extensively revised to address the above comments and the concept of "previously disturbed land" no longer is the criteria for initiating a site-specific analysis. The concept of relying on a previous ecological survey and an environment protection plan to determine whether a site-specific analysis is needed has also been eliminated.*

Comment: 4.3.5 Aquatic Ecology (4.3.5.2) pg. 4-17, 1st para. in Section 4.3.5.2, 4th sentence, "Aquatic environment s" should be corrected. (**CL-04/18**)

Response: *Section 4.3.5.2 was changed to eliminate the typographical error*.

Comment: Page 4-16, Section 4.3.5, Lines 25-29. This section's discussion of impacts to aquatic resources following plant shutdown seems to contradict the example given on page 1-5, lines 6-7, of plant discharges post-shutdown being outside the scope of this document. Similarly, the discussion at Page 4-19, Section 4.3.6, Lines 26-29 seems to contradict page 1-5.

Note also the comment above on the page 1-5 language. (**CL-16/45**)

Response: *Section 4.3.5 was changed to eliminate the contradiction.*

Comment: Page 4-18, Section 4.3.5.2, Lines 17-23. The Supplement states that the potential impact of disturbing areas beyond the original construction area is SMALL and can be characterized generically if "the aquatic environment has been characterized," and that a site-specific analysis is needed if "decommissioning activities occur in aquatic environments have not been characterized." What must this characterization consist of, and when and how recently must it have been performed, to allow a licensee to conclude that it is sufficient and can properly support the conclusion that potential impacts are SMALL? (**CL-16/48**)

Response: *Section 4.3.5, Aquatic Ecology, has been revised to eliminate the use of an environmental characterization to determine whether a site-specific analysis needs to be performed.*

Comment: Page 4-21, Section 4.3.6.2, Lines 23-25. What is a "significant" terrestrial resource? What does "potentially" affected mean? These terms need to be defined or examples provided so that licensees understand when they are required to perform a site-specific analysis. (**CL-16/54**)

Response: *Section 4.3.6.2 has been extensively revised and the phrase "significant terrestial resource" is not used in this section in the Final Supplement. The comment is no longer relevant. The comment did not provide new information relevant to this supplement and will not be evaluated further. The comment did not result in a change to the Supplement*.

Comment: Pages 4-21 to 4-22, Section 4.3.6.3. The document assumes that "[i]n most cases, the amount of land required to support the decommissioning process is relatively small and is normally a very small portion of the overall plant site." It also states that "licensees typically anticipate utilizing an area of between 0.4 ha (1 ac) to approximately 10.5 ha (26 ac) to support the decommissioning process." EPA assumes this means that a licensee must perform a site-specific analysis of impacts if the terrestrial ecology impacts of decommissioning activities may or will be greater than 10.5 ha (26 ac). If this assumption is incorrect, when is a site-specific analysis required and why? (**CL-16/56**)

Response: *The estimates of the typical area used to support decommissioning are based on the decommissioning experience to date. They are not criteria. The licensee must evaluate impacts resulting from decommissioning activities against previously issued environmental assessments (10 CFR 50.82(a)(b)(ii)). If the evaluation determines that the impacts are greater than previously assessed then the impact is not SMALL and the impact is outside the envelope*

established by this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Page 4-22, Section 4.3.6.3, Lines 27-29. The document assumes that the "activity of rubblization of construction material should not have significant nonradiological impacts beyond other decommissioning activities except for potential short-term noise and dust effects." However, on Page 4-12, the document states that rubblization may affect groundwater pH and thereby "affect the transport properties of radioactive and nonradioactive chemicals in the subsurface." Any radioactive or nonradioactive chemicals in the subsurface that are mobilized as a result of concrete leaching from rubblized material could have an adverse effect on the terrestrial ecology of a facility. For this reason, EPA recommends that the Supplement require a site-specific analysis of all of the potential environmental impacts of rubblization, both nonradiological and radiological. (**CL-16/57**)

Response: *The staff, based on the available literature and experience has determined that the impacts associated with concrete leaching from subsurface burial of uncontaminated demolition debris are SMALL, localized and can be evaluated generically. Evaluation of the long-term radiological aspects of rubblization (or onsite disposal of slightly contaminated material) would require a site specific analysis and would be addressed at the time the LTP is submitted. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: (4.3.6.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS: Conclusion - Terrestrial Ecological Resources: The NRC staff aptly stated,"...the magnitude, (i.e., SMALL, MODERATE, LARGE) of potential impacts will be determined through a site-specific study ..." These flexible barometers should be applied to all the above mentioned Conclusions. (**CL-02/53**)

Response: *The NRC established an envelope of environmental impacts resulting from decommissioning activities, identified those activities that can be bounded by a generic evaluation, and identified those that require a site-specific analysis. The NRC concentrated the environmental analysis on those activities with the greatest likelihood of having an environmental impact. The staff determined for onsite terrestrial issues, that the impacts of decommissioning activities are SMALL and the analysis need not be site-specific analysis. For those impacts that have been determined to be generic, a licensee is required to evaluate impacts resulting from decommissioning activities against this Supplement or previously issued environmental assessments (10 CFR 50.82 (a)(6)(ii). If the evaluation determines that the impacts are greater than previously assessed, then a site-specific analysis is required. The comment did not provide new information relevant to this Supplement and will not be evaluated*

further. The comment did not result in a change to the Supplement.

Comment: Regarding aquatic ecology p.4-16, as touched on earlier, the environmental impact statements originally written for the plants were often very poor, and did not mention that the discharge water would be radioactively contaminated nor that sediment would be contaminated for miles etc. (**CL-20/36**)

Response: *The original Environmental Impact Statements for power reactors acknowledged that there would be routine releases of radionuclides to the aquatic environment that would be controlled to meet regulatory requirements. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Other aquatic environmental impacts also merit site-specific review. (**CL-11/5**)

Response: *The comment can not be evaluated because it did not provide specific information. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: (4.3.5.2) ENVIRONMENTAL IMPACTS OF DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Aquatic Ecological Resources- Conclusions: The staff found that"....the impact to aquatic ecology for all decommissioning activities is generic and that the environmental impact for these activities is SMALL." Unfortunately, the staff biologists are unfamiliar with the unique water chemistry of the Susquehanna River and historic infestations that have afflicted Three Mile Island. In February 1986, one celled organisms believed to be fungus, bacteria and algae-like creatures were discovered. These creatures obscured the view of the reactor core. And impeded the cleanup of Three Mile Island-2.

On June 23, 1999, Three Mile Island, trying to rid itself of clams, recently released too much of a potentially hazardous chemical into the Susquehanna River. State regulations allow TMI to release 0.3 parts per million of Clamtrol back into the Susquehanna River. For about an hour, the plant was releasing 10,500 gallons per minute containing twice the amount. (**CL-02/51**)

Response: *Table 1-1 of this Supplement lists activities at facilities that have been permanently shutdown by a major accident as out of scope. The microorganisms discussed in the comment were found inside the reactor vessel, and were not a result of an impact on the Susquehanna*

River. The operating unit, TMI-1, rather than TMI-2 was involved in the release of Clamtrol to control clams. Discharge of chemicals to control molluscs occurs at operating facilities and is regulated by the NPDES permit issued by the state or EPA. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: It is a proven fact - proven by the old Atomic Energy Commission and its contractors, - that migratory birds become contaminated eating seeds, drinking water and so on at radioactively contaminated sites, wetlands areas etc. and the birds carry this contamination in their bodies worldwide. NRC, DOE and licensees violate the MBT by not protecting birds from such contamination, and by spewing radioactive noble gases out that impact passing birds. This is one of the reasons I suggest that netting or similar should be placed over the sites in question, fine wire mesh set at an angle that can have leaves and other debris hosed off it, it must be small enough to keep birds out down to the size of hummingbirds. Enclosed, such an obscene site poses slightly less of a threat to birds and other wildlife, the utilities can pay for it all, it can come out the salaries of the top management and company owners. And on the endangered bird subject, let me address the Migratory Bird Treaty Act of 1918 - (p.4-20). (**CL-20/40**)

Response: *Licensees are required to take measures necessary to control the spread of contamination through the animal pathway. Studies to date have not shown that the spread of contamination by this route is in any way significant, but rather is very minor. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: (4.3.1.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; On site/Off site Land Use - Conclusions:

The GEIS stated, "It is rare for decommissioning activities to affect off-site land use ..." This statement fails to recognize that most nuclear generating stations are located in close proximity to substantial water resources. The Susquehanna Steam Electric Station, Three Mile Island and Peach Bottom are located on or adjacent to the Susquehanna River which feeds the most productive estuary in America, i.e., the Chesapeake Bay. (**CL-02/45**)

Response: *Table F-2 identifies each of the licensed nuclear power plants and the cooling water source. The comment cannot be evaluated because it did not provide specific information. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Draft GEIS does not adequately consider the effects on aquatic ecology caused by an accidental, radioactive release. **(CL-11/4)**

Comment: NRC saying that it has not established standards to biota other than humans on the basis that limits established (by the aforementioned) for the public would provide adequate protection for other species is outrageous and contrary to what has been established for decades. (**CL-20/9**)

Comment: When thinking about exposure to plants and animals and fish, one needs to take the effects to an infant and to a child in the womb to better approximate the effects to wildlife, the smaller the non-human entity (e.g. a bird, a frog) the child in utero down to embryonic level would be appropriate. We all know what happens when an embryo is exposed - namely death or severe damage. The same happens to birds eggs. (**CL-20/10**)

Response: *The NRC established standards for radiological exposures to humans on the basis that limits established for the exposed members of the public would provide adequate protection for other species. No standards were established for radiological exposure to biota other than humans. The validity of the assumption that radiation guidelines, which are protective of the public, would also provide adequate protection to plants and animals has been upheld by national and international bodies that have examined the issue, including the National Council on Radiation Protection and Measurement (NCRP Report No. 109, Effects of Ionizing Radiation on Aquatic Organisms, 1991) and the International Atomic Energy Agency (IAEA Technical Report Series No. 332, Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards, 1992). Both of those studies were conducted in part to evaluate the original assumption presented in 1977 by the International Commission on Radiological Protection (ICRP Publication 26, 1977). In all of these cases, it has been emphasized that such radiation levels may adversely affect non-human species, but effects at the population level are not detectable. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Removal of intake/outfall structures may be the most beneficial action to the aquatic ecology, but it should not go forward without site-specific study of the environmental impacts. (**CL-11/8**)

Response: *The removal of the intake/outfall structures and other SSCs after operation of the facility is discontinued is not expected to detectably change or destabilize the aquatic environment. The removal process is expected to be conducted in a manner and at a time that will have minimal impact to the aquatic environment. In addition, it is anticipated that best management practices would be employed and the necessary permits obtained. All impacts would be, at most, a short-term impact. Therefore, the staff concluded that the impact to the aquatic environment for these decommissioning activities is SMALL and no further mitigation is required. The comment did not provide new information relevant to this Supplement and will*

not be evaluated further. The comment did not result in a change to the Supplement.

Comment: The aquatic ecology issue should also be site-specific (**CL-20/38**)

Response: *The analysis in the Supplement shows that the impacts on aquatic ecology will not be detectable. Therefore, the staff concluded that the impact to the aquatic environmental to these decommissioning activities is SMALL. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.5 Threatened and Endangered Species

Comment: 4.3.7 Threatened and Endangered Species (4.3.7.4), pg. 4-25, last para., last sentence. This conclusion indicates that the NRC will meet its responsibilities on a site-specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees. (**CL-04/6**)

Response: *The responsibilities under ESA will be met through interactions among the licensee, the NRC, and the appropriate resource agency either the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS). Information required of the licensee will likely depend on the activity and the species potentially present. This process is described in Section 1.5. The staff has determined that it will conduct informal consultations after the licensee announces permanent cessation of operations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 4-23, Section 4.3.7, Lines 10-12. The supplement should elaborate on the basis for the statement that "the potential impacts of nuclear power facility decommissioning efforts on threatened or endangered species will normally be no greater and likely less than the effects of plant operations." **(CL-16/61)**

Response: *There are one or more threatened and endangered species in the general vicinity of virtually all licensed commercial nuclear facilities. Very few of these facilities have had documented adverse impacts on the local threatened and endangered species, and in those rare instances when there is an effect, the species that are affected are almost all aquatic species. An operating reactor can affect threatened or endangered aquatic species via water intake through the cooling system resulting in impingement or entrainment, through the heated discharge from the cooling system, or through the purposeful or inadvertent addition of chemicals or contaminants to the cooling water stream. When the plant is shut down for decommissioning the reactor cooling system is shut down, and therefore the impact on aquatic environment is much lower than the impacts of an operating reactor. Therefore, the potential*

effects on the threatened and endangered species will likely be less during decommissioning than during operations. For terrestrial species, the most common potential impacts from operating plants are due to transmission line rights-of-way maintenance activities. Most transmission lines (beyond the switchyard) are expected to remain energized even after a commercial nuclear power facility ceases operation and the right-of-way maintenance activities are expected to continue. Therefore, the potential impacts of decommissioning on terrestrial species will normally be no greater than the potential impacts of plant operation. Section 4.3.7 was revised.

Comment: Page 4-25, Section 4.3.7.2, Lines 3-7. The Supplement should provide guidance on determining the amount of habitat that can be disturbed beyond previously disturbed areas. (**CL-16/62**)

Response: *The evaluation of impacts on threatened and endangered species will be conducted on a site-specific basis. Guidance on the amount of habitat disturbed is irrelevant. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.6 Radiological

Comment: Section 3.1.4 Formation and Location of Radioactive Contamination and Activation in an Operating Plant, pg. 3-15. This description should include the activation of corrosion products as a contributor to radioactive contamination. (**CL-04/16**)

Response: *Radioactive corrosion products are the result of activation and can be considered activation products. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 3.1.4, Pg 3-15, last paragraph - clarify whether the last sentence is referring to radiation exposure during decommissioning or operation. In context, the inference is that the activation products provide the main source of radiation exposure to plant personnel in an operating plant, but typically contaminated materials provide more exposure to plant personnel during operation. (**CL-05/8**)

Response: *The sentence refers to the decommissioning process. Section 3.1.4 was revised for clarification.*

Comment: It also is not clear how, why, and how many plants were selected for Tables G-11 and G-12. Additionally, the first sentence of the fourth paragraph should indicate that the data

is estimated worker dose for major types of decommissioning activities. Actual data appeared to be listed for only one plant in the tables. (**CL-09/41**)

Comment: Section G.2.2, p G-21 – while the conclusion appears correct, it is strange that information was only available for a small sample of facilities. This data is reported to the NRC annually by licensees. (**CL-09/45**)

Comment: Table G-15 – the basis of this table should be better explained. How were the plants selected? What years are covered? (**CL-09/46**)

Comment: Table G-16 – how were the plants listed in this table selected? It appears to be a strange non-representative sample. (**CL-09/47**)

Response: *Data were used to be representative of operating plants around the country including an operating BWR and two PWRs, two different vendors, and two different location types (coastal and interior). Two shutdown power reactor facilities were also included. Data on permanently shutdown plants were used as provided by the licensee or found in references. Tables G-11 and G-12 have been revised.*

Comment: In Appendix G, I was very surprised to read of excess malignancies that have been experienced at doses of 10 REM. This is contrary to the health physics and radiological health handbook and other material that I've read over the more than 25 years I've spent in this industry. And I think that needs to be addressed and reevaluated. (**CH-D/11**)

Response: *The statement made in Appendix G related to the health effects of doses of approximately 10 rem is correct and is taken from the BEIR V report. However, the commentor's statement that the excess malignancies were "experienced" is incorrect. They were calculated based on the extrapolation of an assumed linear relationship between dose and malignancies. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: 4.3.8 Radiological (4.3.8.3), pg. 4-29, 4th full para. last sentence. Maine Yankee agrees that it is not necessary to update the estimates for exposure found in the 1988 GEIS. (**CL-04/7**)

Response: *The staff agrees with this comment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 3.1.4, page 3-15, does not reflect that alpha-emitting Transuranic radioactivity is significant at some plants. This radioactivity is formed after failed fuel releases small amounts of Uranium (as well as fission products) to the reactor coolant. Subsequent activation of the Uranium results in the formation of Transuranic isotopes of Plutonium, Americium and Curium, most of which decay with alpha radiations. For the plants where this issue is significant, the production of airborne alpha radioactivity during decommissioning activities must be carefully controlled to avoid radiation exposure from inhaled alpha radioactivity. (**CL-15/6**)

Response: *The NRC staff acknowledge that failed fuel can result in alpha contamination within the facility. However, the standards for protection of workers found in 10 CFR Part 20, "Standards for Protection Against Radiation" provide adequate protection for workers. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 3-16, Section 3.1.4, Line 1. This line notes that spent fuel comprises the largest amount of radioactive material at a shutdown facility. It would be informative to include here a summary of or reference to the data in Appendix G on the amount of radioactive material at various types of power plants. (**CL-16/20**)

Response: *The amount of radioactive material varies between facilities and is dependent on factors such as the type of facility, the size of the facility, the length of time the facility is operated and other variables. Because of the number of factors affecting the amount of radioactive material, the staff does not believe this information will be useful. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: FOR THE NRC TO HAVE USED DATA FOR SOUTHERN COMPANY'S PLANT HATCH IS SICKENING - WHEN HATCH HAD THEIR DISASTROUS SPENT FUEL POOL SPILL, DID ANYONE ADD THE EXTRA DOSES AND CONTAMINATION IN ? THIS IS THE SAME HATCH WITH OVER 1200 WORKER CONTAMINATION EVENTS IN ONE YEAR. (**CL-20/96**)

Response: *The comment cannot be evaluated because it did not provide specific information. The only place in the document where occupational dose information from the Hatch plant was included was in Table G-9, which summarized occupational dose as a total at all light water reactors for a given year. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Pg. G-21, Table G-15, Summary of Effluent Releases Comparison of Operating

Facilities and Decommissioning Facilities. The values associated with the maximum, minimum and average gaseous effluents for the Decommissioning Reactors do not add up. The Fission and Activation Gases for gaseous effluents are incorrectly all the same for the maximum, minimum and average in each category (PWR & BWR). It appears that the minimum category for Decommissioning PWR's is Maine Yankee. If so, the minimum value for Fission and Activation Gasses for gaseous effluents should be "none detected." Making this correction appears to make the table add up assuming a PWR population of two. (**CL-04/12**)

Response: *The average, maximum, and minimum values for this radionuclide category are identical because the licensees of only one reactor of each type reported emissions. Others either did not report or were reported as below detection limits and therefore could not be included in the calculation. A footnote was added to Table G.15 for clarification.*

Comment: Pg. G-22, Table G-16, Summary of Public Doses from Operating and Decommissioning Facilities. This table is not well formatted and difficult to interpret. The table mixes the collective dose in person-rem with the individual dose in mrem. The years of concern are assorted. We suggest that the table be simplified and either further discussed in Section G.2.2. Text or eliminated. The following is Maine Yankee's data on individual public doses from Maine Yankee's effluents for 1998, 1999 & 2000. (chart followed). (**CL-04/13**)

Response: *Table G-16 was deleted and general information was added to the text.*

Comment: In order to ensure that the radiological aspects of this activity are assessed consistently, NEI recommends that standard dose modeling assumptions be documented directly through the Q&A process associated with the NRC guidance consolidation project. (**CL-05/2**)

Response: *Dose modeling assumptions are not within the scope of this Supplement. Information related to dose modeling assumptions, that are currently in NUREG-1727, will be documented with the NRC guidance consolidations project. In addition, and to the extent possible, the results of NEI's quality and assurance effort will also be included in the consolidation project. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Table 4-1 provides estimates of cumulative occupational dose for decommissioning reactors (comparisons of the 1988 GEIS to new estimates compiled for draft Supplement 1). In order to reflect the conclusions of Section 4.3.8, it is recommended that a note be added to Table 4-1 to clarify that these estimates of cumulative occupational dose are generic and are not intended to be site-specific limits. (**CL-06/1**)

Response: *While these are not site-specific limits, this document is providing an envelope that licensees can use in the future to compare impacts from their decommissioning activities. If the licensee is within the values listed for cumulative occupational dose in this Supplement then the impact is expected to be SMALL. As stated in Section 1.5, licensees must make sure they are within the envelope or must perform a site-specific analysis. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: After the meeting in Atlanta, we are increasingly concerned about the safety of the workers that will be involved in decommissioning. Will a more specific analysis of worker effects be dealt with in the final EIS or is there a separate report that will research health impacts? Georgians for Clean Energy requests that all worker exposures that have occurred at nuclear power plants that are currently being decommissioned be made available to the public and listed in the final GEIS. (**CL-08/25**)

Response: *NRC licensees, including permanently shutdown reactors, are required to provide reports as specified in 10 CFR Part 20, Subpart M. These reports are publicly available. The potential health impacts to workers are discussed in Section 4.3.8 and Appendix G of the Supplement. A more specific analysis of worker health impacts will not be provided in Section 4.3.8. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section G.1.1.4.1, Pg. G-5 – delete or revise fourth bullet. Conditions typically encountered in exposures from normal facility operations result in external dose, rather than internal dose. Internal deposition of particles can occur, but this is less common than external dose. Also, clarify last bullet. (**CL-09/37**)

Response: *Occupational doses are typically from external exposure; however, environmental exposures to members of the public would be a result of an internal dose largely from radionuclide intake. Section G.1.1.4.1 was revised and the last bullet referenced above has been deleted.*

Comment: Section G 1.1.4.3, p G-8, lines 13-22 – this somewhat explains selection of the occupational nominal probability coefficient in Table G-4 for fatal cancers, but does not explain selection of hereditary coefficient. (**CL-09/38**)

Response: *Section G.1.1.4.3 was revised and provides a source for the hereditary coefficient used in Table G-4.*

Comment: Table G-6, p G-11 – the table per its title covers dose limits for an individual member of the public under 10 CFR 20. The ALARA air emission dose constraint listed in the

table is not a 10 CFR 20 limit. (**CL-09/39**)

Response: *Table G-6 was revised and a footnote added stating that the value is not a 10 CFR Part 20 dose limit but is given to ensure consistency with air emission standards for Federal facilities in 40 CFR Part 61.*

Comment: Section G.2.1, Pg. G-13, lines 26-45 – the conclusion in the first sentence of the third paragraph is misleading. The main reason that the occupational doses at reactors undergoing decommissioning are a small fraction of dose accumulated at operating facilities, as shown in Table G-9, is that there are many more operating plants than decommissioning plants. The average for decommissioning plants shown in the table is less than the operating plant, but not only a small fraction. (**CL-09/40**)

Comment: Table G-12, Page G-17 – the two numbers listed for San Onofre should be explained. (**CL-09/42**)

Response: *Table G-12 is revised. The estimate of Bequerel's has been corrected and the extraneous personnel exposure estimate was removed.*

Comment: Table G-14 it appears strange that only 26-34 operating plants were listed as reporting dose from gaseous effluents each year, since all plants are required to report. Also, the selection of the years 1985-1987 appears strange for an update report. (**CL-09/44**)

Response: *The information cited was taken from a published report, and is limited to information contained in that report. More recent information from operating facilities is also included in Appendix G. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 3-10, Section 3.1.3, Lines 34-37. The supplement states that "the amount of liquid and gaseous radioactive waste generated is usually lower for decommissioning plants." Must the plant's waste remain within the limits established during operations to be bounded by this GEIS? (**CL-16/18**)

Response: *Liquid and gaseous waste releases must meet the requirements in 10 CFR Part 20, Appendix B, Table 2. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 4.3.8.2, Potential Radiological Impacts from Decommissioning Activities, fails to adequately consider the potential for decommissioning activities to spread or hide radiological contamination. The presumption is that accidents or mistakes will not take place, when experience at decommissioning plants shows that they do. The report fails to draw from this experience. For example, early in the decommissioning of one site and prior to complete radiological survey, a trench was dug across an impacted area to lay an electrical cable to power equipment no longer serviced through the plant. The trench was left open to the weather for a few days, then backfilled with loose material and thus could permit rainwater to carry contamination deeper and spread it further. Individually, such activities may not provide what are termed significant doses, but they have the potential to add incremental to the dose of future site occupants and overall risk and may violate ALARA principles. The potential environmental impacts of such activities should be evaluated. Incidents have occurred in which workers left the site with contaminated clothing and in which train car loads of class A waste were permitted to languish for weeks on a siding in a residential community. Although radiation levels in these instances were extremely low, the potential for greater exposures existed. Such scenarios should be considered, worst case, in preparing the GEIS. (**CL-13/14**)

Response: *Decommissioning experience related to characterization of radiological contamination and decontamination was obtained from many of the permanently shutdown reactors currently in decommissioning. This experience is summarized in Section 4.3.8 and Appendix G of the Supplement. Potential radiological accidents for all permanently shutdown plants were characterized and presented in Section 4.3.9 and Appendix I of the Supplement. The scenarios considered in Appendix I are considered appropriate for evaluating the environmental impacts from decommissioning. Furthermore, accidental releases of radioactive contamination are investigated on a site-specific basis. Such investigations focus on the potential and actual exposure of workers and the public. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 4-28, Section 4.3.8.3. This discussion in this section indicates that public and occupational dose comparisons were made with the facility's EIS for normal operations and with the 1988 GEIS. This statement appears to contradict earlier statements about the assessment of impacts being based on NRC regulatory limits for worker protection. Please clarify how the comparisons were made. (**CL-16/64**)

Response: *The comparisons of public and occupational doses were made to identify whether the envelope for radiological impacts to workers and the public needs to be adjusted from the 1988 GEIS. The level of significance was determined using the regulatory limits in 10 CFR Part 20, "Standards for Protection Against Radiation." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 4-29, Section 4.3.8.3. Line 14 indicates that the data used in the evaluation are those presented in Appendix G. Appendix G uses units of collective dose equivalent; however, as also outlined in the appendix, the radiation protection standards are in units of annual individual dose. The Supplement should use consistent units and provide data on population densities for nuclear power plants.

Appendix G.2 (page G-19) provides the average public dose within a 50 miles radius of a facility. The Supplement should clarify if facilities which fall outside this analysis (e.g., have denser populations yielding more person-rem than indicated in the appendix) must complete a site-specific analysis. (**CL-16/65**)

Response: *Appendix G provides a general discussion on radiation protection to assist the reader in understanding the basis for the analysis and conclusions in Chapter 4. The information in Appendix G is abstracted from a variety of published documents making consistency in units difficult. The staff chose to report the units as given in the referenced document.*

The discussion in 4.3.8.3, Evaluation, addresses public dose and states that both the average individual dose and the collective doses attributable to decommissioning activities are not substantially different from those experienced by the public during operation and are much lower than from natural background radiation. The NRC regulations do not establish collective dose limits to the population surrounding a nuclear plant but rather address limits to individual dose. The individual dose limits were established to assure that the radiological impact to the public from the nuclear facility would be SMALL. Even if the anticipated collective public dose attributable to a specific facility decommissioning exceeded the collective dose values given in Table G-13 of the Supplement no site-specific analysis would be required. A site specific assessment would not be required for decommissioning activities as long as the highest dose to an individual member of the public from sources under the licensee's does not exceed the limit in 10 CFR Part 20 of 1 mSv/yr (0.1 rem/yr) and effluent concentrations do not exceed the levels specified in 10 CFR Part 20,Appendix B, Table 2, at the unrestricted boundary. In addition, the dose from external sources in an unrestricted area should not exceed 0.02 mSv(0.002 rem) in any given hour or 0.5 mSv (0.05 rem) in 1 year. If these limits are not exceeded, the radiological impacts, regardless of the collective dose to the population within the 50 mile radius, are inconsequential. The comment did not provide new information related to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Page 4-31, Section 4.3.8.4. While the overall worker health impact is SMALL,

Appendix G shows data from some decommissioning facilities where worker exposure is higher during decommissioning than during operations. The Supplement should clarify how these

higher exposure levels compare with the radiation protection standards. Also, this section should clarify whether an analysis was done of the normal wastewater streams produced during decommissioning that are contaminated with radiation. (**CL-16/66**)

Response: *Annual collective doses at decommissioning facilities vary widely with time depending on the nature of the activities taking place during the year and the number of workers involved in those activities. Similar variations can also occur at operating facilities during periods of major maintenance. Although the annual average collective dose for decommissioning facilities is generally lower over the long-term than during active operations at the same facility, the maximum collective dose during any given year may be comparable to, or higher than, the annual dose during a typical year of operation. No individual workers at decommissioning (or operating) facilities have exceeded the regulatory dose limit of 0.05 Sv/y (5 rem/y) since the late 1980s.*

Decommissioning activities are typically planned to minimize generation of liquid waste, which is ultimately solidified and managed with other solid radioactive waste. Because the facility cooling systems are shut down during decommissioning, these activities would not generate large volumes of liquid effluents to which members of the public might be exposed. Nevertheless the licensee is required to submit an effluent release report to the NRC on an annual basis that summarizes radioactive releases over the previous 12 months. The procedures and results of the monitoring programs are inspected and reviewed by the NRC staff to ensure requirements are being met. The wastewater streams do contain measurable amounts of radiological contaminants, however they have consistently been within regulatory limits. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: On Page M-2 it says, under the glossary, under Background Radiation, that "the typically quoted United States average individual exposure from background radiation is 360 mrem per year." It may be typically quoted, but it is a blatant LIE. For example, typical background radiation in Georgia is 42 mrem year according to the state (which recently upped it a notch probably due to the radioactive fallout on the state from nuclear power plants and the Savannah River Nuclear Site on its borders.) (**CL-20/103**)

Response: *Background radiation from various sources differs depending on the location within the United States. The value quoted in this document is an average for the United States, including cosmic radiation, terrestrial sources, natural radon, and artificial exposures (largely for medical purposes). The value was taken from the National Council on Radiation Protection and Measurements (NCRP's) Report No. 94 issued December 30, 1987. The dose quoted for*

Georgia probably did not include the component from radon, which is the largest contributor overall. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: On Page 4-29 the NUREG (Section 4.3.8.3) concludes that it is not necessary to update estimates for collective dose due to decommissioning activities. This is an important conclusion that is supported by the current range in collective dose that decommissioning plants have experienced. Any change to this conclusion needs to be well supported by actual data and needs to be thoroughly studied to identify all potential impacts. (**CL-31/10**)

Response: *The staff agrees with this comment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Table 4-1 on page 4-30 is misleading. The totals given include 100 rem of transportation dose that is not tracked by the facility undergoing decommissioning. It also does not include dose incurred during construction of a Spent Fuel Pool Island or in support of a dry cask storage campaign. A footnote should be added explaining these differences. (**CL-31/11**)

Response: *Section 4.3.8 of the Supplement indicates that the estimates in the table do not represent dose estimates for the same activities. Some of the estimates include doses from transportation of radioactive material, while others do not. Table 4-1 only provides a comparison of occupational dose estimates. Section 4.3.17 provides information on transportation impacts from decommissioning.*

Comment: The Draft even says during licensing the applicants commit to implement ALARA programs. The combination of ICRP, NRC, NCRP, and ALARA standards is, and has been a recipe for premeditated murder and/or illness, genetic damage and great suffering as it is. (**CL-20/8**)

Comment: R.M. Sievert (after whom the unit the Sievert is named) pointed out that there was no level below which radiation did not cause damage, no threshold that must be exceeded for damage to occur, yet NRC says a threshold must be exceeded for effect to occur, I believe Sievert. The ICRP standard of 5 rem per year is based on a principle called risk/benefit that allows a one in five thousand chance of contracting cancer. In other words, the death or cancer risk is the workers and the publics', the benefits are the dollars flowing to the industry and the NRC (from the industry in return for NRC services and licenses etc.). (**CL-20/7**)

Comment: The exposure allowed by regulation is, in fact, slow death, and furthermore, worker doses can't always be trusted because of faulty measuring equipment, horror stories of workers being told not to wear their dosimeters periodically, and so on. The dose received also has a

different effect on each person depending on age, sex, current and past health status and many other factors, plus each organ is affected differently. (**CL-20/55**)

Comment: Regarding Occupational Dose and nuclear power plant exposure data (Page. G 12, etc.). The regulatory limits for exposure were not set based on medical reasons but were set in order to enable the industry to operate - that is historic FACT because what people are being exposed to is either not found in nature (i.e., it is man-made) or found in nature at far, far lower levels. (**CL-20/54**)

Comment: To add to these levels by deliberately ignoring the dangers of radiation exposure is wantonly criminal. Those who do so will go down in history as villains of the worst sort: smug, obtuse, shrivel-hearted, deceiving, opportunistic, self-serving, cowardly, corrupt people who really ought to know better. (**CL-33/4**)

Comment: Environmental and health risks from improper decommissioning are very high, particularly to neighboring communities. (**CL-45/2**)

Comment: Health problems in the community must be determined and taken into consideration when decommissioning plans are being established since continued exposure to radiation through routine decommissioning releases and the inadvertent release of hot particles can jeopardize the health and safety of the public. (**CL-50/10**)

Comment: The direct gamma radiation coming off the plants to the public is the equivalent of a continuous x-ray emanating from their midst. No x-ray is "negligible." (**CL-20/94**)

Comment: That no one asked to be exposed to ANY dose of radiation, and most people in surrounding communities don't even know they are being exposed, or if they know, they think they are being protected because they think there is a safe level of radiation. (**CL-20/98**)

Comment: There are no "acceptable levels" - the public does not accept any level of radioactive contamination - plutonium, cobalt-60, Strontium-90, etc. or tritium, radioactive iodine and so on and on - (**CL-20/105**)

Comment: Most of us also realize that the immune systems of every living thing on this planet – human systems included – are becoming intolerably stressed by mounting (and synergistically interacting) levels of pollution of all sorts. (**CL-33/3**)

Comment: You are insuring the further deterioration of health for innocent civilians and this planet. (**CL-34/2**)

Comment: Underlying these failures of the agency's responsibility for the facilities and activities that it had sanctioned by granting an operating license and through its regulatory actions and inactions is the failure of the NRC - and of EPA - to set radiation protection standards that recognize the great varieties of adverse effects of low-level radiation on human beings. (**CL-52/12**)

Comment: But it is also increasingly important to incorporate into radiation protection standards low-dose effects. (**CL-52/20**)

Comment: One problem here is that the only non-stochastic effects considered in the GIS—GEIS are those related to above threshold doses which cause such things as cataracts or other high dose morbidities. This is unacceptable. There are many morbidities which are associated with low dose radiation which do not rise to the level of effects on cataracts, such as the effect on the human immune system and many other non-cancer effects. This is missing from the generic statement. (**AT-F/6**)

Comment: Even the NRC admitted back in the late ‘70's that there was no safe level. (**CL-20/99**)

Response: *The NRC's primary mission is to protect the public health and safety, and the environment from the effects of radiation from nuclear reactors, materials, and waste facilities. The NRC's regulatory limits for radiological protection are set to protect workers and the public from the harmful health effects of radiation on humans. The limits are based on the recommendations of standards-setting organizations. Radiation standards reflect extensive scientific study by national and international organizations (International Commission on Radiological Protection [ICRP], National Council on Radiation Protection and Measurements [NCRP], and the National Academy of Sciences [NAS]) and are conservative to ensure that the public and workers at nuclear power plants are protected. The NRC radiation exposure standards are presented in 10 CFR Part 20, "Standards for Protection Against Radiation," and are based on the recommendations in ICRP 26 and 30. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: In addition to onsite worker doses, decommissioning exposure calculations must capture and include doses incurred by workers involved in offsite reactor decommissioning activities i.e. shipping, decontamination, smelting, recycling etc., of all radioactive materials and components. (**CL-50/16**)

Comment: The NRC must incorporate offsite contamination in all evaluations of environmental impacts. (**CL-25/8**)

Comment: I utterly oppose [that] NRC should incorporate offsite contamination into all evaluations of environmental impacts. (**CL-33/12**)

Comment: I ask that the NRC incorporate offsite contamination into all evaluations of environmental impacts. (**CL-26/9**)

Comment: The contamination of soil, land and property beyond the station boundary line must be included in the decommissioning analysis and plan. Offsite migration of radioactive materials has occurred through both deliberate and inadvertent removal of materials originally contaminated onsite (tools, concrete construction blocks, etc.). For example, concrete cinderblocks used to construct a shield wall at the Connecticut Yankee's Haddam Neck nuclear power station were inappropriately distributed to affected communities as construction materials for buildings including a children's daycare facility. We believe the Connecticut Yankee incident is not an isolated case. The scope of the current definition does not provide for the investigation, analysis and mitigation of radioactive materials, equipment and components originating from a nuclear facility that have been deliberately or inadvertently released to affected communities. (**CL-48/14**)

Comment: NRC ignores radiation offsite and permits utilities to ignore it in decommissioning planning. NIRS calls on the NRC to incorporate offsite contamination into all evaluations of environmental impacts. (**CL-48/41**)

Comment: One does not want radioactive and chemical particulate matter getting offsite if possible. (**CL-20/34**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC ignores radiation offsite. (**CL-26/7**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC permits utilities to ignore it [radiation offsite] in decommissioning planning. (**CL-26/8**)

Comment: I utterly oppose ignoring offsite radiation and permitting utilities to ignore it in decommission planning. (**CL-33/11**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC ignores radiation offsite and permits utilities to ignore it in decommissioning planning. NIRS calls on the NRC to

incorporate offsite contamination into all evaluations of environmental impacts. (**CL-43/6**)

Comment: The extent to which radioactive contamination levels that are permitted to be released from regulatory control for decommissioning would result in the release of radioactive materials routinely. (**CL-38/5**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow offsite radiation to be ignored, and permits utilities to ignore it in decommissioning planning. It is imperative to include offsite contamination into all aspects of decommissioning planning and evaluation of environmental impacts. (**CL-44/7**)

Comment: I am hopeful that you will act in the interest of the public, & listen to the concerns of all of the communities that will be affected by the by-products of nuclear energy. Offsite radiation is something that must not be ignored. (**CL-49/2**)

Comment: There are right now already elevated levels of some radioactive contaminants nearly 100 miles downstream of Plant Hatch and Plant Vogtle. (**AT-A/33**)

Response: *All nuclear power plants were reviewed and licensed with the expectation that there would be routine very low-level releases of radioactivity to the environment through airborne and liquid releases from the facility and that these releases would be detectable offsite. Gaseous and liquid releases to the environment must be monitored and meet the requirements of 10 CFR Part 20, Appendix B, Table 2. Therefore, contaminants may be present and detectable offsite, however the release limits have been designed and proven to be protective of the health and safety of the public and environment. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: As techniques of research and analysis in complex biological systems improves, it is becoming more apparent to thoughtful, careful scientists and regulators that it is imperative to include the impacts of low-level radiation exposures on all forms of living beings, not merely on humans. (**CL-52/19**)

Comment: Page 4-27, Section 4.3.8, lines 17-21. The Supplement should clarify the statement about the "relatively lower sensitivity of non-human species to radiation." Is this statement based on scientific studies or is the impact to non-humans not known? Why were decommissioning's radiological impacts on ecological receptors defined as outside the scope of the Supplement? (**CL-16/63**)

Response: *The effects of ionizing radiation on non-human biota have been studied since at least the 1940s. Radiological impacts on ecological receptors are not within the scope of this Supplement because the NRC does not maintain radiation protection guidelines for non-human organisms because they are assumed to be protected by the radiation protection standards for humans. The validity of the assumption that radiation guidelines, which are protective of the public, would also provide adequate protection to plants and animals has been upheld by national and international bodies that have examined the issue, including the National Council on Radiation Protection and Measurement (NCRP Report No. 109, Effects of Ionizing Radiation on Aquatic Organisms, 1991) and the International Atomic Energy Agency (IAEA Technical Report Series No. 332, Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards, 1992). In both of those studies, it was emphasized that non-human species may be adversely affected by such radiation levels, but effects at the population level are not detectable. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Contamination means: that some thing/someone etc., has been brought into contact with something that defiles or pollutes it etc., - go look the word up - NRC must stop redefining words and lying about their meaning. (**CL-20/106**)

Comment: The definition of CONTAMINATION is also a LIE, in that it states that something is contaminated if its in excess of "acceptable levels." (**CL-20/104**)

Response: *The definition for contamination used in the Supplement is "undesired radioactive material or residual radioactivity that is deposited on the surface of or inside structures, areas, objects or people in excess of acceptable levels (e.g., for a release of a site or facility for unrestricted use)." This word is defined in Appendix M for clarification as used in this Supplement and is generally accepted by radiation protection experts. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The radioactive material releases is not released in stringently controlled conditions, technical specifications are often violated, monitoring is only done at select locations and frequently monitors don't work. (**CL-20/91**)

Response: *The NRC sets limits on radiological effluents, requires monitoring of effluents and foodstuffs to ensure those limits are met, and has set dose limits to regulate the release of radioactive material from nuclear power facilities. The regulations are intentionally conservative and provide adequate protection for the public, including the most radiosensitive members of the population. All reactor licensees monitor their effluent and calculate offsite doses caused by radioactive liquid and gaseous effluents. These calculations are performed to demonstrate the*

licensee's compliance with its technical specifications and NRC regulations. Requirements for redundancy in monitoring as well as the monitoring of various pathways that could result in the release of radiation to the environment ensure that unmonitored and unplanned releases are avoided. The licensee's Offsite Dose Calculation Manual (ODCM) provides for collection and analysis of a variety of samples such as soil, water, plants, and animals. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: NRC ignores radiation exposures to children and other vulnerable members of the population and creates a fictitious highest exposed "critical group" based on unsubstantiated assumptions. (**CL-48/40**)

Comment: I am very concerned that children, who are much more susceptible to the effects of radiation, may not be being looked at in the Environmental Impact Statement. This is a very serious issue, & if left unaddressed, would not only be morally wrong, but could lead to a horrible name in history for the NRC, & possibly legal action. (**CL-49/1**)

Comment: I utterly oppose ignoring radiation exposures to children and other vulnerable members of the population and creating a fictitious highest exposed "critical group" based on unsubstantiated assumptions. (**CL-33/10**)

Comment: All decommissioning activities need to consider the impacts of radiation exposure to workers and the public. Radiation exposures to children and other vulnerable members of the population should be separately and realistically addressed with all pathways to exposure closely examined. Assumptions about off-site exposure should be substantiated with full peer-review from neutral parties, i.e. not employees of the nuclear utilities. The risk to public health cannot be minimized or discounted. (**CL-40/2**)

Comment: Affected populations are composed of many individuals who are not close to being that "standard man" in whom the NRC places so much faith. (**CL-52/13**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC ignores radiation exposures to children and other vulnerable members of the population and creates a fictitious highest exposed "critical group" based on unsubstantiated assumptions. (**CL-43/5**)

Comment: Using an adult male as the average member of the critical population for dose calculations in site release criteria does not establish effective cleanup standards. The adult male assumptions address workers during reactor operation; however when reactor sites are released for unrestricted use the "average member" of the critical population requires the inclusion of children since they bear the greatest burden of the effects of ionizing radiation as

described in the Biological Effects of Ionizing Radiation (BEIR) V report. (**CL-50/17**)

Response: *The NRC's primary mission is to protect the public health and safety, and the environment from the effects of radiation from nuclear reactors, materials, and waste facilities. The NRC's regulatory limits for radiological protection are set to protect workers and the public from the harmful health effects of radiation on humans. The limits are based on the recommendations of standards-setting organizations. Radiation standards reflect extensive scientific study by national and international organizations (the International Commission on Radiological Protection [ICRP], the National Council on Radiation Protection and Measurements [NCRP], and the National Academy of Sciences [NAS]) and are conservative to ensure that the public and workers at nuclear power plants are protected. The NRC radiation exposure standards are presented in 10 CFR Part 20, "Standards for Protection Against Radiation," and are based on the recommendations in ICRP 26 and 30. The assumptions used for the critical group are not fictitious or unsubstantiated. The "critical group" means the group of individuals reasonably expected to receive the highest exposure to residual radioactivity within the assumptions of a particular scenario. The average dose to a member of the critical group is represented by the average of the doses for all members of the critical group, which in turn is assumed to represent the most likely exposure situation. For example, when considering whether it is appropriate to "release" a building (allow people to work in the building without restrictions) that has been decontaminated, the critical group would be the group of regular employees that would work in the building. If radiation in the soil is the concern, then the scenario used to represent the maximally exposed individual is that of a resident farmer. The assumptions used for this scenario are "prudently conservative" and tend to overestimate the potential doses. The added sensitivity of certain members of the population, such as pregnant women, infants, and children, are accounted for in the analysis. However, the most sensitive member may not always be the member of the population that receives the highest dose. This is especially true if the most sensitive member (for example, an infant) does not participate in specific activities that may provide the greatest dose or if he/she does not eat specific foods that cause the greatest dose. These comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: ALARA is not a sufficient basis for judging proper methods. (**CL-10/11**)

Comment: NRC ignores radiation dangers after decommissioning is done and utility is relieved of liability. (**CL-48/39**)

Response: *The Commission has established a dose of 0.25 mSv (25 mrem) per year total effective dose equivalent to an average member of the critical group as an acceptable criterion for release of any site for unrestricted use. The licensee will be required to demonstrate that the site can meet this criterion before the license will be terminated for unrestricted use. In*

addition to the dose criteria, the regulations state that the licensee must show that residual radioactivity left on the site have been reduced to levels that are as low as is reasonably achievable (ALARA). The concept of ALARA means that doses must be reduced to the lowest possible level considering economic and societal factors. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: All sites should have audible (sirens) alarms that are triggered during decommissioning, and after decommissioning, when monitors exceed the EPA levels EPA allows, but reduced below what EPA allows to give an advance warning. Such audible alarm systems are absolutely vital also during the time radioactive spent fuel is still on the site, these alarms should be at various locations onsite, including next to the spent fuel pool and one above it, and next to an ISFSI/cask area and suspended on a wire or pole above it. The alarms should be audible miles of site via relay loudspeakers. (**CL-20/89**)

Response: *Requirements for emergency response at nuclear facilities are provided in 10 CFR Part 50 and their application to decommissioning facilities is stated. This Supplement does not (1) establish or revise regulations, (2) impose requirements, or (3) provide relief from requirements. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Clear methodologies should be established for the clean up of transuranics and hot particles. Yankee Rowe failed to include transuranic measurements in its LTP and currently Connecticut Yankee intends to avoid doing direct alpha measurements (and beta measurements) through less expensive surrogate measurements of easier-to-detect radionuclides...Surrogate measurements must not be allowed at sites where consistent ratios of radionuclides do not exist. (**CL-50/20**)

Response: *The purpose of this Supplement does not include establishing methodologies for decommissioning or measurement of radionuclides. The information that should be presented in the LTP is not included as part of this GEIS. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: DOESN'T NRC UNDERSTAND THAT ONE CANNOT DECONTAMINATE SOMETHING RADIOACTIVELY CONTAMINATED IN THE TRADITIONAL SENSE, UNLIKE WITH A CHEMICAL OR OTHER CONTAMINANT, WHATEVER IS DONE TO SOMETHING RADIOACTIVE DOES NOT CHANGE THE CHARACTER OF THE RADIATION, IT CONTINUES TO EMIT ITS DEADLY ALPHA, BETA, GAMMA, NEUTRON ETC. RADIATION THROUGH THE FULL RADIOACTIVE HAZARDOUS LIFE. (**CL-20/70)**

Response: *The definition of decontamination is the removal and appropriate disposal of radioactive materials to ALARA levels. The NRC has prescribed specific radiological criteria for license termination. Radioactive materials removed during decontamination are appropriately disposed of just as any other chemical material would be. Subpart K of 10 CFR Part 20 provides the requirements for the disposal of licensed material, including low-level waste. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: And to ignore radiation concerns to the unsuspecting public health is criminal. It is outrageous to allow the reactors to be liability-free. (**CL-32/3**)

Response: *NRC's actions do not in any way eliminate the liability of licensees of nuclear power reactors. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: An EIS must also consider the effects of the synergies between and among ionizing radiation and the multitude of hazardous materials also released into the environment. (**CL-52/21**)

Response: *The levels of radiation and amounts of radioactive material that are released offsite as considered in this document, are so low that synergies between radiation and hazardous materials are not an issue. This document does not look at the synergies between ionizing radiation and hazardous materials released into the environment. At the levels of radioactive releases from decommissioning plants there has been no documented cases of harmful synergistic interactions with hazardous waste that could pose a public health and safety concern. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I do not think it's outside of the scope of this particular document to have some regulations about the speed, let's say, of how the total amount of radiation on a given site was reduced. I think that would be perfectly within the scope of this document. (**SF-C/7)**

Response: *The mission of the NRC includes ensuring that decommissioning of all nuclear reactor facilities will be accomplished in a safe and timely manner. NRC regulations currently require that all decommissioning activities be completed within 60 years after a nuclear power plant permanently ceases operations, unless exemptions are granted on a case-by-case basis. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The potential threat of a release along the shoreline or into the lake of radioactive material during decommissioning or storage of spent fuel requires special consideration. (**CL-11/3**)

Response: *The licensee is allowed to release gaseous and liquid effluents to the environment, but the releases must be monitored and meet the requirements of 10 CFR Part 20, Appendix B, Table 2; therefore, contaminants may be present and detectable offsite. However, the release limits have been designed and proven to be protective of the health and safety of the public and environment. Although long-term storage of spent fuel is not within the scope of the Supplement, as described in Section 1.3, "Scope of This Supplement," NRC is committed to ensuring that both spent fuel and low-level wastes are managed to prevent detrimental health impacts to the public. The NRC has stated in its regulations that "The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impact of at least 30 years beyond the licensed life for operation (which may include the term of renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent fuel-storage installations." Further, the Commission believes there is reasonable assurance that at least one mined geological repository will be available in the first quarter of the 21st century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such a reactor and generated up to that time. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Third, the Draft GEIS does not explain at what point in time radioactive decay of the material will make it sufficiently safe to proceed with any further dismantling. NRC should shorten the acceptable time period for SAFSTOR and link it to the timeframe that would make the material safer. NRC should encourage licensees to go forward with dismantling the facility under DECON as soon as appropriate, even if they start with placing the facility in SAFSTOR. (**CL-11/11**)

Response: *NRC regulations currently require that all decommissioning activities be completed within 60 years after a nuclear power plant permanently ceases operations, unless exemptions are granted on a case-by-case basis. The purpose of the Supplement is not to discuss acceptable time periods for decommissioning activities or provide or suggest to licensees when they should undergo decommissioning activities. The Supplement describes the potential environmental impacts from decommissioning activities and provides an envelope of the impacts that the licensee can compare to prior to undertaking a decommissioning activity. The purpose of the Supplement is described in Section 1.1, "Purpose and Need for This Supplement." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The area being worked in should be covered to contain dust if it means covering the whole site with a tent with an adhesive inner surface to capture particulates. (**CL-20/33**)

Response: *The use of enclosures (such as plastic "tents") during decommissioning to contain airborne contamination is a common practice. However, the enclosures are limited in size to the area that is being worked on in order to contain contamination and not allow it to drift to areas that are not contaminated. Covering the whole site with a tent would not be an appropriate or realistically feasible method of containing contamination. In addition, the specification of methods to use during decommissioning is not within the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: For the Draft to take the attitude of "well, the doses at plants being decommissioned are generally only a small fraction of doses at operating plants," p. G 13 is no comfort, and all the charts show, concerning Occupational doses (P. G 14 and on), is thousands upon thousands of contaminated workers. (**CL-20/56**)

Response: *The connection between occupational doses and contaminated workers is incorrect. Although some occupational dose is associated with contamination, most is from direct radiation (radioactive sources in piping or other components, including activation products). The NRC's regulatory limits for radiological protection are set to protect workers and the public from the harmful health effects of radiation on humans. The limits are based on the recommendations of standards-setting organizations. Radiation standards reflect extensive scientific study by national and international organizations (the International Commission on Radiological Protection [ICRP], the National Council on Radiation Protection and Measurements [NCRP], and the National Academy of Sciences [NAS]) and are conservative to ensure that the public and workers at nuclear power plants are protected. The NRC radiation exposure standards are presented in 10 CFR Part 20, "Standards for Protection Against Radiation," and are based on the recommendations in ICRP 26 and 30. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: "Dose to members of the public" Pg. G-19, and following pages, the doses to the public are listed in the usual deceptive and inaccurate manner. (**CL-20/90**)

Response: *The comment cannot be evaluated because it did not provide specific information. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: WHEN YOU CALCULATED THE RADIO-IODINES, DID YOU ADD IN THE HUGE RADIO-IODINE RELEASE OFF PLANT FARLEY THAT WENT OVER GEORGIA? (**CL-20/97**)

Response: *It is not clear what calculation the commenter is referring to. The NRC sets limits on radiological effluents, requires monitoring of effluents and foodstuffs to ensure those limits are met, and has set dose limits to regulate the release of radioactive material from nuclear power facilities. The regulations are intentionally conservative and provide adequate protection for the public, including the most radiosensitive members of the population. All reactor licensees monitor their effluent and calculate offsite doses caused by radioactive liquid and gaseous effluents. These calculations are performed to demonstrate the licensee's compliance with its technical specifications and NRC regulations. The licensee's Offsite Dose Calculation Manual (ODCM) provides for collection and analysis of a variety of samples such as soil, water, plants, and animals. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The degradation that will occur due to the constant bombardment of radiation could affect how the plant is dismantled and how the radiation exposures will be for workers and could easily add new accident scenarios. For instance, Plant Hatch has a cracked core shroud, and I know other plants do, too. But I don't know—that's question, I guess, have any of those been dismantled? How will that deficiency affect decommissioning? These factors, among others, must be incorporated in addressing the decommissioning of individual facilities. (**AT-A/27**)

Response: *The reactor fuel will be removed from the reactor core before any major decommissioning activities take place. A reactor with a cracked core shroud will not pose any additional difficulty in decommissioning. The industry has considerable experience in the removal of damaged components (e.g., the cleanup at Three Mile Island, Unit 2). Decommisioning can be accomplished efficiently and safely with minimal radiation exposure to the workforce. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Okay, we searched the document to determine what the actual acceptable risk is to the public for the activities addressed in your process. And what we determined is that it's a pretty wide range, from three to 21 person rems. Okay, yeah. What is the absolute level of acceptable risk -- and I know it ranges in the experiences that the NRC has had at different decommissioned power plants. And so there were different doses identified at different plant locations and I know some of the variables that went into that. What is the absolute level of acceptable risk that NRC will allow for decommissioning activity in general? That's number one. (**AT-B/1**)

Response: *This Supplement does not establish acceptable risk levels; it lists reported doses for individuals and populations and provides estimates of potential impacts. NRC and EPA regulations contain permissible dose limits for individuals. Neither agency has established*

permissible population doses. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: I don't think the long-term radiological impacts [from entombment] are being addressed and the scope of this document is inadequate as it relates to radiological impacts. I think in generic terms, that should be addressed. (**CH-C/6**)

Response: *Entombment was addressed in this Supplement at the request of the Commission. Although Entombment, as described in this Supplement, does not result in unrestricted release at License Termination, the environmental impacts from the activities for preparing for Entombment can be evaluated and that was within the scope of this Supplement. In October 2001, the Commission published, for public comment, an advance notice of proposed rulemaking (ANPR) on Entombment Options for Power Reactors (66 FR 32551). The NRC's regulatory limits for radiological protection are set to protect workers. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The NRC is charged to protect the quality of the human environment and we ask that they all can uphold that charge. The current draft GEIS is not protective and needs major improvement. (**CL-08/33**)

Response: *The NRC's mission includes ensuring that decommissioning of all nuclear reactor facilities will be accomplished in a safe and timely manner. This comment cannot be evaluated because it did not provide specific information. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The U.S. Environmental Protection Agency (EPA) and most state agencies that set radiation exposure standards employ measures, limits, or goals expressed in terms of risk. NRC Radiological Site Release Criteria appear to yield a higher risk to the public than those risk levels acceptable to EPA under CERCLA. If this is so, then the GEIS should contain the comparisons (risk to risk, nuclear to chemical, one in ten thousand to one in a million) in plain language. The presentation of risk in Appendix G is unnecessarily obtuse and murky. It appears not to contain a comparison to permissible or target risks from non-radiological pollutants, which in all fairness, it should. (**CL-13/2**)

Response: *Although licensees may be required to meet state and other Federal regulations during decommissioning, this Supplement evaluated environmental impacts from decommissioning activities using, where appropriate, NRC regulations and guidelines as part of the evaluation. The statement is made that the GEIS should contain the comparisons (risk to*

risk, nuclear to chemical, one in ten thousand to one in a million). NEPA requires Federal agencies to consider every significant aspect of the proposed action. NEPA requires that the agencies inform the public that it has considered environmental concerns in its decision-making process and it requires agencies to take a hand look at the environmental consequences of an action. It does not require comparisons between technologies , or comparisons of risks between the various technologies. Appendix G provides a summary of risks from radiation exposure. Section G.1.1.4.3, "Risk Coefficient Selection," discusses the use of the BEIR-V risk coefficient of 8 x 10^{-4} fatalities per 0.01 person-Sv (1 person-rem). The Supplement provides a range of occupational doses experienced in permanently shutdown reactors for a number of decommissioning activities. The staff concludes that the occupational and public health impact from radiological dose for all decommissioning activities is generic and the impact will be SMALL. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Water quality should continue to be tested for radioactive contaminants for at least 600 years which is the full radioactive hazardous life approximately for cesium-137, which is a contaminant of concern in fish and shellfish as it migrates to muscle in particular. (**CL-20/37**)

Response: *There are regulations in place concerning the release of any material from a nuclear power facility. The plants were licensed with the expectation that there would be routine releases to the air and water due to normal operations and that these releases would be detectable offsite. The releases are limited to ensure public health and safety. Liquid releases to the environment must be monitored and meet the requirements of 10 CFR Part 20, Appendix B, Table 2. Therefore, contaminants may be present and detectable offsite, however the release limits have been designed and proven to be protective of the health and safety of the public and the environment. No offsite decontamination efforts or additional monitoring procedures are warranted. The Supplement does not (1) establish policy, (2) establish or revise regulations, (3) impose requirements, (4) provide relief from requirements, or (5) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: NRC MUST MAKE LICENSEES, CONTRACTORS, SUBCONTRACTORS AND ANYONE WHO WORKS ON DECOMMISSIONING TAKE THE EFFECTS OF RADIOACTIVE "DAUGHTER" PRODUCTS INTO CONSIDERATION AS THEY MAY HAVE VERY DIFFERENT PHYSICAL, CHEMICAL AND RADIOACTIVE PROPERTIES THAN THE RADIOACTIVE "PARENT." THIS MUST BE PART OF DECOMMISSIONING STANDARDS. (**CL-20/52**)

Response: *The NRC radiation exposure standards are presented in 10 CFR Part 20 and take into account daughter products. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Emissions are allowed to be averaged out to make them appear less, and there is no independent monitoring and utilities do and say whatever they please. (**CL-20/92**)

Response: *Emissions are reported as total for a given period, not as averages. The NRC sets limits on radiological effluents, requires monitoring of effluents and foodstuffs to ensure those limits are met, and has set dose limits to regulate the release of radioactive material from nuclear power facilities. The regulations are intentionally conservative and provide adequate protection for the public, including the most radiosensitive members of the population. All reactor licensees monitor their effluents and calculate offsite doses caused by radioactive liquid and gaseous effluents. These calculations are performed to demonstrate the licensee's compliance with its technical specifications and NRC regulations. The licensee's Offsite Dose Calculation Manual (ODCM) provides for collection and analysis of a variety of samples such as soil, water, plants, and animals. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I know that I am not alone in asking you to protect our citizens from radioactivity on such a large scale and hope that you will live up to your responsibility by not lessening the requirements that utility companies face when decommissioning takes place. (**CL-39/6**)

Response: *The NRC's primary mission is to protect the public health and safety, and the environment from the effects of radiation from nuclear reactors, materials, and waste facilities. The NRC has and will continue to live up to the responsibility to protect the citizens of the United States from the harmful effects of radiation resulting from the use of licensed material. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: How could the NRC, with its limited surveillance staff, make certain that each licensee would search conscientiously for contamination on the interior as well as the exterior surfaces of pipes, drain lines and ductwork? (**CL-51/10**)

Response: *Included in the license termination plan is a site characterization, which is based on radiological surveys made throughout operation of plant and decommissioning process. The purpose of the site characterization is to ensure that the final radiation surveys are conducted to cover all areas where contamination existed, remains, or has the potential to exist or remain as well as to provide data for planning further decommissioning activities. The site*

characterization contains a description of (1) the radiological contamination on the site before any cleanup activities associated with decommissioning took place, (2) a historical description of site operations, spills, and accidents, (3) a map of remaining contamination levels and contamination locations, and (4) a description of the survey instruments and supporting quality assurance practices used in the site-characterization program. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: How can the radioactive content of this structure be accurately estimated? (**CL-51/13**)

Response: *Discussion of method for estimating the radioactive content of structure is outside the scope of the Supplement. There are several methods by which the total activity could be estimated. These methods include taking core samples through the containment vessel and determining the variation of activity as a function of the location of the sample and position in the sample. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Tritium can't be contained. (**CL-20/93**)

Response: *Tritium is water with an extra neutron in the nucleus. It can be contained in the same manner as water, for instance in bottles, tanks, etc. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.7 Decommissioning Accidents

Comment: Section 4.3.9 and Appendix I discuss the potential of, and consequences of, postulated radiological accidents. On page I-2 of Appendix I, the text states, "As a result of improvements in the technology used for decommissioning, several of the accidents listed in Table 1-2 may now be considered to be of a much lower probability or, at the least, to result in much-reduced consequences." It is recommended that the text be revised to identify typical technology improvements. For example, some of the plants currently undergoing decommissioning intend to use single failure proof cranes to preclude the potential for certain postulated spent fuel cask drop or heavy load drop accidents. (**CL-06/3**)

Response: *Appendix I was revised to include reference to specific technological improvements such as the upgrading to a single failure proof crane.*

Comment: Section 4.3.9.3, page 4-35, lines 19-21 – the category of hazardous (non-radiological) chemical related accidents is listed here, which is appropriate since such accidents are possible during decommissioning. The description only mentions potential for injury to the public. However, in Section 4.3.9.2, which describes the classification of accidents as small, moderate and large, effects on workers are also discussed. This should be clarified since it appears to be inconsistent. (**CL-09/24**)

Response: *Section 4.3.9 is a discussion of offsite impacts to members of the public. The commenter is referred to Section 4.3.10 for an assessment of impacts to workers, including chemical hazards.*

Comment: I think the document needs to address fires, chemical hazards, particulates, spills. I just think there are more issues that need to be addressed in the document. (**CH-D/8**)

Response: *Appendix I of the Supplement evaluates a large number of potential accidents for plants undergoing decommissioning including fires, chemical hazards and spills. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Table I-5, page I-20 – add fire and hazardous materials to associated accidents for removal of contaminated pipe and tubing. (**CL-09/51**)

Comment: Table I-5, page I-21 – add fire and hazardous materials to associated accidents for metal component dismantlement, intact removal or partial segmentation of large components and the first three subcategories of removal of reactor pressure vessel and internals. (**CL-09/52**)

Comment: Table I-5, page I-22 – add fire to associated accidents for cut piping attachments. Add fire and hazardous materials to associated accidents for decontamination, segmentation and disposal of RCS and other larger bore piping. (**CL-09/53**)

Comment: Table I-5, page I-23 – add fire to associated accidents for deactivate systems, disposal of nonessential structures and systems; establish a permanent reactor coolant system vent path; establish a permanent containment vent path; remove dedicated safe-shutdown diesel and generator; and remove unused equipment during SAFSTOR. Add hazardous materials to deactivate systems; disposal of nonessential structures and systems; drain and flush plant systems; process, package, and ship liquid and solid radioactive wastes; remove dedicated safe-shutdown diesel and generator; dispose of non-radioactive hazardous waste; and limited decontamination of selected structures and systems. (**CL-09/54**)

Comment: In general, any activities that involve cutting or welding could lead to a fire. Precautions are implemented to minimize the possibility and respond quickly if a fire starts. Depending on the materials in the systems during operation or during earlier decommissioning activities, a hazardous materials accident is possible when removing systems, handling waste or using decontamination materials. Again, precautions are planned to minimize the possibility. (**CL-09/55**)

Response: *Table I-5 was revised and "fire" was added as a potential accident for a number of decommissioning activities.*

Comment: Page 1-8, Lines 10-13. EPA agrees that inadvertent releases resulting from an accident should be handled on a site-specific basis. We would like to see an explanation of how the analysis of impacts from an accident would be handled. (**CL-16/14**)

Response: *As stated in the Supplement, the discussion of environmental impacts from reactors that were permanently shut-down due to a major accident is outside the scope of this document and would require a site-specific analysis. In response to EPA's request, the staff recommends that EPA examine NUREG-0683, as supplemented. NUREG-0683 is a Programmatic EIS related to the decontamination and disposal of radioactive wastes resulting from the March 28, 1979 accident at Three Mile Island, Unit 2. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Perhaps most disgusting is that under "Consequence of Potential Accidents" p. I-16 the impression given is that spent fuel pool accident risks are low, when in fact NRC's own cited document shows, hundreds upon hundreds would die and also many spent fuel pools were highly vulnerable to catastrophic accident due to earthquakes and a lot more besides - spent fuel pool accidents would have terrible consequences. (**CL-20/100**)

Response: *The level of risk is the result of the probability of occurrence and the consequences of the accident. The risk associated with spent fuel pools is low because the probability of an accident is low. Furthermore, the accident could be mitigated before a release occurs. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Table I-3 incorrectly lists site flooding as the only accident analyzed for Peach Bottom Unit 1 in the documents referenced in Appendix 1 for Peach Bottom Unit 1. The additional accidents analyzed for Peach Bottom Unit 1 that should be added to Table I-3 are:

-- Release of helium coolant under containment breach (open penetration to containment) for accidents involving radioactive materials (non-fuel-related) on page I-9.

-- Fire inside reactor vessel under fire for accidents involving radioactive materials (non-fuel-related) on page I-10. (**CL-31/15**)

Response: *The additional accidents identified above for Peach Bottom Unit 1 were added to Table I-3.*

Comment: Appendix 1, Summary of Accidents For PWR and BWR Plants Undergoing Decommissioning Operations, Table 1-3 lists accidents considered in various individual plant evaluations but lists no potential consequences and no probabilities. So what good is this list except to show the random and will-nilly cafeteria approach to individual plants picking out and designing bounding accident scenarios? At one plant the limiting scenario is fuel handling accident; at another it is a fire in the low-level waste storage building. Case in Point: No fire scenarios are listed for Maine Yankee under Table 1-3, yet recently a fire occurred in a low-level waste dewatering unit and burned at several hundred degrees for more than an hour. A local volunteer fire company approached the fire without respirators and without advice from radiation protection personnel. A GEIS should contain a comprehensive generic list of potential accidents (scenarios) together with probabilities and potential consequences. (**CL-13/3**)

Response: *Potential consequences are shown in Table I-4 of Appendix I. Probabilities for accidents other than those related to the spent fuel pool have not been calculated primarily because of the low risk associated with the accidents and the potential for mitigation of the accident consequences. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Presenting licensee estimates of consequences without comment or qualification as in Table 1-4, Highest Offsite Doses Calculated for Postulated Accidents in Licensing Basis Documents, provides an incomplete picture of real potential consequences. For example, Maine Yankee asserts that loss of spent fuel pool heat sink will result in the same offsite dose as a liquid waste spill, that of .23 REM. Other than a reference to another study, NRC does not bother to explain what sort of dose spent fuel pool drain down might result in if remedial action is not taken. As dose consequences can be rather large, the actual figures should be included in he GEIS. (**CL-13/4**)

Response: *The event scenarios that lead to a spent fuel pool drain-down and subsequent large offsite radiological release are beyond design basis. While the consequences from such a postulated event can be large, the likelihood of the event is very small. The overall risk to the public is well within the quantitative health objectives of the NRC. To more accurately quantify the risk, several figures have been added to Appendix I of the Supplement and the discussion on spent fuel pool drain-down events has been appropriately modified.*

Comment: A serious accident or terrorist act could be catastrophic. Such an occurrence could result in large numbers of human fatalities, injuries and illnesses and vast areas of land uninhabitable for years. (**CL-46/4**)

Comment: Given the recent experience with wild fires at the Los Alamos and Hanford Nuclear Reservation and now the potential for flooding and massive soil erosion, the NRC should re-evaluate risk assessments and dose calculations for decommissioning reactors. (**CL-50/25**)

Response: *Once the reactor shuts down permanently, the risk to the public is greatly reduced; however, there are still accidents that may occur that could have consequences offsite. Licensees are required to examine their sites and plans for decommissioning to identify postulated accidents that could occur during decommissioning. An analysis of these accidents is required in their Final Safety Analysis Report, or equivalent document, which is part of the licensing basis for the plant. Possible accidents, such as the ones mentioned above, and many other possible scenarios, have been considered in this analysis. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Wherever human beings are involved, there are bound to be errors and accidents. The human element cannot be removed, as we found out at Three Mile Island and Chernobyl. (**CL-10/5**)

Response: *Radiological accidents during decommissioning are considered in Appendix I of this Supplement. The comment is not specific and did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I challenge any licensee and any NRC staffer, to walk into the area where the spent fuel pool is after the water has drained from the spent fuel pool, and try and refill the spent fuel pool with a garden hose (that is what they thought they'd do at the Georgia Institute of Technology Reactor) and see how well they can "mitigate" the situation before "offsite dose consequences could occur" - they'd be dead before they could pick up the hose. To say that such an accident could be mitigated is the height of deception. (**CL-20/101**)

Response: *The NRC staff considers loss of water from the spent fuel pool to be a very low probability accident because of design features required at all spent fuel storage pools that minimize the possibility of losing all the spent fuel coolant. Obviously, what the NRC staff had in mind as mitigation of a loss of inventory accident at a spent fuel pool was not manual refilling with a garden hose. Technology exists and it is routinely employed to work effectively in very high radiation fields. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: THE NRC SHOULD READ ITS OWN DOCUMENTS AND THE FAMOUS "CRAC 2" REPORT DONE BY SANDIA LABS, THE NRC AND THEN CONGRESSIONAL OVERSIGHT BECAUSE TO PRESENT DATA TAKEN FROM LICENSING-BASIS DOCUMENTS WHICH HISTORICALLY HAVE DOWNPLAYED ANYTHING THAT COULD HAPPEN IS OUTRAGEOUS, AND IF THERE IS STILL FUEL IN THE REACTOR AND A LOSS OF WATER COOLANT HAPPENS, EVEN IF THE REACTOR HAS BEEN SHUTDOWN RECENTLY, THERE WILL BE A MELTDOWN. (**CL-20/102**)

Response: *The staff is aware of the information that is present in the documents it publishes. This comment is general in nature and does not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 4.3.9.2, page 4-34 – it is not clear whether the physical injuries discussed in this section are only those due to radiological impacts or due to non-radiological aspects of an accident. The section is on radiological accidents so the former is implied, but the wording is not clear. (**CL-09/23**)

Response: *Section 4.3.9.2 was revised to refer specifically to radiological accidents. Information that could be misconstrued pertaining to nonradiological accidents has been removed from the section.*

O.1.8 Occupational (Nonradiological) Impacts

Comment: I'm going to have comments on the details of my facility, Fermi I, ranging from the status of our decommissioning since we are inactive, the final act of decommissioning…(comments on the details of my facility, Fermi I) what kind of fuel the plant used, the type of containment, some of our systems. We are cleaning up sodium residues. I'd like that stated in the report. It is one of the type of chemical activities and chemical hazards that are being done as part of decommissioning. (**CH-D/2**)

Response: *Section 4.3.10.1 was revised to include removal of sodium residues.*

Comment: There are some additional hazards that have to be addressed in the discussion of the hazards. I don't think these would affect the overall conclusions of the document. But I think there is more detail, and to some extent, some hazards that are not fully addressed in the document. And some of these are in the areas of occupational hazards. (**CH-D/7**)

Comment: Section 4.3.10.1, page 4-37 – the hazard of flames and fires should be addressed in the section on physical hazards. (**CL-09/25**)

Response: *Section 4.3.10 was extensively revised. The hazard of flames and fires are addressed in Section 4.3.10.3.*

Comment: Section 4.3.10.1, page 4-39 – the following items should be added to the list of activities that expose workers to chemical hazards:

"Removal of chemical containing systems, such as demineralizers, and acid and caustic containing tanks," "Removal of sodium and NaK residues." (**CL-09/26**)

Response: *Section 4.3.10.1 was extensively revised. The chemical hazards identified above are addressed in Section 4.3.10.3.*

Comment: Tables E-3 and E-5 The issue of occupational hazards applies to activities in addition to those indicated in Table E-3. Since Table E-5 is based on Table E-3, it also needs to be revised to reflect the following.

Such additional activities that can affect or involve occupational issues are as follows. A brief explanation of why follows each item.

Adjust site training (Industrial safety type training needs to be continued and revised based on job hazards to ensure workers are trained for activities or areas [e.g., confined spaces] involved in decommissioning)

Establish a reactor coolant system vent pathway (Depending on specific method, this could involve cutting, welding and working at heights)

Establish containment vent pathway (Depending on specific method, this could involve cutting, welding and working at heights)

Do preventive and corrective maintenance on SSCs (Maintenance activities at an operating plant or decommissioning plant can involve industrial hazards, some more so than others. There can be energized systems, pressurized fluids, rotating equipment, etc.)

Chemical decontamination (Occupational hazards include chemicals and pressurized fluids)

High pressure water sprays of surface (High pressure sprays are themselves a hazard due to energy involved. Precautions need to be taken to use them safely)

Cut out radioactive piping (Cutting typically involves torches or cutting wheels, creation of fumes or particles, and rigging)

Remove large and small tanks or other radioactive components from the facility (Careful rigging is needed to maintain control and prevent injury. If this activity also involves cutting the equipment free, the hazards of cutting are also involved)

LLW packaging and storage (Handling the LLW and packages needs to be performed ergonomically safe to prevent injuries)

Large component transportation (The transportation issues all involve lifting of materials to remove them or bring them onto the site. Care also is needed if vehicle is backing up during the evolution.)

LLW transportation

Equipment into site transportation

Backfill tracked into site

Non-radioactive waste transportation

Complete final radiation survey (The survey will involve working at heights if buildings remain, and possibly accessing hard to reach locations.) (**CL-09/33**)

Comment: Tables H-1 and H-2 – as addressed under comments on Tables E-3 and E-5, other activities involve occupational hazards. Occupational issues do not seem to belong as an environment issue category. Safety of workers is considered as a separate category when planning work. From a regulatory perspective, OSHA and state agencies typically promulgate regulation on worker safety, not the EPA or state environmental agencies. The environmental issues typically are impacts to the air, water, or land both on and off site, while other environmental issues that impact people are evaluated for the public. The type of review is also different for occupational issues than other environmental issues. As each work package is planned, the hazards of the job need to be addressed in the planning and appropriate methods, engineering controls and protective equipment planned and workers briefed for each activity. This is an immediate, short-term (for the duration of the activity) type of review, while most environmental issues have longer term implications. However, if occupational issues are to be included in this environmental review, the additional activities discussed earlier also need to be included. (**CL-09/48**)

Response: *Tables E-3, E-5, H-1 and H-2 were revised as appropriate in response to the above comments.*

Comment: (4.3.10.1) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Occupational Issues - Conclusions:

Labor relations is an essential component, and potential impediment to prompt decommissioning activities. For example:

On August 12, 1982, William Pennsyl, a cleanup worker, was fired for insisting he be allowed to wear a respirator while undressing men who entered highly radioactive areas. Pennsyl filed a complaint with the U.S. Department of Labor. William Pennsyl settled out-of-court two days before an administrative law judge was scheduled to hear his case

On March 22,1983, JM 1-2 senior-safety engineer Richard Parks publicly charged GPU and Bechtel Corporation with deliberately circumventing safety procedures, and harassing him and other workers for reporting safety violations.

On July 31,1990, the NRC announced "that an allegation that a shift supervisor on duty at Three Mile Unit 2 control room, during defueling operations in 1987, had sometimes slept on shift or had been otherwise inattentive to his duties, was true ..."

Also, in February 1991 an operator "inadvertently flooded the vaporizer" and several days later an operator was discovered "apparently sleeping.

Based on the experience at Three Mile Island, the SMALL and MODERATE evaluations need to be upgraded to "LARGE." (**CL-02/54**)

Response: *Consideration of worker safety and health, training, and experience with nuclear facilities was included in looking at occupational health and safety issues in this Supplement. Instances of worker misconduct occur, and the licensee and NRC have been diligent in identifying such instances and will continue to do so in the future. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I noticed that the Draft blabbers on about OSHA standards YET FAILS TO MENTION THAT OSHA DOES NOT COME ON SITE AND IS NOT ALLOWED TO ACCORDING TO OSHA, EVERYTHING IS UNDER NRC. So let's print the truth shall we? (**CL-20/24**)

Response: *OSHA has jurisdiction for non-radiological safety hazards. NRC inspectors have jurisdiction over radiological safety hazards. OSHA has access to licensed facilities, however, because of NRC inspector presence onsite during decommissioning activities, the NRC has entered into a Memorandum of Understanding with OSHA. NRC inspectors are required to be*

alert for conditions of non-radiological safety hazards. NRC inspectors are also required to follow up on identified non-radiological safety hazards to include reporting requirements to OSHA. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: To what extent will chemical decontaminants be used? (**CL-51/11**)

Response: Chemical decontamination, the use of chemicals to decontaminate structures, systems, and components is conducted and will be conducted at all decommissioning sites to varying degrees. Chemical decontamination of the primary system has been conducted at a number of facilities including Maine Yankee and Big Rock Point. Chemical decontamination of the primary system is a determination that is made by the licensee. When available, data on chemical decontaminants were factored into the evaluation of environmental impacts from decommissioning activities presented in this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

O.1.9 Cost Impacts

Comment: Table 4-3 lists the decommissioning cost of Peach Bottom Unit 1 to be 54 million dollars (in January 2001 dollars). In our letter submitted on March 30, 2001, in accordance with 10 CFR 50.75 the decommissioning cost estimate for Peach Bottom Unit 1 reported in beginning of year 2001 dollars is 65.4 million dollars. Table 4-3 should be changed to reflect the latest cost estimate. (**CL-31/12**)

Comment: Table 4-4 lists the decommissioning cost of the high-temperature gas-cooled reactor in SAFSTOR (Peach Bottom Unit 1) to be 54 million dollars (in January 2001 dollars). In our letter submitted on March 30, 2001, in accordance with 10 CFR 50.75 the decommissioning cost estimate for Peach Bottom, Unit 1 reported in beginning of year 2001 dollars is 65.4 million dollars. Table 4-4 should be changed to reflect the latest cost estimate. (**CL-31/13**)

Response: *The revised decommissioning cost estimate for Peach Bottom Unit 1 was included in Tables 4-3 and 4-4.*

Comment: No, I think my main issue is just, you know, having the costs on the table and having the costs be understood, and I think there's got to be some explicit discussion of those sorts of economic issues, and it seems like they're not really out there. (**AT-C/6**)

Response: *This Supplement does not discuss cost-estimation techniques or the economic factors, which may or may not enter into those estimates. The regulations (10 CFR 50.82) require periodic submittals to the NRC on estimates associated with decommissioning. 10 CFR 50.75 requires biannual submittal of the status of the licensee's decommissioning trust fund. Guidance for the cost estimates is found in Draft Regulatory Guide, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors" (temporarily identified as DG-1085) and Draft NUREG 1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: For example, the specific formula for the decommissioning cost. Not that we don't have to have plant's decommissioning fund and have to look to the adequacy because the regulations do require that and we do that. But the formula doesn't apply to non-light water reactors. (**CH-D/6**)

Response: *The decommissioning funding requirements for plants involving other than light water reactor designs (Fermi I and Peach Bottom 1) currently undergoing decommissioning were evaluated on a site-specific basis. All of the United States commercial nuclear power plants currently operating use light water reactor designs and the formulas in 10 CFR 50.75 apply. It is anticipated that most future plants will be light water reactor designs, so the formulas will apply to these reactors also; if other than light water reactors are licensed to operate, then the decommissioning funding requirements will be established on a site-specific basis or the regulations revised to include other reactor designs. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: An Associated Press news article from December 5, 2001, "Japanese power company begins dismantling country's oldest nuclear reactor," highlighted the enormous financial and technical concerns that Japan is facing regarding decommissioning. "Japan Atomic Power Co., which took the Tokaimura plant off line in 1998, won't begin taking apart the reactor for another 10 years because extremely high levels of radiation remain inside, said spokesman Eichi Miyatani. It will completely dismantle the plant by 2017 and spend an estimated 92.7 billion yen (US$748 million), Miyatani said." These monetary figures exceed those that were mentioned as average decommissioning cost estimates at the NRC's public meeting in Atlanta. (**CL-08/11**)

Response: *Decommissioning and environmental requirements differ significantly in the United States from elsewhere in the world. Additionally, economic (societal, design, etc.) and other factors (labor, inflation, etc.) vary from country to country, and, thus make decommissioning*

costs incomparable. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: On Pg. 3-19 the discussion of the SAFESTOR option assumes that there is a savings associated with less Solid RW disposal costs. However, they do not consider that the current NRC guidance for release of material includes a no detectable criteria. In order for the reduction of Solid RW to be achieved, significant quantities of plant materials would need to be released from the site. The current regulations do not support this assumption. (**CL-31/7**)

Response: *Discussion of cost estimates for the Supplement did consider current regulations for release of materials from a decommissioned plant. The assumption made in the GEIS for developing cost estimates did assume the no detectable criterion for release of solid waste. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The cost of decommissioning nuclear facilities can vary according to the size of the facility and the degree of contamination. (**CL-48/21**)

Response: *The variables of size, location, operating history, and others are considered when evaluating the cost impacts. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: A lot of my work has been based on concern about the cost of these facilities relative to the amount of electricity or other benefits they provide on a life cycle basis, and that seems to be something that's a subtext of this statement. (**AT-C/4**)

Response: *The societal benefits, or the lack of benefits, from plant operations is outside the bounds of the Supplement. This comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including: Cost Estimates for Radiological Decommissioning; (**CL-02/3**)

Response: *Decommissioning costs are discussed in Section 4.3.11. Two other documents that address decommissioning costs are or were available for public comment. One is a draft guide, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," temporarily identified as DG-1085. This guide is being developed to assist licensees*

in determining financial assurance and for preparing the various cost estimates required for different stages and methods of decommissioning nuclear power reactors. A related document, Draft NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors," is also available. The NRC staff plans to use Draft NUREG-1713 in their review of licensees' cost estimates for decommissioning that are submitted to the NRC. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: [In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including:]Rate payer Equity. (**CL-02/7**)

Comment: We are tired of being unknowingly treated as an entity from whom the industry can escape the obligation of full disclosure, and "used" as the entity upon whom the industry dumps the real long-term costs, and as the entity who absorbs the costs. (**CL-44/16**)

Comment: Public Citizen is opposed to any policy that would shift the financial burden of decommissioning to ratepayers. The cost of properly decommissioning (including thorough decontamination) a reactor site can vary widely, depending on the size of the facility, the amount of time in which it was operational, and the degree of contamination. As the NRC itself stated in the Supplement, the lack of adequate decommissioning funds can potentially result in delays and/or unsafe and improper decommissioning. Further, with utility deregulation and the attendant shuffling of corporate ownership, much uncertainty has developed regarding the ability of the owning and operating utilities to pay for proper decommissioning of their facilities. Public Citizen insists that site-specific reviews are necessary so that the public has an opportunity to ensure that the utility will be able to pay for the entire, thorough decommissioning process. (**CL-47/17**)

Comment: Georgians for Clean Energy requests that all decommissioning costs be borne by the parent company of the licensee in perpetuity. The parent company should not be allowed to recoup the cost of decommissioning from the ratepayer or federal government through the taxpayer. Ratepayers and taxpayers in Georgia have already had to pay far beyond their share of promised cheap nuclear power that has brought one of the largest rate hikes in the history of Georgia. Furthermore, private landowners, whether residential or commercial, farms, federal, state, county, city, community properties or others should not be responsible for the costs of monitoring, containment or cleanup. (**AT-A/29**)

Comment: THE COSTS MUST NOT BE PASSED ON TO THE RATE PAYERS (**CL-20/47**)

Comment: I think going back 25-30 years, the notion was well, we're going to build these things, we're going to run them and then we're going to cover them up in concrete and post guards around them and they'll be safe. Well, now we have rubblization. Suddenly entombment was the floor, now it's become the ceiling, we won't see it because it's too expensive. Money moves too fast and, you know, how can we do it cheap, how can we do it quick. And of course, our concern is, you know, it may be quick and cheap for the licensee, but for people in the immediate area, people downstream, people on the Savannah River, on the Altamaha River, my concern is that they not be unduly saddled with costs that should be taken into account and that those local concerns be maintained in this process. (**AT-C/2**)

Comment: The most troubling aspect of this section is the assertion that, "The cost of decommissioning results in impacts on the price of electricity paid by rate payers." Due to deregulation, additional decommissioning recovery is either limited or "under-funding" is the sole responsibility of the "electric utility," e.g., Three Mile Island Unit-1. The "hostage rate payer" is being replaced by the shareholder who is not likely to advocate paying for the "under-collected" portion of the fund after the plant is permanently shut down. This section needs to be redrafted and include the following variables: Cost Estimates for Radiological Decommissioning (20); Planned Operating Life of Nuclear Generating Stations; Spent Fuel Isolation; Low-level Radioactive Waste Isolation; Rate Payer Equity; Plant Valuation; Joint Ownership; and Regulatory Ambiguity. (**CL-02/57**)

Response: *The missions of the NRC include the protection of public health and safety, and protection of the environment. NRC requirements established a framework to ensure that decommissioning of all nuclear reactor facilities will be accomplished in a safe and timely manner, and that funding will be available for this purpose. NRC regulations regarding the methods used to ensure that funds will be available to cover the decommissioning process are in 10 CFR 50.75. NRC does not prescribe how the funds are to be raised. The license holder for the facility funds decommissioning costs. Equitability of investment decisions is outside of the regulatory authority of the NRC and thus is not within the scope of this Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Power reactor licensees continue to rely heavily on nuclear decommissioning projections provided by the industry consultant, Thomas LaGuardia and TLG, Inc. Furthermore, TLG continues to base decommissioning estimates on flawed and specious "Yield" studies extrapolated from small, minimally contaminated, and prematurely shutdown nuclear reactors. No reasonable, sound or prudent financial officer operating outside of the nuclear industry would accept funding formulas and that rely on so many fluid caveats and assumptions.

The wild fluctuation in the cost estimates for radiological decommissioning are attributable to the lack of actual decommissioning experience at large nuclear generating stations (over 1,000 MWe), or at plants that have operated for their full and planned lifespan. The largest commercial nuclear power plant to be fully decommissioned, Shippingport, is a 72 megawatt (MWe) light-water breeder reactor and is substantially smaller than the Susquehanna Steam Electric Station-1 & 2 (1,050 Net MWe for each unit).

Several other nuclear reactors are being prepared for decommissioning but provide little meaningful decommissioning experience that could be used reliably to predict decommissioning costs.

TLG's are specious and depend on: 1) The development of nonexistent technologies; 2) Anticipated projected cost of radioactive disposal; and, 3) The assumption that costs for decommissioning small and short lived reactors can be accurately extrapolated to apply to large commercial reactors operating for forty years.

The industry "leader", Exelon, has filed comments attesting to the imprecise and speculative nature of radiological decommissioning estimates. (**CL-02/17**)

Comment: TLG provided nuclear waste storage and nuclear decommissioning costs estimates for all Pennsylvania utilities regulated by the Public Utility Commission. However, TLG's testimony during the 1995 PP&L Base Rate Proceeding discredits their projections. Mr. LaGuardia based his cost estimates for low-level radioactive waste (LLW) disposal on the assumption that the Appalachian Compact would be available when the SSES closes. He concluded that the disposal of LLW is the most expensive component in the decommissioning formula. Furthermore, Mr. LaGuardia conceded that it may be necessary to recompute cost estimates for disposal because it now appears imminent that Barnwell will open for seven to ten years for all states except North Carolina. However, the Company has not yet taken the step of reconfiguring costs of LLW disposal now that Barnwell has been open since July 5, 1995. (**CL-02/28**)

Response: *Cost estimates are simply estimates. The adequacy or inadequacy of site specific cost estimates is outside the scope of this Supplement. Draft Regulatory Guide DG-1085, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors" and Draft NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors" contain additional information on cost estimates for decommissioning. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Experience at large commercial nuclear power plants over 200 MWe has clearly demonstrated that TLG's assumption that nuclear units will operate for 40 years, contradicts existing nuclear reactor experience.

The Company reconfirmed the 40 year assumption in the 1997 Rate Case.

Mr. LaGuardia's and Mr. Jones's acknowledgments are confirmed by empirical data contained in the GEIS. (**CL-02/19**)

Comment: Obviously, there are chronic shortfalls between "targeted" funding levels and actual costs for nuclear decommissioning. The burden of proof rests squarely on the shoulders of power reactor licensees, their partners and the NRC to demonstrate that a 40 year operating life, which they predicate their financial planning upon, is realistic. Furthermore, the nuclear industry has exacerbated this problem by resolutely refusing to put aside adequate funds for non-radiological decontamination and decommissioning. (**CL-02/20**)

Response: *NRC recognizes that each reactor that has been decommissioned or that is now being decommissioned was permanently shut down prior to the end of its expected operating life. Operating life is based on the reactor design life, i.e., on the plant remaining structurally safe for a certain period of time. For financial planning purposes, operating life is a reasonable period of time. Utilities that have decommissioned their reactor plants prematurely have done so because of political, economic, or other unforeseeable factors. Since energy planning decision factors have diverse options, decommissioning funding requirements are linked to operation for the license term. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Cost projections by "electric utilities" must be revised to necessarily include funding scenarios that anticipate premature closure. (**CL-02/27**)

Response: *The impacts of the cost of decommissioning generally occur over the life of the facility as the decommissioning fund is being collected. Most power generators are diversified and are able to continue to add funds to their decommissioning trust funds as part of their continued business. In the event that a facility shuts down prematurely, the licensee is still required to fully fund the decommissioning. Further, licensees are required to demonstrate throughout the operational period that the finances are available by one of several methods outlined in 10 CFR 50.75. The licensees submit the status of decommissioning funding to the NRC on a biannual basis. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The cost estimates for non-radiological decommissioning (an imprecise term) are not mandated by the NRC. "For PECO Energy Company and ComEd, the costs for 'Greenfield' are included in the cost estimates and in the funding streams established for decommissioning." However, Greenfield, i.e. the original environmental status of nuclear generating station prior to construction of the nuclear power plant, has never been achieved by an operating nuclear generating station. Moreover, this site status is unattainable if a station is placed in delayed-SAFSTOR, DECO, or ENTOMB. (**CL-02/36**)

Comment: Since 1999, Rancho Seco has embarked on an extended DECON process scheduled for completion in 2008 (including license termination). After license termination, SMUD will, depending on its business needs, embark on site restoration currently estimated at ~$45-80 million. This approximate estimate dollar figure was never a part of the decommissioning trust fund. (We assume your number in Table 4-3 includes all the costs of dismantlement, fuel storage and non-radiological site restoration.) (**CL-18/2**)

Response: *Decommissioning activities continue until the licensee requests termination of the license and demonstrates that radioactive materials have been removed to levels that permit termination of the NRC license. Once the NRC determines that the decommissioning is completed, the license is terminated. At that point, the NRC no longer has regulatory authority over the site, and the owner of the site is no longer subject to NRC authority. As a result, activities performed after license termination (to meet other requirements, e.g., additional state requirements, are not subject to NRC authority) and the resulting impacts are outside the scope of this Supplement. Site restoration or the return of the site to greenfield conditions is specifically stated to be out of scope of the Supplement (Section 1.3, Scope). Most power generators are diversified and are able to be flexible in case of a change in plans (such as a change in decommissioning method). The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: All references to Three Mile Island-2 as a "decommissioned reactor" are in error. The plant has not been decommissioned or decontaminated. TMI-2 was placed in Post-Defueling Monitored Storage in December, 1993. (**CL-02/66**)

Response: *Three Mile Island Unit 2 was not considered as one of the decommissioned reactors in the Supplement. Table 1-1 of the Supplement specifically lists activities at facilities that have been permanently shutdown by a major accident as out of scope. References to Three Mile Island will be revised for clarification.*

Comment: The GAO report also highlights several uncertainties relating to the costs of decommissioning: "Varying cleanup standards and proposed new decommissioning methods introduce additional uncertainty about the costs of decommissioning nuclear power plants in the

future. Plants decommissioned in compliance with NRC's requirements may, under certain conditions, also have to meet, at higher cost, more stringent EPA or state standards. New decommissioning methods being considered by NRC, which involve leaving more radioactive waste on-site, could reduce short-term decommissioning costs yet increase costs over the longer term. Moreover, they would raise significant technical and policy issues concerning the disposal of low-level radioactive waste at plant sites instead of in regulated disposal facilities. Adding to cost uncertainty, NRC allows plant owners to wait until 2 years before their license is terminated—relatively late in the decommissioning process—to perform overall radiological assessments to determine whether any residual radiation anywhere at the site will need further cleanup in order to meet NRC's site release standards. Accordingly, GAO is recommending that NRC reconcile its proposed decommissioning methods with existing waste disposal regulations and policies and require licensees to assess their plant sites for contamination earlier in the decommissioning process." (**CL-08/14**)

Response: *The commenter raises a number of issues that will be responded to in the approximately same order as they were asked. Cost estimates are precisely that: estimates. For the facilities that are currently decommissioning the monies available for the radiological decontamination and license termination appear to be sufficient. Once the reactor license is terminated no additional decontamination of the facility or site would be required so additional funds would not be needed (see Table 1-1 and Section 4.3.11.2). The NRC is using dose-based criteria for termination of the license. There was never the expectation that all radiological contamination resulting from operation of the power reactor would be removed from the site. Rather, the cleanup of the site would result in an acceptable dose (0.25 mSv/yr or 25 mrem/yr) to the average member of the critical group, or that group of individuals reasonably expected to receive the highest exposure to residual radioactivity within the assumptions of a particular future site use scenario. This type of site release criteria assumes some residual radioactivity onsite. This residual radioactive contamination is not waste, and therefore the site would not be considered an unregulated disposal facility. Additional requirements placed upon the licensee by State and local jurisdictions are clearly outside the scope of this Supplement. Licensees make measurements of contamination throughout the life of the plant. A systematic survey of contamination for the purposes of decommissioning most properly should be made during decommissioning. At the time of cessation of operations, the licensee knows where the majority of the contamination is located at their site. Towards the end of the decommissioning process a characterization study is performed to focus the remainder of cleanup activities and to assist in the design of the final site survey. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement*.

Comment: If the costs of the decision to shutdown are included, then the cost of the immediate alternative, repair and continued operation, ought to be included as well as comparative environmental impact and comparative risk. (**CL-13/7**)

Response: *A licensee's decision to shut down its reactor is outside the scope of this Supplement, as is the cost to repair or refurbish a plant to keep it operating during its initial term or for license renewal. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 4.3.11.2 Potential Impacts of Decommissioning Activities on Cost correctly points out that there are many variables in decommissioning that affect cost; among them are the size and type of reactor, the extent of contamination, property taxes and so on. However the GEIS does no more than list these variables without any attempt to assign the weight which any of them contribute. The GEIS correctly points out that only three commercial power reactors have successfully completed decommissioning, but does not say that they can hardly be considered typical of those plants under and entering decommissioning. Fort St. Vrain was a modest sized plant of oddball High Temperature Gas design and decommissioned on a fixed price, loss-leader price by a large manufacturing firm, Shoreham only ran the equivalent of one full power day, and Pathfinder was a 59MWe peanut of a plant. Thus it would be instructive to look at how costs are apportioned among today's more representative plants currently under decommissioning and from this base, knowing which are sensitive to scale and which are sensitive to choice, project final costs. These costs should be broken down and compared in the GEIS. (**CL-13/15**)

Response: *The NRC does not expect that the costs of Fort St. Vrain, Shoreham, and Pathfinder decommissioning represent the costs of typical reactors currently operating. However, the decommissioning costs for Trojan, comparable to a typical operating reactor, falls within the estimated cost range. Table 4-3 provides estimates of cost associated with the decommissioning of facilities that have permanently ceased operations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Generic Environmental Impact Statement needs to specify inappropriate uses of decommissioning funds:

A. Using funds for temporary procedures, such as SAFSTOR, is inappropriate.
B. Using funds for the maintenance and monitoring of temporary procedures, such as SAFSTOR, is inappropriate.
C. Transferring funds from PSC/PUC control to licensee control is inappropriate.
D. Using funds for the temporary storage of spent fuel, such as ISFSI or PFS, is inappropriate.
E. Using funds for the settlement of bankruptcy claims is inappropriate.
F. Using funds as collateral is inappropriate.

G. All other uses of funds that do not directly result in the permanent cleanup of contaminated nuclear plant sites, is inappropriate. Since the funds were obtained as an extra fee from ratepayers for the purpose of safely decommissioning nuclear plants, all of the funds need to be used for that purpose. (**CL-14/5**)

Response: *The requirements for use of decommissioning funds are provided in 10 CFR 50.75. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements or (4) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Furthermore, the most expensive estimate should always be assumed for everything as a wise precaution. NRC lists the decommissioning costs in MILLIONS as estimated by the utilities - however, NRC WELL KNOWS THE COSTS ARE IN THE BILLIONS WHEN EVERYTHING FROM SPENT FUEL ON DOWN IS FACTORED IN, AND THAT MUST BE REFLECTED, PLUS THE NRC INSPECTOR GENERALS OFFICE SHOULD GO OVER ALL ESTIMATES MADE BY UTILITIES TO SEE HOW TRUSTWORTHY AND ACCURATE THEY ARE. (**CL-20/48**)

Response: *The NRC staff has reasonable assurance that the radiological decommissioning costs at facilities that have permanently ceased operation will be within the range of predicted amounts as described in 10 CFR 50.75. The NRC staff recognizes that there are additional costs associated with other activities including disposal of high-level waste and local requirements to refurbish a site to greenfield. Those costs are outside the scope of this Supplement, which is concerned with the radiological decontamination of the site. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Paying the full costs for long-term monitoring and isolation of radioactive wastes. Decommissioning should not end up as a new set of public subsidies for nuclear power by allowing the long-term costs (economic, health, resource, etc.) to be denied, ignored or defined away by NRC with no recourse for the local community or state and federal taxpayers that will end up with the costs by default. (**CL-48/9**)

Response: *There are no requirements for further measurement of radiation levels or long-term monitoring for those sites that have been determined to be acceptable for license termination for unrestricted use. For sites that have been determined to be acceptable for license termination under restricted conditions, additional measurements of radiation are only required for sites that have residual radioactivity in excess of 1 mSv/yr (100 mrem/yr), but less than 5 mSv/yr (500 mrem/yr). These measurements are to be made by a responsible government*

entity or independent third party, including a governmental custodian of a site. Long-term monitoring and isolation following the termination of the license is specifically stated to be outside the scope of the Supplement (Table 1-1). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: NRC AND INDUSTRY FAILURE TO RELIABLY ESTIMATE THE REAL COST OF DECOMMISSIONING AND REASONABLY ASSURE THE AVAILABILITY OF ADEQUATE DECOMMISSIONING FUNDS DOES NOT JUSTIFY OR SUPPORT GENERIC TREATMENT OF ENVIRONMENTAL IMPACT STATEMENTS.

The NRC GEIS does not adequately address the historic inability by the NRC and industry to accurately assess the final and actual costs associated with decommissioning and the associated underestimation of the rate of accrual for funds set-aside by electrical utilities. The final cost for decommissioning remains highly speculative and therefore likely to continue to be significantly underestimated. As NRC has stated in the DGEIS Supplement the unavailability of adequate decommissioning funds potentially can result in delays and /or unsafe and improper decommissioning. Therefore, our organizations contend that site-specific reviews are necessary for public review and disclosure of the availability of adequate decommissioning funds assigned to an adopted decommissioning plan. (**CL-48/18**)

Response: *Insufficient decommissioning funds at time of reactor shutdown generally are not the result of inadequate cost estimates; rather, they are the result of a power generator deciding to prematurely shut down its reactor for economic reasons or other factors generally beyond its control. A premature shutdown may result in insufficient funds having been accumulated at the time of shutdown, thus preventing the licensee from beginning major decommissioning activities. In some instances, funding shortfalls have resulted in decommissioning decisions, such as choosing SAFSTOR instead of DECON as a method of decommissioning. Such decisions are made to ensure that funds can be obtained or can accrue to levels sufficient for proceeding with decommissioning. However, these delays have not resulted in unsafe and improper decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It therefore appears that 300 years of decommissioning experience without a single license termination plan approval does not suggest that NRC is prepared to treat the issue of cost to adequately decommission generically. (**CL-48/20**)

Response: *Three power reactor facilities have had their licenses terminated. In addition the license termination plan for Trojan was approved on February 12, 2001. While the process for decommissioning nuclear power facilities is now well established, the cost of decommissioning*

varies from one nuclear facility to the next. That variability is due to the major factors listed in the Supplement (Section 4.3.11.2). Cost estimates (made at the time of licensing, at 5 years before anticipated shutdown, with the Post-Shutdown Decommissioning Activities Report submittal, at 2 years following shutdown, and at 2 years preceding the anticipated termination of the license) are site-specific and provide a method of re-evaluating the decommissioning costs at various times and stages in each facility's life. The regulations to ensure the availability of decommissioning funds were originally established in 1988, and site-specific decommissioning cost estimates are required by 10 CFR 50.75 and 10 CFR 50.82. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: The Yankee Rowe nuclear power station is a clear example of the inability to accurately assess the final cost of decommissioning. Originally decommissioning estimates ran under $100 million dollars while the current expenditures are estimated to be just under $500 million for the small 170 megawatt pressurized water reactor. The Shoreham nuclear power station can not be relied upon as an accurate gauge for decommissioning costs as it never reached full power operation. (**CL-48/24**)

Comment: The cost is one thing. It was awful, very high cost [Yankee Rowe], up in the millions. I don't remember how much. (**AT-D/1**)

Response: *Cost estimates are highly variable and estimates are precisely that: estimates. As experience increases with decommissioning, improved criteria will be developed to more accurately predict decommissioning costs. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Regarding economics, the NRC needs to pay attention to decommissioning costs proposed by Georgia nuclear utilities during rate cases and other proceedings so there is not a situation created where much needed monitoring and maintenance is ignored simply because there was no regulatory attention to the real cost of decommissioning. (**AT-A/31**)

Response: *The NRC regulations (10 CFR 50.75) require licensees to establish a decommissioning trust fund for each power reactor. The amount of money required in the fund at the time of permanent cessation of operations is based on formula given in 10 CFR 50.75(c). The funds are specific for the radiological decommissioning of the facility. The staff recognizes that State rate case proceedings may provide a more detailed site specific estimate of decommissioning costs; however based on our experience to date the amount of money required by 10 CFR 50.75(c) is adequate to assure radiological decommissioning of the facility. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: And the other is, isn't this fund built through rates, so what happens if it goes off line or even if the company is no longer billing. There seems to be a couple of vulnerabilities. (**AT-G/7**)

Response: *If a facility shuts down prematurely before the decommissioning trust is fully funded, or if it unexpectedly finds itself having to shift to a more costly decommissioning option, the facility license holder is still obligated to fund the entire cost of decommissioning. Most power generators are diversified and are able to continue to add funds to their decommissioning trust fund. To date, none of the license holders of prematurely shutdown power reactor facilities have defaulted on their decommissioning funding obligation. Bankruptcy does not necessarily mean that a power reactor licensee will liquidate. To date, the NRC's experience with bankrupt power reactor licensees has been that they file under Chapter 11 of the Bankruptcy Code for reorganization, not liquidation (for example, Public Service Company of New Hampshire, El Paso Electric Company, and Cajun Electric Cooperative). In these cases, bankrupt licensees have continued to provide adequate funds for safe operation and decommissioning, even as bondholders and stockholders suffered losses that were often severe. Because electric utilities typically provide an essential service in an exclusive franchise area, the NRC staff believes that, even in the unlikely case of a power reactor licensee liquidating, its service territory and obligations, including those for decommissioning, would revert to another entity without direct NRC intervention.*

Additionally, an NRC-licensed facility undergoing decommissioning or a site that is not under license but is undergoing decommissioning under NRC's regulations may also warrant remediation under the Comprehensive Environmental Response, Compensation, and Liability Act (referred to as "CERCLA" or "Superfund"). These statutory provisions might become particularly relevant at sites for which funding is inadequate for cleanup. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: When, and if, spent fuel storage is increased at the above mentioned facilities, the additional upward "adjustments" will have a significant impact on decommissioning funding. This cost, which was omitted from TLG's estimate, "None of the estimates we have prepared include the cost of disposal of spent nuclear fuel" is the main contributing factor to the escalation of decommissioning costs at Yankee Rowe. (**CL-02/22**)

Response: *As discussed in Table 1-1 of the Supplement, issues related to spent fuel maintenance and storage (including costs) are outside the scope of this Supplement. Appendix D provides additional information on spent fuel. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Inflation must also be added to costs. (**CL-20/49**)

Response: *The cost estimates provided in the Supplement reflect constant dollar costs (e.g., January 2001). However, the funding assurance for decommissioning trust fund accumulation does reflect inflation. The comment did not provide new information relevant to this Supplement and will not be evaluated further. This comment did not result in a change to the Supplement.*

Comment: Three Mile Island Alert (TMIA) and the EFMR Monitoring Group (EFMR) do not dispute the contention of "electric utilities" (I) and the Nuclear Regulatory Commission (NRC) that radiological decommissioning and radioactive waste isolation expenses are subject to change and likely to increase. (**CL-02/1**)

Response: *This comment is a statement of agreement and did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.10 Socioeconomics

Comment: Georgians for Clean Energy is also concerned about economic impacts to the local communities associated with decommissioning. Currently, according to the NRC relicensing documents on Hatch, Appling County, where the plant is located, receives an unhealthy 68 percent of its tax revenue from Southern Nuclear. Provisions for environmental staff and maintenance staff be established in perpetuity and all costs then be borne by the parent company of the licensee. The local community should not have to shoulder these costs. In the case of Appling County, after they lose their tax base, they would not even be able to remotely afford any type of monitoring. Again, it is apparent that communities are left dealing with tremendous problems and little or no resources to address them properly. (**AT-A/30**)

Response: *NRC does not require monitoring or maintenance at facilities once the license is terminated for unrestricted release. NRC acknowledges that communities typically experience a large decrease in tax revenue once a plant permanently ceases operation. However, this issue is clearly outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: J. 1 2. and Table J-3. All relevant information is provided on pages 45-46. (**CL-02/68**)

Response: *The staff does not understand the comment which was provided in bullet format. The reference to "pages 45-46" is unknown. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Table J-4 should incorporate data provided in F. Nuclear Plant Valuation pages 26-27 and pages 44-45. (**CL-02/69**)

Response: *Data on impacts to local public services associated with plant closure for Three Mile Island Unit 2 (TMI-2) was included for information. Because TMI-2 closure was the result of a major accident the staff had difficulty separating out which impacts were due to plant impacts and which impacts were due to the accident and the public's perception of impacts associated with the accident. The staff concluded that the impacts on public services from TMI-2 closure were SMALL. Although, the staff recognizes that impacts on the community due to the accident were significant. Since Supplement 1 deals with plant closures not as a result of a major accident, inclusion of the commentor's information would be inappropriate. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The draft Supplement discusses the economic impacts of decommissioning, including the fact that the Barnwell Low-Level Radioactive Waste Management Disposal Facility in South Carolina, the last remaining facility to dispose almost all classifications of LLW, is scheduled to stop accepting LLW from all NRC licensees except those in the Atlantic Compact, by 2009. Id. at 4-43. Yet, decommissioning of most nuclear power reactors is not expected to occur until after 2009. The existence of the EnviroCare disposal facility in Utah, which can accept Class A wastes for disposal, mitigates the economic impact of losing Barnwell, but nuclear power plant operators still are expected to incur significant waste disposal costs. The Supplement discusses how these costs are passed on to electricity customers. The Supplement also analyzes the socioeconomic impacts of decommissioning with respect to the communities surrounding power reactors. These impacts include direct and indirect job losses, losses in tax revenues and reductions in local governments' ability to pay for public services. Id. at 4-47 - 4-53. Yet, the draft Supplement does not discuss the economic and socioeconomic impacts on the metals industries related to the release of radioactively contaminated scrap metal into the economy. (**CL-03/5**)

Comment: MIRC urges NRC to look at all of the economic consequences (i.e., lost sales, employment reductions, and losses in sales by suppliers of equipment, materials, and services to metals industries) to be incurred by the metals industries and allied sectors, as well as the losses in tax revenues to be incurred by governmental entities. (**CL-03/7**)

Response: *The Supplement assumes that licensed burial sites would be available for the disposal of all categories of low-level waste at the time burial capacity is needed. The reader correctly identifies potential problems in the future disposal of low-level waste but the staff is confident that sufficient burial capacity will be available when needed.*

Currently, licensees at power reactors undergoing decommissioning are prohibited from releasing any solid material that has any detectable contamination. A discussion on the impacts of the release of contaminated scrap metal on the scrap metal industry is highly speculative. Furthermore, the release of contaminated scrap metal is prohibited under current regulations and clearly outside the scope of this Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: Page. J-2, Table J-1, Impact of Plant Closure and Decommissioning at Nuclear Power Plants Currently Being Decommissioned. Maine Yankee's Post Termination Work Force should be 360 rather than 246 resulting in a Maximum Work Force Change of 121 rather than 235. (**CL-04/14**)

Response: *Table J-1 was changed to include the revised work force numbers.*

Comment: Georgians for Clean Energy is also concerned about economic impacts to the local communities. (**CL-08/15**)

Response: *Socioeconomic impacts on communities near decommissioning facilities are discussed in Section 4.3.12 of the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: As we have stated in earlier comments, adequate attention to issues surrounding economic justice and the long-term negative economic implications of decommissioning plans in the community have not been thoroughly studied. Reactor sites are often contaminated and made undesirable and unsafe for future economic development. (**AT-A/40**)

Response: *The NRC acknowledges that communities typically experience a large decrease in tax revenue once a plant permanently ceases operation. However, this issue is clearly outside the scope of this Supplement. The staff believes that Section 4.3.12 adequately addresses the socioeconomic implications of decommissioning. The staff has determined that the impact is SMALL and that no site-specific analysis is necessary. With respect to future economic*

development of the site, the established site release criteria will ensure that any future use of the site is adequate to ensure public health and safety and protection of the environment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: This "revised" document also failed to adequately address and factor the socioeconomic impact of "Greenfield" on the revenue base of local municipalities. (**CL-02/34**)

Response: *The NRC is responsible for ensuring the radiological decontamination of the facility. The socioeconomic impact of "Greenfield " is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: There are changing community conditions at these reactors....Last night the Mecklenburg County Board of Commissioners approved a 4,000-plus home development by Crescent, which is, of course, Duke, around the Catawba reactor. So there are changing conditions at these nuclear power plants that deserve your attention and will not fit into any generic environmental impact statement. (**AT-B/14**)

Comment: (4.3.1.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Socioeconomics - Conclusions:

> The staff concludes that shutdown and decommissioning of nuclear facilities produces socioeconomic impacts that are generic. The impacts occur either through the direct effects of changing employment levels on the local demands for housing and infrastructure or through the effects of the decline of the local tax base on the ability of local government entities to provide public services.
>
> There can be no generic measure of the socioeconomic impact of any community without an in-depth study of a number of driving variables. Nuclear plants are subject to various regulations and tax codes based on location, plant history, levels of corporate investment, composition of work force, state and municipal legislation, economic diversity, and municipal relationships.
>
> Any further cuts in tax revenues, community giving or employment levels, i.e. "SMALL 10%" or "MODERATE 10-20%", create undue economic hardships. (**CL-02/58**)

Response: *The Supplement examined the issue of socioeconomic impacts generically at facilities undergoing decommissioning activities and concluded that the impacts were generic*

and SMALL for all plants. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: In 1986, the TMI-2 defueling work force peaked at 2,000. Today less than a dozen AmerGen employees police Unit 2. (**CL-02/55**)

Response: *Table 1-1 of this Supplement specifically lists an evaluation of impacts at facilities that have been permanently shutdown by a major accident as outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Before TMI reaches decommissioning, the community has already lost 250 jobs, and over $220,000 in tax revenues. Pennsylvania is not similar to Connecticut (22) whereby the difference in pre- and post-deregulation revenues are made up by the state. These jobs and revenues are lost forever. Most local and state taxing authorities classify "Greenfield" as non-commercial, tax-paying status. Moreover, TMI and Peach Bottom are located in rural areas that are sensitive to seasonal fluctuations. Farm revenues in the 1980s were sharply down due to drought, avian flu epidemics, and an informal boycott by consumers who did not want to purchase TMI-tainted produce, dairy products, or beef and poultry. (**CL-02/59**)

Response: *Differences between pre-and post-regulation tax revenues are discussed extensively in Section 4.3.12.2. The impacts generally are proportionate with the percentage of total revenue in local jurisdictions (with rural jurisdictions generally more dependent on the lost revenues). The section notes that the impact on the community also depends on manner in which the state and locality treat the plant for tax purposes and whether the state shares the burden with local government. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The draft supplement attempts to reflect the impact of plant closure on jobs, community tax revenues, and population. The impact of reactor shutdown must be considered apart from decommissioning. The decision to shutdown, to lay-off workers, to devalue the plant for tax purposes and so on, is not automatically a decision to decommission the plant. It may be a shutdown for a long-term repair or upgrade period. Or it may be intended to mothball the facility with the decision to decommission or not delayed a decade or more. In any case, if work force reduction at shutdown is a part of decommissioning, then work force replenishment because of fuel storage or enforcement of administrative site release conditions should also be considered. (**CL-13/5**)

Response: *The impacts of work-force reduction and increase related to closure and decommissioning were handled on a net basis—the difference between the decommissioning work force and the (usually much larger) operational work force. The possibility of a long delay between shutdown and active decommissioning is specifically discussed in Section 4.3.12.3. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Table J-1 Impact of Plant Closure and Decommissioning at Nuclear Power Plants Currently Being Decommissioned includes three plants that have already passed from decommissioning to license termination. Maximum work force and post termination work force figures are scant, incorrect, misleading, and more or less, useless for the purpose of gaining usable information. Maine Yankee currently has more than 400 workers on site; not 295 as listed. Without a reference date, maximum work force numbers mean what? During outages? During major repairs and retrofits? Of twenty-two plants listed, work force figures are given for only seven. (**CL-13/8**)

Response: *A footnote was added to Table J-1 to note the three plants whose licenses have been terminated. Regarding work force, the staff relies on information provided by the licensee. The staff recognizes that staffing levels fluctuate over time. The numbers were provided to give the reader some understanding of the magnitude of the changes. Table J-1 was revised.*

Comment: Table J-2 Impact of Plant Closure and Decommissioning on Population Change shows no causal relationship between closure, decommissioning and population change. Of twenty-one plant locations listed, all save two show population increases in the host county following plant closure. Did Rainer County, Oregon increase its population by 16.5 percent as an impact of the Trojan Nuclear Plant shutdown? It is even harder to credit that the impact of the closure of 65 MWe Humbolt Bay is an increase in the population of California of 25.8 percent. This may be the stupidest table ever presented in an NRC document. (**CL-13/9**)

Response: *The title of Table J-2 was revised to "County and State Population Changes During Plant Closure and Decommissioning." The population changes provided in the table are simply those that occurred at about the same time as plant closure. These were almost all increases and many were fairly substantial but did not result from decommissioning. The population increases occurred despite the effects of plant closure. However, the population increases did mitigate the effects of plant closure. The intent of the table was to show that any negative effects of plant closure on county population were not so large as to actually result in a net population decrease. Rainier County, Oregon, and Humboldt County, California, both grew for reasons independent of plant closure.*

Comment: Table J-3 Impact of Plant Closure and Decommissioning on Local Tax Revenues does not show any impacts of decommissioning activities on tax revenues there fore the table is incorrectly titled. There could be some small near term impact of decommissioning on tax revenues, for example, taxes levied on capital equipment purchased by local vendors working on decommissioning and taxes on spent fuel storage facilities. (**CL-13/10**)

Response: *The title of Table J-3 was revised.*

Comment: No effort is made to determine if marketability of local homes is increased by nuclear plant close. Marketability would determine price and ultimately impact tax-base. (**CL-13/11**)

Response: *It was not possible to isolate the effects of nuclear plant closure on marketability. There likely were three effects, which appear to be inextricably linked: (1) loss of labor force as a result of closure (reduced marketability), (2) perception of an improved environment for some people (increased marketability), and (3) other unrelated economic and demographic changes in the community (either direction). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: At sites considered for re-powering, no consideration is given to the tax worth of the re-powered site. Haddam Neck, for example, has applied for early partial site release so that the construction of a gas-fired plant may begin even before decommissioning is completed. Fort St. Vrain hosts a gas-fired plant. If impact of closure is to be considered in a GEIS on decommissioning, so then should reuse be considered. (**CL-13/12**)

Response: *Repowering is a separate decision from decommissioning and should be analyzed separately. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In Maine, utility ratepayers are entitled to share in moneys recovered from the sale of plant components and commodities, such as pipe and cable, as well as real estate and unspent decommissioning funds. While not taxes, per se, these are funds or credits added to the general public revenue. (**CL-13/13**)

Response: *Section 4.3.12.3 was modified to reflect this additional income stream.*

Comment: Regarding the loss of local tax revenues due to "decommissioning." The utility must be required to notify the local government as far in advance as possible that they will lose taxes. (**CL-20/50**)

Response: *Although the NRC staff agrees with the comment that the licensee should notify the local government as far in advance of the permanent cessation of operation as possible, a requirement to do so is not within the scope of current NRC regulations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The nuclear industry - the entire industry - (from nuclear plant owners to uranium enrichment plants to users of radiation for medical experiments posing as "therapy" etc) should have a tax levied on it by NRC to be paid into a special account to go towards compensating the communities. An additional tax can be levied on them yearly in the form of a small, flat fee which would help pay for the NRC and the EPA to do quarterly inspections at facilities, in perpetuity. (**CL-20/51**)

Response: *Consideration of a special "tax" to compensate local communities is outside the scope of this Supplement. NRC's core mission is public health and safety and protection of the environment with respect to the use of by-product and special nuclear material. Based on the requirements in 10 CFR Part 171, "Annual Fees for Reactor Licenses and Fuel and Material Licenses," licensees are charged fees to defray the cost of NRC's activities including inspections. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: If decommissioning is to be risk-informed and the impacts of shut down are to be considered, then the cost and environmental and risk impacts of continued operation should also be compared. Maine Yankee shutdown rather than face the costs of steam generator replacement and correction of a host of safety defects, including system-wide cable separation issues, inadequate high energy line break protection, inadequate containment volume, marginal emergency diesel generator capacity, 95 percent of fire seals defective, undersized atmospheric steam dump valves, and on and on. Haddam Neck had similar problems. Just prior to the closure of Yankee Rowe, NRC staff was arguing internally about the sanity of permitting the plant to run one more fuel cycle with a badly embrittled reactor vessel. (**CL-13/6**)

Response: *The licensee's decision to permanently cease operations is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.11 Environmental Justice

Comment: Facilities included in the NRC's review of information during preparation of the draft supplement should be able to use the NRC's conclusions on socioeconomic impacts instead of performing an additional assessment along with a license-amendment request. In Section 4.3.13, the results of the evaluation stated (page 4-56, lines 30-32) that "in the

21 decommissioning case studies observed, it is concluded that facility decommissioning should have a SMALL socioeconomic impact on low-income and minority populations." At the same time, given that populations differ near each reactor site, the staff concluded that environmental justice was a site-specific issue. The NRC should revise the GEIS Supplement to clarify that licensee of a plant that was one of the case studies can refer to the staff's assessment that this was a SMALL impact instead of having to perform a site-specific evaluation and submit a license amendment request. (**CL-01/6**)

Response: *Section 4.3.13 was revised. It cannot be concluded from the general indicators in Table J-5 that any of the specific plants would not have an environmental justice issue; rather, that it would be unlikely. Therefore, a site-specific analysis of environmental justice is necessary*.

Comment: Table J-5 fails to acknowledge that the "white" population is not monolithic. In the case of Three Mile Island a "special white population", i.e. the Amish does not utilize electricity, telecommunications, or mechanical transportation, and lives in close proximity to the plant. (**CL-02/70**)

Response: *Executive Order 12898 on Environmental Justice explicitly identifies three populations: minority, low income, and Native American. The low-income Amish would meet the criteria for consideration under the Presidential Executive Order. The Amish do not otherwise qualify as a special population group. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: 4.3.13 Environmental Justice (4.3.13.4), page 4-57, last para., last sentence. This conclusion indicates that licensees will need to provide appropriate information related to environmental justice as part of the environmental portion of the PSDAR, but it does not specify what kind of information is needed or what evaluation criterion should apply. (**CL-04/8**)

Comment: Section 4.3.13, p 4-57, last paragraph - This conclusion indicates that licensees will need to provide appropriate information related to environmental justice as part of the environmental portion of the PSDAR, but it does not specify what kind of information is needed or what evaluation criterion should apply. (**CL-05/17**)

Response: *Section 4.3.13, Environmental Justice, has been revised. The text now states that at the time of the PSDAR submittal, the staff will consider the impacts of environmental justice*. *The supplement does not specify the kind of information received. The staff will address information needs in an update to Regulatory Guide 1.184, Decommissioning of Nuclear Power Reactors, July 2000, and Regulatory Guide 1.185, Standard Format and Content for Post-Shutdown Decommissioning Activities Report, July 2000.*

Comment: (4.3.1 3.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS Environmental Justice - Conclusion: The NRC made the appropriate demarcation and concluded,"...the issue of environmental justice requires a site-specific analysis." (**CL-02/60**)

Response: *The comment agrees with a conclusion from the Supplement but did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.12 Cultural Resources

Comment: 4.3.14 Cultural, Historical and Archeological Resources (4.3.14.4), pg. 4-61, last paragraph in section 4.3.14.4, last sentence. This conclusion indicates that the NRC will meet its responsibilities on a site-specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees. (**CL-04/9**)

Response: *The staff's responsibilities are further described in Section 1.5. The staff is committed to conduct appropriate consultations as needed. This Supplement is not a guidance document or a review document. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 4-58, Section 4.3.14. EPA appreciates that, on the whole, decommissioning is not likely to affect previously undisturbed archeological resources potentially located near the facilities, but is concerned about the potential loss of these facilities as a body of engineering work. The Supplement mentions that a few facilities may be eligible for listing on the National Register of Historic Places individually and that those facilities would then be the subject of mitigation based upon consultation with the SHPO. Eventually, however, a substantial number of facilities may be decommissioned. While the facilities themselves may not be fifty years old nor require physical in situ preservation, the processes and engineering they employed may merit inclusion in the Historic American Engineering Record (HAER). The HAER is designed to provide uniform documentation standards so future scholars can look back at our achievements and study them for a multitude of purposes. Rather than make this determination on a case-by-case basis, the NRC may want to consider working with the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers to achieve a programmatic agreement or other programmatic treatment for these facilities. (**CL-16/69**)

Response: *Section 4.3.14.2 was modified to include a reference to the Historic American Engineering Record. The NRC staff is considering working with the National Conference of State Historic preservation Officers on the appropriate actions to be taken for the preservation of significant historic or engineering achievement that might be applicable to a specific facility undergoing decommissioning.*

Comment: (4.3.1 4.2) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS Cultural Resources; Conclusions: The NRC properly concluded,"...the magnitude, (i.e., SMALL, MODERATE, LARGE) of potential impacts will be determined through a site-specific analysis." (**CL-02/61**)

Response: *The comment agrees with a conclusion from the Supplement for activities beyond the operational area. It did not, however, provide new information relative to the Supplement and will not be evaluated further. The comment did not result in a change to the Supplement*.

Comment: One issue that needs to be factored into the equation is what happens when the object of decommissioning has been declared a historical marker, i.e. Three Mile Island-2? (**CL-02/62**)

Response: *Section 4.3.14.2 has been revised to address this comment*.

O.1.13 Aesthetics

Comment: Public opposition to a facility is not an objective criterion for determining the impact of decommissioning on aesthetics. In Section 4.3.15.2, the magnitude of potential impacts on aesthetics is described as proportional to how vigorously the plant is opposed by the host community. Opposition to a facility if frequently expressed by a few vocal individuals or groups who do not necessarily reside in the area, but who are philosophically opposed to the peaceful use of nuclear power. These individuals will continue to speak in opposition against a facility as a matter of principle, even when the facility begins decommissioning and site restoration. Since aesthetic issues are a function of each individual's perception, opposition to the facility should not be used as a criterion for assessing environmental impact. A more objective and justifiable approach would be to apply the other criteria described in this section (the facility's impact on the skyline, noise, land disturbance, traffic) or to consider recreational use, if any, in determining the magnitude of decommissioning impacts. (**CL-01/7**)

Comment: Decommissioning and decontamination tasks affect people's perception, especially when these visibly intrusive and audibly offensive activities are in close proximity to their homes and recreational areas. Peach Bottom and Three Mile Island are located next to prime water

skiing and boating areas on the Susquehanna River. Dozens of summer cabins are located less than 100 yards from TMI on Sholley. Fishing takes place on a daily basis, and Boy Scout badges are available by completing outdoor activities on Three Mile Island. (**CL-02/46**)

Response: *The staff has generically determined that the aesthetic impacts of decommissioning activities are SMALL (Section 4.3.15.4 of the Supplement). The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The GEIS could have looked more closely at TMI-2, and considered the following "visual scenarios":

On August 5, 1992, GPU "declared an event of potential public interest when the Unit-2 west cooling tower caught fire." The fire lasted for ten minutes. This was the third fire at TMI-2 during the cleanup. The Department of Environmental Resources subsequently instructed GPU to dismantle the wooden paneling and waffling at the base of the cooling towers. The cooling towers now serve as a nesting ground for "fugitive" swallows. (**CL-02/64**)

Response: *The aesthetic issues that were considered in the Supplement on Decommissioning of Nuclear Facilities are of a longer term than would be considered for a small fire of short duration, such as that referred to in the comment. Any visual intrusion (such as dismantlement of buildings or structures) would be temporary and would serve to reduce the aesthetic impact of the site. The use of building structures by nesting birds would not be considered a criterion for determining aesthetic impacts. In addition, Table 1-1 indicates that activities at facilities that have been permanently shut down by a major accident are outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.14 Noise

Comment: Section 4.3.16.2 Potential Impacts of Noise from Decommissioning Activities seems to deal with noise as significant only at hearing-loss levels, however the admission is made that noise can be annoying. It can also degrade the general environment, and the aesthetic environment, lead to sleep loss, diminished creativity, and lost sales of goods and property. Where decommissioning schedules require night work, large pneumatic hammers can be heard miles distant from the site. The GEIS should also consider noise from explosive demolition. (**CL-13/16**)

Response: *Section 4.3.16 was revised. This Section discusses levels of noise that are used by government agencies to describe levels of environmental noise. In general, the noise created by decommissioning activities will be similar to noise associated with construction and*

industrial activities. This noise may be heard offsite, but because of the duration of decommissioning activities, it is unlikely that the noise associated with most decommissioning activities, will be of sufficient strength to be environmentally detectable or to destabilize the environment. Some decommissioning activities may involve demolition methods (e.g., pneumatic drills or explosives) that produce significantly higher noise levels. Use of these methods is limited to relatively short periods or isolated events during decommissioning. The environmental effects of these activities may be minimized by properly scheduling the activities, for example, by restricting the use of pneumatic drills and restricting explosives to day shift or by restricting explosive demolition during nesting season.

O.1.15 Transportation/Transportation Dose Impacts

Comment: Now, again, the document here outlines the fact that most—the major impact from radiation would be from low-level radioactive waste transport of the reactor itself, the vessel, to a low-level radioactive waste site. People living all along the waste site, primarily people living in town around that reactor, and all along the transport route along the way to—if it's South Carolina or Nevada or whatever ultimate destination this reactor vessel would have, amounts to many thousands of people, if not hundreds or thousands or millions of people. This level of human carnage cannot and should not be considered as quote, too small to be detectable. (**AT-F/7**)

Response: *Although many people may be potentially exposed to radiation during transport of radioactive materials, transportation regulations limit the dose rate from shipments including the shipment of the reactor vessel and internals, such that the dose to a given individual is very small and would represent a negligible risk to human health. The NRC is committed to preventing detrimental health impacts to the public. NRC has regulations covering the packaging and transport of radioactive material. These regulations are found at 10 CFR Part 71. NRC regulations related to exposure to the public are found at 10 CFR Part 20. In addition, the U.S. Department of Transportation and the U.S. Environmental Protection Agency have regulations to protect the public from health effects associated with radiation. U.S. Department of Transportation regulations related to transportation of radioactive material are found at 49 CFR Part 173, and the Environmental Protection Agency regulations related to radiation are found at 40 CFR Parts 190 through 194. Licensees are required to comply with these regulations during decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: VIII. TRANSPORTATION Please refer to (4.3.1 7.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Transportation - Conclusions: Please refer to the Enclosure which features articles highlighting problems with transporting spent fuel from TMI to Idaho. (**CL-02/71**)

Comment: (4.3.17.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Transportation - Conclusions: Please refer to the Enclosure which features articles highlighting problems with transporting damaged fuel from TMI to Idaho. (**CL-02/65**)

Response: *The comments refer to transporting the TMI-2 core debris resulting form the 1979 accident to the Idaho National Environmental and Engineering Laboratory in Idaho. Section 1.3, "Scope of This Supplement," specifically excludes decommissioning activities following shutdown of a facility after a major accident because they would require site-specific review. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: This section does not seem to give sufficient attention to licensees that are removing all above grade structures from the site and transporting all of the above grade concrete offsite. The volume of concrete for PWR DECON is much too low for this situation by a factor of three or four. Provided below is Maine Yankee's License Termination Plan Revision 2. This waste volume is greater than that assumed in the GEIS. However, even with the increased LLW Volume associated with the removal of all above grade concrete, Maine Yankee's estimates of public dose is still less than that assumed in the draft supplement or the 1988 GEIS because of the extensive use of rail transportation. (**CL-04/10**)

Comment: Section 4.3.17, pg. 4-68 - This section does not seem to give sufficient attention to licensees that are removing all above grade structures from the site and transporting all of the above grade concrete offsite. The volume of concrete for PWR DECON is much too low for this situation by a factor of three or four based recent experience. (**CL-05/19**)

Response: *Additional shipments of uncontaminated waste from a site in response to State or local requirements to remove all above ground structures would not affect the dose estimates to the public because the material is not contaminated. The additional shipments could result in an increase in nonradioactive fatalities due to an increase in trucking or rail accidents. However, the accident rate is so small that even a three or four fold increase in the nonradioactive accident rate would still result in a small impact. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Appendix K Transportation Impacts, pg. K-2, Table K-1 Low-Level Waste Shipment Data for Decommissioning Nuclear Power Facilities {LLW Volume for Maine Yankee is indicated as 5920 cubic meters. The Maine Yankee LTP Rev. 2 states: 31,924 cubic meters for transport and 26,920 for disposal after processing}. (**CL-04/15**)

Response: *Appendix K was changed to include the revised number for LLW volume.*

Comment: Section 4.3.4, pg. 4-14, last paragraph - This statement indicates that in most cases the number of shipments of other materials (nonradioactive materials) will be small compared to those for LLW. This is not necessarily the case for a plant that is removing all above grade facilities. However, this fact should not affect the conclusion that the air quality related environmental impacts for these activities will be small. (**CL-05/13**)

Response: *Section 4.3.4 was revised and the comparison of the amount of contaminated to noncontaminated material was eliminated.*

Comment: Page 4-68, Section 4.3.17.1. This section should address regulations governing the transportation of hazardous and mixed wastes as well as of low-level waste. (**CL-16/70**)

Response: *Section 4.3.17.1 was revised to include a reference to the regulations regarding the transportation of hazardous, mixed waste and radioactive material.*

Comment: Table 4-6 Radiological Impacts of Transporting LLW to Offsite Disposal Facilities is something of a puzzle. Waste volumes and radiological impacts in the table are much greater for the SAFSTOR decommissioning option (45,000 cubic meters/78 person-rem) than for the DECON option (10,000 cubic meters/48 person-rem). Same plant, if you let the radiation dissipate with time, you wind up with more waste. With all due respect, this makes no readily apparent sense. (**CL-13/17**)

Response: *Data on the volume of waste to be shipped and the number of shipments was obtained from licensees undertaking decommissionings. Waste volumes vary considerably from facility to facility and depend on many factors including State and local requirements for the disposal of solid waste. Rather than present the data by decommissioning option the staff revised the text in Section 4.3.17 and Table 4-6 providing potential impacts associated with the shipment of waste from a hypothetical facility. The number of shipments represents a reasonable number of shipments from a facility undergoing decommissioning and is based on existing data and projections provided by licensees. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Draft shows the awful DOT and NRC regulations for transport and radiation levels allowed page 3-14, these should be changed to be massively lower, this can be done by better shielding and more shielding and the transport of fewer assemblies per cask or fewer rods per cask, and shielding that is thick enough that anti-tank weapons would not penetrate

through to the fuel. Disguising the shipments is not an option due to the size of the casks, therefore far stricter security i.e., military escorts and the sealing off of roads ahead of transports would be a must. (**CL-20/85**)

Comment: The NRC needs to pass rules on these issues, and put out orders for more and better transport casks and vehicles. All shipments of LLW should also fall under these better packaging and shielding standards. If the NRC does not address all these issues as part of decommissioning, future generations (that means YOUR children and grandchildren) are going to die due to NRC's lack of actions today. (**CL-20/86**)

Comment: If you're going to cut apart a plant and pack it and ship it, everybody along the route is exposed to the danger and whatever is left is an exposure to the people who still live there. (**AT-D/6**)

Response: *The NRC is committed to preventing detrimental health impacts to the public. NRC has regulations covering the packaging and transport of radioactive material. These regulations are found at 10 CFR Part 71. NRC regulations related to exposure to the public are found at 10 CFR Part 20. In addition, the U.S. Department of Transportation and the U.S. Environmental Protection Agency have regulations to protect the public from health effects associated with radiation. U.S. Department of Transportation regulations related to transportation of radioactive material are found at 49 CFR Part 173, and the Environmental Protection Agency regulations related to radiation are found at 40 CFR Parts 190 through 194. Licensees are required to comply with these regulations during decommissioning. The regulations are sufficiently protective to assure the safety of the public. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. As noted in Chapter 1, the transport of spent fuel is outside the scope of this document. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Georgians for Clean Energy does not promote the idea of shipping nuclear waste all over the country. (**CL-08/21**)

Response: *The comment is general in nature and did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In addition, many reports of lost shipments of nuclear waste and materials, including fuel rods, in various parts of the country come to light, another hazard of transporting radioactive materials. (**CL-10/4**)

Response: *The only missing fuel rods known to NRC are those at the Millstone Nuclear Plant. Although the location of the two missing fuel rods has not been determined, the staff has concluded that the fuel rods were not lost during transportation. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.1.16 Conclusions

Comment: It is hard to believe that decommissioning activities will have a small impact on water quality or air quality. Construction and demolition sites across Georgia, most of which do not have nuclear contaminants fortunately, contribute to the degradation of our rivers and air. How can an enormous project such as decommissioning an entire nuclear plant, which will involve the handling of nuclear contaminated materials, have a small impact? (**AT-A/34**)

Comment: We are still concerned that the NRC mistakenly poses that decommissioning activities will have a small impact on water quality or air quality. Construction and demolition sites across Georgia, most of which do not have nuclear contaminants, contribute to the degradation of our rivers and air. Georgians for Clean Energy would like to know how the NRC determined that an enormous project such as decommissioning an entire nuclear plant, which will involve the handling of nuclear contaminated materials, would have a SMALL impact or air and water quality. We have already requested a copy of the analysis that was done to make this determination, and since we have not received that analysis yet we continue to urge that the NRC make this available to the general public and us. (**CL-08/18**)

Response: *Decontamination and dismantlement of structures, systems, and components are conducted under highly controlled conditions. Impacts of construction and deconstruction activities are mitigated by best management practices. A discussion of the analysis for all the environmental issues addressed in the Supplement can be found in Chapter 4 (see 4.3.3, "Water Quality," 4.3.4, "Air Quality," and 4.3.8, "Radiological"). The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: We request a copy of the analysis that was done to make this determination. (**AT-A/35**)

Response: *The staff's analysis can be found in the Supplement. A discussion of the analysis for all the environmental issues addressed in the Supplement can be found in Chapter 4 (see 4.3.3, "Water Quality," 4.3.4, "Air Quality," and 4.3.8, "Radiological"). No separate analysis is available. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement*.

Comment: Finally, considering the importance of the Great Lakes to the world and to this region, we think that the impact should be addressed specifically. It is not appropriate to lump them under a generic impact analysis. (**CH-A/10**)

Comment: Considering the importance of the Great Lakes, which represent 20% of the world's freshwater supply, the NRC should prepare a site-specific impact analysis for the 18 nuclear facilities located on the United States side of the Great Lakes. (**CL-11/2**)

Response: *The variability between a commercial nuclear plant located on the Great Lakes versus one located on the ocean, a man-made impoundment, or a river was carefully considered in evaluating the environmental impacts from decommissioning activities. The NRC established an envelope of environmental impacts resulting from decommissioning activities, identified those activities that can be bounded by a generic evaluation, and identified those that require a site-specific analysis. The NRC concentrated the environmental analysis on those activities with the greatest likelihood of having an environmental impact. Even for those impacts that have been determined to be generic, a licensee is required to do a site-specific analysis before undertaking any decommissioning activity to determine whether the impacts fall within the generic envelope. If they are outside the bounds of the generic envelope, the licensee must seek approval from the NRC (see Section 1.5) The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The NRC staff correctly concluded,"...the magnitude, (i.e., SMALL, MODERATE, LARGE) of potential impacts will be determined through a site-specific study …" This flexible barometer should be applied to all of the above mentioned Conclusions. (**CL-02/52**)

Response: *The comment agrees with the staff's conclusions in the GEIS. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement*.

Comment: I am strongly opposed to the attempts to designate many issues as generic instead of site-specific and thus to remove these issues form public review and comment. (**CL-26/1**)

Comment: I also strongly oppose and object to the proposed supplement to the "Generic" E.I.S., and the deliberate and inappropriate exclusion of "site-specific" issues, which should be an imperative part of any analysis, for any form of an E.I.S. Supplement. (**CL-44/2**)

Comment: We are deeply concerned about the NRC's proposal to treat almost all decommissioning issues in a generic EIS rather than in an individual EIS for each plant. As we have seen in many of the licensing proceedings, nuclear plants have a wide variety of dissimilarities, even with other plants owned by the same utility and constructed by the same

companies. These differences are compounded when it comes to decommissioning as the different work plans for each plant may have considerably different impacts on workers onsite and the public offsite. (**CL-40/1**)

Comment: Labeling certain issues "generic" and making them unchallengable is a disservice to those communities and citizens around the country who may be exposed to radioactive waste during the transport and disposal process. (**CL-45/3**)

Response: *The NRC established an envelope of environmental impacts resulting from decommissioning activities, identified those activities that can be bounded by a generic evaluation, and identified those that require a site-specific analysis. The NRC concentrated the environmental analysis on those activities with the greatest likelihood of having an environmental impact. Even for those impacts that have been determined to be generic, a licensee is required to do a site-specific analysis to determine whether the impacts fall within the generic envelope. If they are outside the bounds of the generic envelope then the licensee must seek approval from the NRC. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Reactor sites are often contaminated to the extent that the location is made undesirable and unsafe for future economic development. As we stated at the public meeting in Atlanta, Georgians for Clean Energy urges that site-specific studies be conducted. For example, the economy of rural Georgia is much different from that of urban New York. How can these impacts be treated generically? Some nuclear power plants are in urban settings where economic impacts could be much different that in rural areas that have little or no other major employer in the region. (**CL-08/26**)

Response: *In evaluating the environmental impacts from decommissioning activities, the staff took into consideration that there are wide varieties of types of plants, for example, size and location of plants, operating conditions, and levels of contamination. Even for those issues that are considered generic, each licensee, before they conduct a decommissioning activity, must determine that they are within the envelope of those environmental impacts. Most impacts were determined to be of SMALL significance, which meant that the impacts were not detectable in the environment or were so minor as not to destabilize or noticeably alter an important attribute of the environment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Any work on or removal of an intake/outfall structure should trigger site-specific analysis. Indeed, the Draft GEIS explains that the removal of near-shore or in-water structures could result in the establishment of nonindigenous species to the exclusion of native species.

DGEIS, 4-17. It also explains that in some cases wetlands will develop in areas where the construction of the facility alters surface drainage patterns. DGEIS, 4-18. The Draft GEIS suggests that site-specific analysis is appropriate in certain circumstances when the impact is beyond the previously disturbed area and when there is a potential to impact the aquatic environment. DGEIS, 4-19. The above examples of establishment of nonindigenous species or wetlands are exactly the types of impacts that require site-specific analysis. Yet, the site-specific analysis recommended may not cover these examples because they may occur within the previously disturbed area. (**CL-11/7**)

Response: *The comment resulted in a change to the Supplement. Sections 4.3.5 and 4.3.6 were revised. Intake/outfall structures and other SSCs that will be removed after operation is discontinued are not expected to detectably change or destabilize the aquatic environment. As stated in Section 4.3.5.2, impacts associated with removal of the intake and outtake structures are not expected to adversely affect the aquatic environment. The staff concluded that the impact to the aquatic environment for these decommissioning activities is SMALL and of short duration and no further mitigation is required. A site-specific analysis is required if there are disturbances outside of the security fences (protected areas) or the adjoining gravel, the paved or maintained landscape areas, or the intake or discharge structures (see revised Section 4.3.5 and 4.3.6). The issue of non-indigenous species, and creation of wetlands is a valid concern. The assumption in this analysis is that licensees would use best management practices to mitigate for potential impacts to areas adjacent to the intake/discharge structure*.

Comment: The evaluation of each nuclear plant site for radioactive contamination can only be done on a site-specific basis. Data of site contamination from Shoreham with zero years of operating experience cannot be compared with 33 years of operation at Big Rock Point and either of those sites can not be compared with a potential 120 years of Calvert Cliff operation or a potential 180 years of Oconee operation. Stating that, generically, all impacts of radioactive contamination from all sites are similar (P. 4-28), is simply wrong. The important concept underlying the Environmental Impact Statement for decommissioning nuclear plants is the health and safety of the public. The Nuclear Regulatory Commission Staff (NRC) is writing an EIS based on an unsupported assumption. The impacts of a nuclear plant site contaminated with radioactivity can be SMALL or MODERATE or LARGE, but the impacts are site-specific and are not similar nor generic. (**CL-14/1**)

Comment: The evaluation of each nuclear plant site for radioactive contamination can only be done on a site-specific basis. The liquid low-level radioactive waste dump for St. Lucie 1 and 2 is the Atlantic Ocean, whereas the dump for liquid low-level radioactive wastes at Turkey Point 3 and 4 is a closed cooling canal system. The northern end of the canal system, Lake Warren, is the designated dump. If the sediments of Lake Warren and the cooling canals contain levels of radioactivity above those levels that are deemed safe for unrestricted human activity, then Lake Warren is one of the “safety-related structures, systems, and components” that needs to

be decontaminated and dismantled. Lake Warren and the canals are also safety related as they function to mitigate the effects of a design basis accident by collecting and concentrating radioactive spills, dumped liquids, leachates, and site runoff. Other nuclear plants that dump their liquid radioactive wastes into closed waters will also require site-specific evaluations. (**CL-14/2**)

Comment: The evaluation of each nuclear plant site for radioactive contamination can only be done on a site-specific basis. In NUREG-0743, page 4-11, Turkey Point units 3 and 4 averaged 340 curies of radioactive solid waste per year. Twenty two years later NUREG-1437, Supplement 5, page 2-12 states that in 1999, units 3 and 4 shipped solid waste containing 834.3 curies per year, an increase of 145%, yet Turkey Point is only 47% through its potential operational life. Projections concerning the amounts of radioactivity in solid waste, gaseous waste, liquid waste, and site contamination appear to be pure guesswork with a potential operational life of 60 years per unit. For the NRC Staff to conclude that site contamination for all nuclear plant sites is generically similar and that the impacts to the human environment are SMALL, has no basis in fact. The NRC Staff needs to present the reasoning behind its projections to the scientific community for scientific scrutiny. (**CL-14/3**)

Response: *NRC staff recognizes that there is wide variability among nuclear power plants in the quantity and distribution of radioactive contamination at a specific site. One of the primary purposes of decontamination is to reduce residual activity to levels permitting termination of the license. The NRC regulations (CFR 50.82) require a site-specific license termination plan to be submitted by licensees for NRC review and approval. Part of the license termination plan submittal is a detailed site characterization study that characterizes remaining radioactive contamination. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Surface and groundwater quality, p.4-12, should NOT be considered a generic decommissioning issue - climate zone can also create unique problems, terrain likewise, it should be site-specific. (**CL-20/30**)

Response: *Variables such as climate zones were considered in evaluating environmental impacts on groundwater from decommissioning activities. The NRC concentrated the environmental analysis on those activities with the greatest likelihood of having an environmental impact. Even for those impacts that have been determined to be generic, a licensee is required to do a site-specific analysis to determine whether the impacts fall within the generic envelope. If they are outside the bounds of the generic envelope, the licensee must seek approval from the NRC. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I support the designation of environmental justice and endangered species issues as site-specific, NOT generic. (**CL-24/3**)

Comment: I support the designation of environmental justice and endangered species issues as site-specific (not generic) and designation of rubblization as site-specific. (**CL-25/6**)

Response: *The comments are supportive of conclusions in the Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement*.

Comment: …what a sham it all is, and how industry writes it's own ticket. For example, p. xii, [xiii] the Commission has concluded (says the Commission) that impacts that do not exceed permissible levels in the Commission's regulations are considered small. (**CL-20/5**)

Comment: Two site-specific environmental issues were identified, threatened and endangered species and environmental justice, with four other issues listed as quote, conditionally site-specific. That is ludicrous. (**AT-A/21**)

Response: *The comments are not specific, did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: I also utterly oppose making most aspects of decommissioning "generic" rather than site-specific, so they cannot be legally reviewed or challenged at individual sites. (**CL-33/14**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC makes most aspects of decommissioning "generic" rather than site-specific, so they cannot be legally reviewed or challenged at individual sites. (**CL-43/8**)

Response: *There are several methods by which the public can formally raise issues related to decommissioning. If the licensee has requested an action requiring a license amendment, then the process for intervening in this action is by requesting or participating in a hearing. The process is set forth in NRC's regulations in 10 CFR Part 2, Rules or Practice of Domestic Licensing Proceedings and Issuance of Orders. If the action of concern does not involve a license amendment, any member of the public may raise potential health and safety issues in a petition to the NRC to take specific enforcement action against a licensed facility. This provision is contained in the NRC's regulations and is often referred to as a 2.206 petition in reference to its location in the regulations (Chapter 2, Section 206 of 10 CFR). Additionally, the*

licensee is required to submit a license termination plan (LTP) for NRC review and approval approximately two years before anticipated license termination. The LTP is submitted as an amendment to the facility license. As such, interested members of the public can request intervention in the amendment process. The request for intervention could lead to an adjudicatory hearing. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: "Site specific" issues are of vital importance, especially at San Onofre Nuclear Generating Station (SONGS) where Unit 1 is currently being decommissioned. It is imperative that NRC evaluate and analyze SONGS Decommissioning on a "site-specific" basis instead of a "Generic" basis, due to the very unique physical site characteristics at SONGS, which other existing nuclear plants in United States do not possess. The distinctions, and physical characteristics which make conditions at SONGS so different and unique are vitally important, and are of utmost importance in any analysis of Decommissioning at SONGS, in order to ensure the level of public health and safety will be assured, and provided without compromise to citizens in communities surrounding SONGS. As SONGS Unit 1 is currently being Decommissioned, the site-specific analysis must include both short-term and long-term effects, and must also analyze effects of offsite contamination, effects of cumulative contamination and exposure, and must provide realistic mitigation measures. A Summary of the "site-specific" physical characteristics and conditions at SONGS, which should justify "site-specific" analysis (as opposed to a Generic E.I.S. Supplement) include the following: - SONGS is located in a highly populated area, with dense populations in both Orange County and San Diego County, where citizens may be exposed to potentially significant offsite effects. - SONGS is located in a highly active seismic zone, where seismic activity is speculated by some geological experts to generate quakes up to 7.6 Magnitude on the Richter Scale (by new evidence of local off-shore blind thrust faults, which cause a greater extent of groundshaking and acceleration than the manner in which quakes are traditionally studied). SONGS was only designed and constructed to withstand a maximum quake of 7.0 Magnitude. - SONGS is located in an area immediately on the southern California coastline, with most facilities elevated only to a level of 20 ft. above mean sea level. These facilities are highly exposed and vulnerable to effects of rising sea levels, and tsunamis, and are insufficiently protected. (**CL-44/3**)

Response: *NRC staff recognizes that there is wide variability among nuclear power plants. However, based on the results of our analysis, the impacts resulting from decommissioning are similar regardless of plant characteristics, including site-specific information from San Onofre. The NRC established an envelope of environmental impacts resulting from decommissioning activities, identified those activities that can be bounded by a generic evaluation, and identified those that require a site-specific analysis. The NRC concentrated the environmental analysis on those activities with the greatest likelihood of having an environmental impact. Even for those impacts that have been determined to be generic, a licensee is required to do a site-*

specific analysis to determine whether the impacts fall within the generic envelope. If they are outside of the bounds of the generic envelope, the licensee must seek approval from the NRC. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: (4.3.10.3) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Costs - Conclusions: TMIA and EFMR object to the absence of a Conclusion in this section. (**CL-02/56**)

Response: *As stated in Section 4.3.11, "Cost," an assessment of decommissioning cost is not required by NEPA; however, for completeness the staff included an analysis of decommissioning cost in the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: We contend that decommissioning practices on nuclear facilities and its environmental impacts as major federal actions must be conducted under public review with full disclosure and documentation of the amount of radioactivity, the location of residual contamination and the types of radioactive contamination that remain onsite and offsite and are subject to site-specific public hearings. (**CL-48/3**)

Response: *NRC has determined that decommissioning is not a major Federal action. NRC chose to update the 1988 GEIS to further the purposes of NEPA (see Section 1.1, "Purpose and Need for This Supplement"). With the exception of some physical security activities and requirements, all NRC activities associated with decommissioning are conducted in a manner that assures full public disclosure. If the licensee has requested an action requiring a license amendment, then the process for intervening in this action is by requesting or participating in a hearing. The process is set forth in NRC's regulations in 10 CFR Part 2, "Rules or Practice of Domestic Licensing Proceedings and Issuance of Orders." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The primary reason I am submitting the following comments is to urge the Nuclear Regulatory Commission to maintain its commitment to study the operating history and resulting contamination of each reactor on a site-specific, not generic basis - in its effort to design appropriate decontamination and decommissioning requirements for each site. Only in this way can there be any hope of achieving the requisite, long-term isolation of the contaminants from the human environment. (**CL-51/1**)

Response: *NRC takes a serious and specific overview of the decommissioning of each site. The contamination levels of each site are looked at on a site-specific basis by the NRC regional inspectors throughout the decommissioning process and again during the license-termination phase, when the licensee is required to submit a site characterization showing the amount of contamination that remains on the site. See the explanation in revised Section 3.3.3. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I am very strongly opposed to the regulatory changes sought by NRC to further relax decommissioning requirements for nuclear power reactors, as proposed by the 1998 "Generic" E.I.S. on Decommissioning Nuclear Facilities (NUREG-0586), with new "updated" information on nuclear power reactor decommissioning. The Proposed regulatory changes sought by NRC are an insult to the public interest. (**CL-44/1**)

Comment: The only rules changes that I want to see until spent rods are removed to Yucca Mountain are to stricter rules. (**CL-25/2**)

Response: *The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.2 NRC Experience, Role and Regulations

O.2.1 NRC Experience with Decommissioning

Comment: We're familiar with some of the decommissioning models that they, NRC, are using. Believe me, Yankee Rowe, Connecticut Yankee and Maine Yankee are not good models for anyone to follow for subsequent decommissioning. (**AT-B/10**)

Response: *Overall decommissioning of Yankee Rowe, Connecticut Yankee, Maine Yankee and Haddam Neck have been conducted safely and without endangering the public. Applicable lessons learned at these and other decommissioned sites are evaluated for subsequent decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: And so much of what is in this document depends on the skills and the experience level, which are lacking, because decommissioning is new, just like plutonium fuel is new. NRC does not know what it's doing, the people who are on these reactor sites don't know what

they're doing and so if safety depends on human capability, it does too much by the way in this document, then you know, that's not very reassuring and I'm glad I've got the last word. (**AT-B/22**)

Response: *Since the 1988 GEIS was written, the NRC and the industry have gained over 200 facility-years' worth of additional decommissioning experience. This Supplement addresses new decommissioning technologies and approaches that the 1988 GEIS did not address. Decommissioning work is typically done by experienced contractors in conjunction with staff who have worked at the plants and are very familiar with the facilities. The operations associated with decommissioning are also similar to those performed during routine maintenance or major system replacements, which have been carried out routinely since the plants began operating. In addition, all commercial reactor fuel contains some plutonium at the end of its life cycle, so handling the material is not a new experience. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The GEIS stated, "Based on the number of reactors shut down and the date that they permanently ceased operations, over 200 facility-years' worth of decommissioning experience have accumulated since the 1988 GEIS." (Executive Summary, xi). However, based on this statement, and NRC's inability to grasp the "exponential nature" of radiological decommissioning estimates, it appears that the Commission has had the same experience 200 times. Moreover, the GEIS's sophomoric tone in declaring vast decommissioning experience is similar to the NRC's rhetoric at the time of the 1988 GEIS. On May 26, 1988, in Harrisburg, Pennsylvania, the Commission confidently stated they have "considerable experience [decommissioning] with reactors that have not had a significant accident before the end of their useful lives." (**CL-02/18**)

Response: *The staff believes that there is significant value in 200 facility years' worth of decommissioning experience. The staff is not aware of the concept of the "exponential nature" of radiological decommissioning estimates. The staff endeavored to write the Supplement using plain language that would be understood by a wide audience, despite the highly technical nature of the subject. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The fact is that decommissioning has a long and significantly checkered regulatory history. The draft supplement to NUREG-0586 does not address or acknowledge these repeated oversight failures including numerous decommissioning experiences where licensees did not adequately decontaminate their facilities. These failures include but are not limited to: the NRC does not know the types, amount and location of buried radioactive waste at some of its decommissioned facilities; -many licensee decommissioning records are nonexistent or

incomplete; -ground water contamination is higher than federal drinking water standards allow and-the long standing failure of the responsible federal regulatory agencies to prevent and prohibit radiation contamination that can remain after the NRC terminates a nuclear facility license. (The Environmental Protection Agency is on record requiring more protective cleanup levels than NRC, evidence that NRC's requirements are inadequate.) (**CL-48/5**)

Response: *This Supplement updates information provided in the 1988 GEIS by considering decommissioning experience gained since 1988 and changes in the U.S. Nuclear Regulatory Commission regulations and, where appropriate, other agency regulations. This Supplement is intended to be used to evaluate environmental impacts for facilities currently undergoing decommissioning and those that will decommission in the future. The four "failure areas" identified in the comment above are addressed in detail during the licensee's site-specific, license termination plan review. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: While the Executive Summary of NUREG-0586 Supplement 1 claims that the NRC and the industry have over 300 years of decommissioning experience with 22 nuclear reactor facilities permanently shut down, the fact remains that the process is still relatively new and NRC has yet to complete a single radiological decommissioning operation to a license termination plan for a typical large United States commercial reactor that operated for any significant length of time. As stated by Mr. Michael Masnik with the NRC at the Public Scoping Meeting on Intent to Prepare Draft Supplement To Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities in Boston, Massachusetts, May 17, 2000 with regard to a question on how many license termination plans have been accepted by NRC, he responded, "none have resulted in a license termination." (**CL-48/19**)

Response: *The commenter is correct that not a single license has been terminated under the Commission's 1996 revised regulations. The NRC has, however, terminated three licenses at three facilities: Shoreham, Ft. St. Vrain, and Pathfinder. None of the decommissioning challenges facing licensees of reactors that are currently undergoing decommissioning are substantially different from those experienced by the industry in the past 50 years. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Although the NRC claims numerous successful decommissionings of nuclear sites, few large-scale reactors that operated for decades have completed successful decommissioning. Decommissioning remains experimental. Resources and time required for decommissioning a site have been routinely underestimated. More importantly, worker doses have been repeatedly underestimated. Safe decommissioning is about radiological control and the need to limit exposures to the workers. Nuclear corporations have failed to do this because of

inexperience and a lack of enforcement by the NRC. With over 100 nuclear reactors yet to be decommissioned in this country, cutting decommissioning exposures by 200-300 person-rem per reactor will reduce the nation's nuclear work force exposures by 20,000-30,000 person-rem. (**CL-50/12**)

Response: *Trojan, Maine Yankee, and Haddam Neck are a few examples of large-scale reactors that operated for decades and are successfully undergoing decommissioning with worker radiological exposure levels at or below estimates. This is discussed in Table F-1 of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Nor does the NRC have any experience decommissioning nuclear power plants that used plutonium bomb fuel, also known as mixed-oxide fuel (MOX). (**CL-08/9**)

Response: *None of the plants being decommissioned or operated at this time have used MOX fuel. The use of MOX fuel is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.2.2 NRC Role

Comment: [There is a] discrepancy or debate between the EPA and the NRC standard for site cleanup or license termination and I think that has been an obstacle to public understanding and acceptance of decommissioning. While it's not unexpected, if you gave two different regulators authority over the same activity that they might develop different approaches towards regulating that activity—and in fact that is the case....The reality is, as was noted in a GAO report on the EPA and NRC standard, that the results actually are very similar, of the two approaches, that they both protect public health and safety....In other words, you can leave more radioactivity behind under the EPA standard, by the way it's designed, for light water reactors than you can under the NRC standard. (**AT-E/2**)

Comment: Former Senator John Glenn and the General Accounting Office announced in November 1994, that it is time for the Environmental Protection Agency (EPA) and the NRC to coordinate radiation protection standards which are based on risk-assessment. Eight years later, the agencies have been unable and unwilling to settle their conflicting regulatory standards. As it stands, how would the nuclear industry determine what levels constitute "Greenfield?" Worker exposures remain decidedly liberal. The Commission has already approved a 1-in-285 lifetime cancer, or 100 mR/year and rejected the Staff's recommendation of 3 mR/year of residual radiation. (**CL-02/37**)

Response: *EPA and NRC have elected to establish separate radiation dose criteria for licensee termination. Licensees must meet the NRC criteria for license termination in order for NRC to terminate their reactor license. The NRC staff is working with EPA to resolve any differences in site release criteria. The commenter is correct in that either standard is sufficiently protective to assure public health and safety and protection of the environment after termination of the license. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Within the same paragraph it talks about the non-radiological impacts following license termination that are related to activities performed during decommissioning are considered in this supplement. We are considering in this supplement the non-radiological impacts following license termination, not the radiological impacts after a license termination. This is a radiological device, a nuclear reactor. I cannot understand how that could even be in the executive summary to describe the document which is under review. (**AT-F/1**)

Response: *The radiological consequences occurring after termination of the license were considered in the NRC staff's environmental assessment of the rulemaking that established the criteria for license termination. That assessment is contained in the Environmental Impact Statement found in NUREG-1496, "Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities." No environmental assessment of the nonradiological impacts occurring after license termination associated with the decommissioning process for power reactors exists prior to this Supplement. Such impacts are considered in the Supplement for completeness. Hence, post-license nonradiological impacts are considered in this Supplement, and radiation-related consequences are excluded. See Section 1.2, "Process Used to Determine Scope of This Supplement." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In this Supplement, the NRC fails to consider whether it has the statutory or regulatory authority to terminate a license that allows for unrestricted site use with residual contamination present on site or to terminate the license with restricted site use in an Agreement State. **(CL-17/5**)

Comment: We request that licensees undergoing or planning decommissioning require a new environmental assessment. (**AT-A/22**)

Comment: The Final GEIS should directly indicate that licensees must obtain all necessary environmental permits prior to beginning the decommissioning process. Omitting this information may imply that the compliance with the requirements of this GEIS is adequate. (**CL-11/15**)

Comment: I am violently opposed to the Nuclear Regulatory Commission's proposal to further relax its decommissioning requirements for nuclear power reactors. This is nothing but a sellout to the nuclear industry--which puts citizens at risk--with no recourse in case of liabilities. This is wrong and dangerous. (**CL-21/1**)

Comment: I am appalled at the NRC's draft of decommissioning requirements for nuclear power reactors. The requirements should be made stricter not more relaxed!!!!!!!!!!!! (**CL-24/1**)

Comment: I strongly object to the proposed changes to the decommissioning rules. We have recently become more sensitive to the rules governing nuclear power plants, even their decommissioning. Since these proposals were begun before September 11, I hope and expect that they will be dead on arrival at the Commission. (**CL-25/1**)

Comment: I urge you to stop any further relaxing of nuclear power reactor decommissioning requirements. (**CL-32/1**)

Comment: In setting requirements for decommissioning United States nuclear power reactors, please bear in mind other things besides the needs of Richard (Enron) Cheney, Halliburton Inc., Brown & Root, and other powers that be. (**CL-33/1**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow NRC to redefine terms to avoid local, site-specific opportunity by public to question, challenge and prevent unsafe decommissioning decisions. (**CL-44/9**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow (with this supplement), NRC to legally justify removal of existing opportunities for community involvement and for legal public intervention until after the bulk of decommissioning has been completed, including activities as flushing, cutting, hauling and possible rubblization of reactor. (**CL-44/11**)

Comment: In conclusion, it is with utmost disappointment to again observe with each and every new NRC rulemaking, important components of the public's existing "right to know" and the public's right of active involvement in plant processes, decisions and their methodology, on all aspects of decommissioning activities routinely appears to be further diminished. As proposed, the EIS (Supplement 1) would eliminate all opportunities for public intervention, and public oversight and/or intervention entirely with use of a "generic" EIS. In such cases, the loss of public oversight and intervention on projects with a scope as large as decommissioning at SONGS, such losses may be unparalleled, or fully understood without a site-specific issue analysis. The citizens in local communities surrounding nuclear plants such as SONGS deserve this entitlement, and demand this entitlement. (**CL-44/14**)

Comment: CAN requests the NRC restore distinct categories between reactor operations and cessation and that the Possession Only License should be reinstated. It affords citizens the possibility for a hearing prior to reactor decommissioning. The opportunity for a hearing must not be withdrawn by the Commission. The hearing is essential for communities to participate in matters that vitally effect them. To offer a hearing at the termination of the license rather than at the cessation of operations sets aside meaningful citizen participation. (**CL-50/6**)

Comment: The relaxation of regulatory control is also evident throughout this draft volume. Decommisioning is the final chapter for the agency in its relationship to a given site and license. (**CL-52/23**)

Comment: We also advocate for sound, systematic policymaking regarding decommissioning. (**AT-A/9**)

Response: *The Supplement does not eliminate opportunities for public intervention. Opportunity to intervene is specified by regulation at 10 CFR Part 2. This Supplement is a Generic Environmental Impact Statement that evaluates impacts from the decommissioning process. It does not (1) establish policy, (2) establish or revise regulations, (3) impose requirements, (4) provide relief from requirements, or (5) provide guidance on the decommissioning process. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Surely the most surprising and disturbing pronouncement in the "Draft Supplement" appears on page 1-7: "The decommissioning process continues until the licensee requests termination of the license and demonstrates that radioactive material has been removed to levels that permit termination of the NRC license. Once the NRC determines that the decommissioning is completed, the license is terminated. At that point, the NRC no longer has regulatory authority over the site, and the owner of the site is no longer subject to NRC regulations." (p. 1-7; emphasis added). (**CL-51/24**)

Response: *The comment is not specific and the NRC staff is unable to determine what is surprising or disturbing about the statement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement*.

Comment: GEIS does not consider the give and take between the federal government and the agreement states as to who really has the authority to say that yes, you can entomb a reactor. And from the State of Illinois' perspective, it's not you folks, it's us. Because what you are proposing in this GEIS as an allowable decommissioning option is the disposal of low-level radioactive waste. (**CH-C/10**)

Response: *The NRC is currently considering the development of changes to its regulations pertaining to the entombment option for decommissioning nuclear power plants, as discussed in Section 3.2.3 of the Supplement. This comment relates to a future rulemaking process. It is considered out of scope for this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: This only relates to the nuclear power stations, but in previous NRC federal register notice, they specifically asked whether or not entombment should be allowed for non-reactors as well. In terms of authority as it relates to those federal acts, you know, there's no talk here in this GEIS about consultation with regional compacts. I see your GEIS as not addressing those issues in terms of, again, authority as to who can really say something can happen. (**CH-C/12**)

Response: *The Supplement is limited (see Section 1.1) to considering the environmental impacts of decommissioning reactor facilities that were licensed by the NRC for commercial power production. In October 2001, the Commission published for public comment an Advance Notice of Proposed Rulemaking (ANPR) on entombment options for power reactors (66 FR 32551). The rulemaking process encourages and involves the public and other stakeholders, including states, to make comments and recommendations on the rulemaking effort. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: [In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including:] Regulatory Ambiguity. (**CL-02/10**)

Response: *Regulatory ambiguity is outside the scope of this Supplement. The Supplement does not (1) establish policy, (2) establish or revise regulations, (3) impose requirements, (4) provide relief from requirements, or (5) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The NRC, once again, has missed an opportunity to constructively participate in solving the nuclear decommissioning riddle. Radiological decommissioning requires interagency cooperation among federal, state, and local shareholders. (**CL-02/15**)

Response: *The process followed by the NRC staff includes opportunity for cooperation on all levels. Public meetings are held during the decommissioning process to which States and local shareholders are invited to comment. In both cases, the NRC publishes notifications of the meetings in the Federal Register and in local media, and the meetings are held in the vicinity of the power plant to encourage local participation. Representatives from other Federal agencies*

and State and local governments are invited to attend. Amendments to the license also require NRC interaction with State officials. Comments and questions may also be submitted in writing to the NRC project manager of the facility. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: What legislation or regulations are in place to compensate communities, such as fisheries, farmers, etc. in cases of releases or accidents during or after decommissioning? (**CL-08/30**)

Comment: If the NRC is confident--as its supplementary changes to NUREG-0586 suggest--that onsite and offsite radioactive contamination during decommissioning and afterward will be minimal, why does it seek to remove all liability from the owner even before the process is complete? (If the NRC is wrong, who will pay?) (**CL-36/2**)

Response: *Licensees are required to maintain insurance coverage as part of the Price-Anderson system in the event of accidents. The level of coverage is commensurate with risk and risk changes as the plant status changes from an operating status to a permanently shutdown status. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The NRC should be required to expressly approve a post-shutdown decommissioning activities report ("PSDAR") before a licensee initiates decommissioning activities. Otherwise, the licensees have little incentive to perform a rigorous analysis of whether their decommissioning activities fit within the envelope of environmental impacts set forth in the GEIS. Instead, they will likely assume they fit within the guidelines when they prepare their PSDAR. Moreover, a formal approval process should incorporate more opportunity for public input. (**CL-11/14**)

Response: *The primary purpose of the PSDAR is to inform the public and the NRC of the licensee's plans for facility decommissioning. NRC staff conduct an inspection to verify the licensee's basis for concluding that the potential impacts of the proposed decommissioning fall within the bounds of previously issued environmental assessments. The results of that inspection are included in an inspection report, which is available to the public. However, the regulations do not require the NRC to review and approve the PSDARs. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The NRC should reevaluate their legal standing in deciding what radioactive material would remain at a reactor site located in an Agreement State and whether their proposed action would be contrary to the waste management policies of the applicable compact. (**CL-17/12**)

Response: *Low-level waste would not be left behind after license termination. Any radioactive contamination left behind after license termination must meet the License Termination Criteria given in 10 CFR Part 20, Subpart E. Materials that cannot meet these criteria are considered to be low-level waste and would have to be disposed of at a licensed low-level waste facility before the license could be terminated. Therefore, any radioactive material remaining onsite after license termination would not be considered radioactive waste. This Supplement does not (1) establish policy, (2) establish or revise regulations, (3) impose requirements, (4) provide relief from requirements, or (5) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The NRC should add a 10% surcharge to any calculated fees for decommissioning to help cover those costs that are unforseen which may arise.[It is absurd that NRC states that "decommissioning activities do not include the maintenance, storage or disposal of spent nuclear fuel, or the removal and disposal of nonradioactive structures and materials beyond that necessary to terminate the NRC license..... they are not considered as a cost impact because the licensees are not required to accumulate funds for these activities." (See p.4-42).The licensees must be held responsible and accountable for everything about and on the site and generated by the site past, present and future.] (**CL-20/44**)

Response: *NRC's role is not to levy taxes on licensees. The NRC's regulations requiring establishment and funding of the Decommissioning Trust Fund (10 CFR 50.75) provides adequate funds necessary for the safe radiological decontamination of the facility. NRC's responsibilities are limited to the radiological decontamination of the facility. The oversight of any onsite surplus structures, after the termination of the license, is clearly outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: And of course they must pay for the "spent" deadly radioactive fuel storage at the sites, whether in pools or casks at ISFSI's and the maintenance and upkeep and security and waste handling and fire prevention and similar. This MUST be addressed as past as part of this decommissioning, it must be incorporated. (**CL-20/45**)

Response: *All issues related to spent fuel maintenance and storage, including costs, are outside the scope of this Supplement (see Section 1.3). Appendix D provides additional*

information on spent fuel. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: NRC seems to have ignored it in this Draft also. This is an important health and also environmental issue that cannot be ignored.[NRC MUST MAKE LICENSEES, CONTRACTORS, SUBCONTRACTORS AND ANYONE WHO WORKS ON DECOMMISSIONING TAKE THE EFFECTS OF RADIOACTIVE "DAUGHTER" PRODUCTS INTO CONSIDERATION AS THEY MAY HAVE VERY DIFFERENT PHYSICAL, CHEMICAL AND RADIOACTIVE PROPERTIES THAN THE RADIOACTIVE "PARENT." THIS MUST BE PART OF DECOMMISSIONING STANDARDS.] (**CL-20/53**)

Response: *Decay products ("daughter" products) are included in the dose assessments. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: HOW ABOUT TESTS BEING RUN BY THE NRC ON THE SITE. HOW ABOUT INTERVIEWS WITH LONG TIME STAFF CONCERNING PAST PROBLEMS THAT COULD BE ENCOUNTERED? (**CL-20/66**)

Response: *Radioactive contamination will be detected during the final radiation survey and will be reduced to the level necessary to allow license termination. NRC staff will either oversee the final radiation survey or conduct independent surveys of the site and environs. The licensees are required by 10 CFR 50.75 to keep records of information during the operating phase of the facility that would be used to identify where any spills or other occurrences involving the spread of contamination would be located. During site characterization, licensees routinely interview former and current staff to uncover any past occurrence of radioactive spills, contaminants, or other events that may affect decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: You must not remove license amendment requirements when changing from an operating license to a nuclear materials possession-only license. (**CL-25/10**)

Comment: There should be a requirement for a license amendment when a utility changes from being a nuclear power operating license to a nuclear materials possession-only license. (**CL-39/5**)

Comment: The NRC must retain regulatory control of the entire site. The NRC must require a LICENSE AMENDMENT when an owner is granted a change from an operating license to a materials-possession-only license. (**CL-36/4**)

Response: *The regulations do not allow the reactor licensee to have a "materials-possession-only license." The operating license is maintained until decommissioning is complete and the criteria for license termination are met. The NRC retains regulatory authority over the licensee and site as long as the licensee possesses a license. This Supplement does not establish or revise regulations, impose requirements, provide relief from requirements, or provide guidance on the decommissioning process. The NRC staff believe that these comments are in fact directed at rule changes that occurred in 1996 in which the NRC revised its regulations by the Commission's notice and comment rulemaking process. The public had several opportunities during the rulemaking process to comment on and influence the development of the revised regulations. The basis for the current regulations and a summary of the current regulations are given in Sections 2.1 and 2.2 of the Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC is removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license. (With no license amendment, there is no opportunity for public challenge or adjudicatory processes.) (**CL-43/11**)

Comment: I also utterly oppose removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license, thereby eliminating the opportunity for public challenge or adjudicatory processes. (**CL-33/17**)

Comment: NRC is removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license. (With no license amendment, there is no opportunity for public challenge or adjudicatory processes.) (**CL-48/46**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC is removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license. (With no license amendment, there is no opportunity for public challenge or adjudicatory processes.) (**CL-26/13**)

Response: *There are two public meetings required by the regulations during the decommissioning process. The first occurs before the major decommissioning activities begin, when the post-shutdown decommissioning activities report is submitted. The second takes place when the licensee submits a license-termination plan, which describes how the site will be returned to a condition that makes radiological controls no longer necessary. In both cases, the NRC will publish notifications of the public meetings in the Federal Resister and in local*

media. The meetings are held in the vicinity of the power plant to encourage local participation. Normally, a license amendment request allows for an opportunity for a request to intervene, which could lead to a hearing. However, the regulations do not allow the reactor licensee to have a materials possession-only license. Therefore, there has not been, nor can there be a license amendment. The comments did not provide new information and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: Decommissioning should not be a final opportunity for the nuclear industry to "take the money and run" - be it to make a profit from inadequate cleanup and monitoring, or to limit losses from costs that had been underestimated for decommissioning throughout the operating lifetime of the nuclear reactor. (**CL-47/8**)

Response: *The missions of the NRC include the protection of public health and safety and protection of the environment. The NRC's regulations ensure that decommissioning of all nuclear reactor facilities will be accomplished in a safe and timely manner and that adequate licensee funds will be available for this purpose (10 CFR 61.61). It has regulations regarding the methods used to reasonably ensure that funds will be available to decommission the facility, but it does not regulate how the funds are to be raised. The particular licensee that holds the license for the facility pays for the decommissioning. Disposition of remaining funds after license termination are outside the scope of this Supplement and NRC's purview. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Our organizations continue to assert that NRC is deferring its regulatory responsibility of radiological decommissioning to facilitate a cost driven utility self assessment through an expedited decommissioning licensing process and by restricting a duly promulgated public hearing process for affected communities as embodied under the 1988 law. (**CL-48/2**)

Response: *The missions of the NRC include the protection of public health and safety and protection of the environment. The NRC's regulations ensure that decommissioning of all nuclear facilities will be accomplished in a safe and timely manner. The decommissioning regulations published in 1996 supercede those promulgated in 1988. The changes in the regulations were made through an established notice and comment rulemaking process, which allowed for public participation. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: CAN believes that streamlining the process for nuclear corporations and setting aside NRC requirements abdicates the responsibility to protect the health and safety of the workers, the public, the environment, and violates citizen due process. Nuclear power

generators should not be given broad discretionary powers to regulate themselves, which this Draft proposes. Protecting public and worker health and safety and the environment must remain the NRC's mission. (**CL-50/5**)

Response: *The mission of the NRC is to regulate the nation's civilian use of by-product, source, and special nuclear materials to ensure adequate protection of public health and safety, to promote the common defense and security, and to protect the environment. To accomplish this mission, the NRC staff must ensure that the decommissioning of all nuclear reactor facilities is accomplished in a safe and timely manner and that adequate licensee funds will be available for this purpose. The NRC has promulgated regulations which must be followed by licensees in the construction, operation, and decommissioning of power reactors. The licenses for power reactors in the United States continue throughout decommissioning, and licensees must comply with the NRC regulations and conditions specified in the license. In 1996, the NRC changed the regulations pertaining to the decommissioning of power reactors. The NRC revised its regulations by the Commission's notice and comment rulemaking process. The public had several opportunities during the rulemaking process to comment on and influence the development of the revised regulations. The NRC did not, as the commenter suggests, set aside NRC requirements, abdicate its responsibility to protect health and safety and the environment, and violated due process, but instead adopted new regulations after the appropriate notice and comment rulemaking. Supplement 1 provides no licensees of power reactors with "broad discretionary powers to regulate themselves." The Supplement does not establish or revise regulations, impose requirements, provide relief from requirements, or provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Given the repeated and serious exposure of workers during decommissioning of reactor sites, an onsite NRC inspector should be required throughout decommissioning to protect worker health and safety. (**CL-50/22)**

Response: *The NRC disputes the statement that there have been repeated and serious worker radiation exposures during decommissioning of reactor sites. Worker contamination has been infrequent and individual worker doses have been well within Federal standards. Rather than stationing a resident inspector at the site during the entire decommissioning process, the NRC will provide subject-matter experts to cover specific activities occurring at the site. For example, if the licensee is planning to remove a large component, the NRC might send, at appropriate times, an expert in radiation protection, an expert in heavy lifting and polar cranes, and an expert in packaging radioactive waste. Inspections are performed by the NRC headquarters staff and NRC regional personnel. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Concerns and unknowns about the decommissioning of nuclear power plants started many years ago. In January 1975, for example, Sheldon Meyers, as director of the EPA's Office of Federal Activities, included the following observation about the Callaway plant's draft environment statement: "The section in the draft statement regarding decommissioning of the plant indicates the plant site may require long-term surveillance after being shut down. This section should be expanded to provide an estimate of the length of the surveillance time and the length of time the land must stand unproductive. It should also identify who will be responsible for the surveillance activity and who will incur the cost." (Published by the NRC in March 1975; p. A12, emphasis added.) Why has no one answered these concerns prior to now? Or are there no credible answers? (**CL-51/26**)

Response: *Current regulations require continued surveillance at commercial power reactors after permanent cessation of operation. Such requirements are similar to those at operating plants. The NRC's environmental impact statement, NUREG-1496, "Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," was prepared in support of the rulemaking effort that established the site-release criteria. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement*.

Comment: Failure of NRC regulatory control to require that the radioactively-contaminated materials and wastes remaining at a reactor site post-closure will not be released into the biosystem – as described in this document and in NRC regulations—constitutes a serious violation of the provisions of the Atomic Energy Act, as amended, Chapter 1, and of the National Environmental Policy Act. Any such decisions by the NRC are therefore arbitrary and capricious, and contrary to both the AEA and NEPA. (**CL-52/4**)

Response: *The missions of the NRC include the protection of public health and safety and protection of the environment. The NRC reviews and inspects the environmental programs to ensure that the requirements related to radioactive releases into the environment are consistent with the regulations. Any remaining onsite radioactive material attributable to plant operation and decommissioning must meet the stringent site-release criteria set forth in 10 CFR Part 20, Subpart E. The staff has determined that any remaining radioactive material after license termination will not pose a threat to public health and safety. The staff's analysis is presented in NUREG-1496, "Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," prepared in support of the rulemaking effort that established the site-release criteria. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In practice, in the decommissioning of reactors the NRC's Decommissioning Rule has both allowed release into the environment of radioactive materials and wastes and disallowed members of the affected public from an opportunity for adjudicatory hearings in advance of decommissioning activities. (**CL-52/5**)

Response: *Nuclear power plants were licensed with the expectation that there would be routine releases of radioactive material to the air and water due to normal operations. The releases are limited to levels that ensure public health and safety. There was never the expectation that this material would be completely removed from the site or surrounding environment prior to license termination. Any radioactive materials remaining onsite that are attributable to plant operation or decommissioning must meet the stringent site release criteria set forth in 10 CFR 50.20, Appendix E. The staff has determined that any remaining radioactive material after license termination will not pose a threat to public health and safety and protection of the environment. The staff's analysis is presented in NUREG-1496, "Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," prepared in support of the rulemaking effort that established the site-release criteria. The licensee is required to submit a license termination plan (LTP) for NRC review and approval approximately two years before anticipated license termination. The LTP is submitted as an amendment to the facility license. As such, interested members of the public can request intervention in the amendment process. The request for intervention could lead to an adjudicatory hearing. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: What happens in the real world is different from your idealistic presentations and your idealistic views of what ought to be happening. And we have such things as the nuclear waste train carrying Yankee Rowe waste coming into the town of Roanoke at 9: 00 on a Friday evening with a street festival going on and you know where the railroad track goes in Roanoke, it comes right into downtown. And all of the highways were blocked off for the festival, there were thousands of people there, having come into the county for this festival. And that train sat there for hours. And if they were really only emitting 10 millirem per hour at six feet—and believe me, people were closer than six feet, a bunch of them ran up to it, although our people who were there tried to stop them and get the crowd to move away from the train. There was nobody there who was doing that function except us. And so, you know, in the real world, what—the decisions that you make come down to people's communities and so I don't need to preach at you—well, yeah, I do. You've got to do better, you've got to make assumptions that are way more conservative than what you're doing. And you've got to assume human failings. (**AT-B/21**)

Response: *The regulations applying to transportation of radioactive materials are provided by the U.S. Department of Transportation (DOT) and cited in 49 CFR Parts 171-177. NRC regulations are cited in 10 CFR Part 71 and discussed in this Supplement in Section 4.3.17. These regulations are adequate to protect public health and safety and take into account public presence in the vicinity of waste shipments. Specific details related to the shipment described above are outside the scope of this Supplement. However, the comment has been forwarded to the appropriate NRC office for follow up. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Now my point in bringing this up is that the NRC cannot continue to allow rulemaking to be driven by exemption as it has been done in the past. It lowers the bar for all subsequent actions every time an exemption is made. (**AT-F/5**)

Response: *The comment is not specific. The granting of exemptions to the NRC regulations is allowed under 10 CFR 50.11. This Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Atomic Energy Act allows states to assume regulatory authority over the disposal of low-level radioactive waste in their state. In an Agreement State it is the Agreement State not the NRC that has the jurisdiction over disposal of low-level radioactive waste at reactor sites. (**CL-17/8**)

Response: *The "Low-Level Radioactive Waste Policy Amendments Act of 1985" gives states the responsibility to dispose of low-level radioactive waste generated within their borders and allows them to form compacts to locate facilities to serve a group of states. The Act provides that the facilities will be regulated by the NRC or by States that have entered into Agreements with the NRC under Section 274 of the Atomic Energy Act. This comment is in reference to entombment, which is the subject of future rulemaking, as discussed in Section 3.2.3. Such future rulemaking on entombment will address the issue as to what role Agreement States will play in the entombment process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It always amazes me how the Nuclear Regulatory Commission INVENTS its own laws and standards - its own regulations, its own definitions (such as "decommissioning" see p. xii) (**CL-20/4**)

Response: *The NRC does not pass laws; that is the role of Congress. Under its authorizing legislation, the NRC does develop implementing regulations. The definition of "decommissioning" in the NRC regulations was established by the NRC rulemaking process. The rulemaking process encourages and involves the public and other stakeholders to make comments and recommendations. Information about this process can be found in NRC regulations at 10 CFR 2, Subpart H, and on the NRC Web site at: http://www.nrc.gov. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: HOW ABOUT THE NRC ACTUALLY READING THE INSPECTION REPORTS AND VIOLATIONS ETC. ON THE DOCKETS OF EACH FACILITY AS I SAID EARLIER. (**CL-20/65**)

Response: *The NRC staff writes, reviews and issues the inspection reports and the violations placed on the dockets. All dockets that dealt with the nuclear facility must be reviewed prior to decommissioning to ensure that all previous problems or concerns with the site are taken into account and are addressed properly and thoroughly in decommissioning plans. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: NRC should take its own independent samples of offsite water and sediment and soils, as well as onsite. The NRC must not go by the original Offsite Dose Calculation Manuals as what was allowed in them. (**CL-20/67**)

Response: *During the License Termination phase of reactor decommissioning, the NRC staff conducts its own independent, confirmatory measurements. The NRC may also observe, perform, or collect side-by-side surveys or samples with licensees during the final site survey. The results of these confirmatory surveys are publicly available. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Often the plants DO NOT HAVE TO REPORT THEIR RELEASES UNTIL THOSE RELEASES REACH A CERTAIN LEVEL, IT DEPENDS WHAT THEIR LICENSE STATES. (**CL-20/95**)

Response: *The site is carefully monitored and regulated prior to license termination, and is only released for unrestricted use under carefully monitored conditions (Section 2.2.2). Gaseous effluent and liquid releases from all licensed light water power reactor sites are monitored in accordance with the licensee's Offsite Dose Calculation Manual (ODCM) and releases must meet the requirements in 10 CFR Part 20, Appendix B, Table 2. The licensee is required to submit an effluent release report to the NRC on an annual basis that summarizes*

radioactive releases over the previous 12 months. The procedures and results of the monitoring programs are inspected and reviewed by NRC staff to ensure that all requirements are being met. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: In the name of humanity and morality, you should all leave your jobs now in righteous protest at what you're being asked to do. Walk out. Say goodbye. Go work at Wal-Mart if you have to. But don't recklessly endanger the health of this nation by acquiescing in these evil plans. (**CL-33/6**)

Response: *The comment is not specific to the Supplement, however, the missions of the NRC do include the protection of public health and safety and protection of the environment. The mission of the NRC includes ensuring that decommissioning of all nuclear reactor facilities will be accomplished in a safe and timely manner and that adequate licensee funds will be available for this purpose. Regulations are in place to ensure that the health and well-being of our nation is protected (see 10 CFR Part 20 and NUREG-1496). The health and safety of the public is a top priority and the staff takes this matter very seriously. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The regulations are in violation of the appellate court decision in CAN v NRC. The court ruled that decommissioning remained a "major federal action" requiring National Environmental Policy Act (NEPA) compliance. CAN strongly urges the NRC to enforce NEPA compliance and require decommissioning reactors to undertake site-specific Environmental Impact Statements (EIS). In addition CAN requests the Commission withdraw the proposed draft and revise it so that it complies with the ruling of the court decision. (**CL-50/1 and CL-50/2**)

Response: *The appellate court did not rule (59 F.3d 284 [1st Cir 1995] that decommissioning was a "major Federal action." In fact, the decommissioning of power reactors was never considered a major Federal action. The appellate court did rule that the NRC had not followed its own regulations [the 1988 revision to the regulations] in allowing the licensee of the Yankee Rowe Nuclear Plant to remove major components before the completion of the review and approval of the Decommissioning Plan. Since then, in 1996, the NRC has revised its regulations by the Commission's notice and comment rulemaking process. The public had several opportunities during the rulemaking process to comment on and influence the development of the revised regulations. By regulation, the NRC staff no longer has to review and approve a decommissioning plan for power reactor decommissioning. Supplement 1 to NUREG-0586 is consistent with the current NRC regulations for decommissioning of power reactors. The purpose and need of this Supplement are to provide an analysis of environmental impacts from decommissioning activities that can be treated generically so that*

many of the decommissioning activities for commercial nuclear power reactors conducted at specific sites will be bounded, to the extent practicable, by this and appropriate previously issued environmental assessments. Supplement 1 is not the proper forum for challenging the NRC regulations on decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: What the NRC decides to do concerning decommissioning, is what the following generations of children, women, men, plants, animals, insects, birds, fish - all life, is going to suffer from, and die by. A small bunch of (mainly) men in an office complex in Washington, along with a few cohorts elsewhere, plus an immoral multinational polluting industry (in the business for money only) are seemingly setting a set of criteria that will impact the whole world to no good end and cause great misery. (**CL-20/107**)

Comment: You need to start doing what is safest and in the best interest of the people of the United States and its land, NOT what is going to relieve the nuclear power companies of their responsibility to what they have created and profited off. (**CL-24/6**)

Response: *The comments are not specific and did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The NRC has a statuatory obligation to do a better job. (**CL-52/24**)

Comment: Because of deregulation, the United States public must rely more than ever upon the NRC to maintain its authority and responsibility to identify, assess and regulate the full range of potential high-risk impacts of every commercial reactor - before, during and following its decommissioning. The NRC is our only option. (**CL-51/20**)

Comment: I fail to see any moral difference between terrorists who fly planes into buildings, and bureaucrats who are perfectly willing to expose whole populations to additional dangers from radiation. (**CL-33/5**)

Comment: The present openness is most welcome, and a nice change, but past history hangs over NRC like a dark cloud. (**CL-10/2**)

Comment: The most formidable governmental regulations facing nuclear related industries is conflicting regulatory authority. Uncertainty is the enemy of the electric industry. This is most clearly evident in the decontamination and decommissioning of nuclear power plants. (**CL-02/38**)

Comment: The Nuclear Regulatory Commission can no longer evade its responsibilities and duties without considering the practical consequences, financial limitations, and political realities. (**CL-02/11**)

Comment: The reactors must be decommissioned in a prudent manner that will seek to protect the health and safety of the workers and the public. In the United States we must rely on the Nuclear Regulatory Commission for its knowledge, guidance and surveillance. I hope that trust is warranted. (**CL-51/28**)

Response: *The missions of the NRC include the protection of public health and safety and protection of the environment. The NRC staff takes this responsibility seriously. The reputations in place and the actions and activities of the NRC staff provide adequate oversight of the industry to assure public health and safety. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.2.3 Decommissioning Duration and Options

O.2.3.1 Decommissioning Duration

Comment: On page 1-6 of the document, it references that, there's literature saying that materials can be stored safely for 30 years, yet safe store can go on for 60 years. And I don't understand how you can reconcile that. There may be a way but I just don't understand it from the document. There may be a way that you can make that more clear in the document. (**CH-A/12**)

Response: *The reference on page 1-6 of the draft Supplement refers to spent fuel storage and the second reference is related to permissible time the facility has to complete decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I understand that spent fuel is dealt with in a different GEIS. But I think I raised this concern during the scoping. The 60-year period presumes a lot of things. (**SF-B/4**)

Response: *Although long-term storage of spent fuel is not within the scope of the Supplement, as described in Section 1.3, the staff is committed to ensuring that both spent fuel and low-level wastes are safely stored to protect the public. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: What was the technical basis for establishing a 60-year period? And is it still appropriate? (**CH-A/14**)

Response: *The basis was that major dose reduction via decay of cobalt-60 would occur in approximately 30 years, and major contaminant volume reduction would occur in approximately 50 years; also, detailed engineering considerations estimated that prompt dismantlement could require as much as 6 years to complete. Thus, an estimate of 50 years for significant contaminant waste reduction was used. Adding the time needed for dismantlement of 5-6 years and rounding up resulted in the 60-year time period for permissible storage delay given in the final rule. The staff currently finds the 60-year time period to be appropriate. The 60-year time includes the time required for termination of license by the NRC. A licensee of a power reactor has 60 years to complete decommissioning. Additionally, the regulations allow for completion of decommissioning beyond 60 years, but only by approval of the Commission when necessary to protect the public health and safety. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Sixty years is an arbitrary and inappropriate time period to allow a nuclear reactor to remain in SAFSTOR, where the contaminated facility will largely remain intact and spent fuel may remain onsite. According to NRC staff, no technical basis exists for this 60-year timeframe. See Transcript, December 6, 2001 Public Meeting, Drake Hotel, Chicago. First, if a company waits too long to decommission, it will lose its institutional memory and familiarity with the facility's structures because current workers may be deceased or otherwise unavailable. Such intricate knowledge of the facility is critical to avoiding radioactive releases during decommissioning. (**CL-11/9**)

Response: *There is a basis for the 60-year period for decommissioning. The consideration was that major dose reduction via decay of cobalt-60 would occur in approximately 30 years, and major radioactive contaminant volume reduction would occur in approximately 50 years. Thus, an estimate of 50 years for significant contaminant waste reduction and dose reduction was used. Adding the time needed for dismantlement of 5-6 years and rounding up resulted in the 60-year time period. The staff currently finds the 60-year time period to be appropriate. The 60-year period also includes the time required for termination of license by the NRC. The possible shortage of personnel familiar with the facility at the time of deferred dismantlement and decontamination is recognized as a disadvantage of SAFSTOR. There are offsetting advantages, such as reduction of worker dose and public exposure compared with the DECON option. Sections 3.2.1, DECON, and 3.2.2, SAFSTOR, explain the advantages and disadvantages of each option. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.2.3.2 Decommissioning Options

Comment: The Supplement incorrectly addresses the impact on the SAFSTOR scenario due to the time gap between cessation of operations and decommissioning activities. The Supplement expects the time gap will result in a shortage of personnel familiar with the facility when decommissioning activities commence. Our own experiences have shown us that both DECON and SAFSTOR decommissioning scenarios can be conducted in a safe and efficient manner. Regarding the familiarity of the facility at the end of licensed life, whether the plant begins decommissioning immediately or waits for some defined period - the most difficult aspect is retrieving records from the earliest days of operation. Recently retired facilities have taken the appropriate step of preparing a site historical assessment - documenting the operating years of the facility. This historical assessment will guide the decommissioning process whether it begins immediately upon retirement or 50 years later. (**CL-31/5**)

Response: *The text in the Supplement was meant to be general in nature with regard to the possible advantages and disadvantages of the various decommissioning options. There are always exceptions to such general comments. The staff does not mean to imply that DECON is preferable to SAFSTOR or vice versa. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In conclusion, as we have stated earlier, the methods used to decommission a nuclear plant will affect not only the communities of today but also the livelihood of future generations. (**AT-A/42**)

Response: *The staff agrees with the comment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: If life cycle plants has the decommissioning activities out as far as 60 years, what's the scenario that might involve? (**BO-A/1**)

Response: *The scenario in which decommissioning activities extend for a period of up to 60 years is described in Section 3.2.2, SAFSTOR, of this Supplement. In the SAFSTOR option, there is an initial period of activity to prepare for storage, a storage period, and a period of final decommissioning activities in which the facility and systems are decontaminated and dismantled. All three periods must be completed within 60 years. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: But, at least, in your experience, have you seen facilities--You haven't seen facilities where the only facility that's been operating has been shut down, and then they're just sitting there waiting. (**BO-A/2**)

Response: *Table 3-2 lists the facilities that have permanently ceased operations. La Crosse is a one-unit plant in SAFSTOR. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It [SAFSTOR] seems like it's taking a substantial land mass out of sort of useful life for a long period of time. (**BO-A/3)**

Response: *The SAFSTOR option involves continued commitment of land for a significantly longer period than the DECON option. This is one of the disadvantages of the SAFSTOR option. Most of the plants selecting the SAFSTOR option are at multi-unit facilities where one of the facilities has permanently ceased operation and the commitment of land would continue as a result of the other operating unit(s). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: First, we don't believe you should allow nuclear reactor owners under safe store to store waste for 60 more years after operations cease. We think the document should narrow the parameters. Because we have many concerns, some of which relate to institutional memory. (**CH-A/5)**

Response: *NRC regulations 10 CFR 50.82 require that decommissioning be completed within 60 years of permanent cessation of operations. Amendment of NRC regulations is outside the scope of this Supplement. NRC rulemaking procedures are found at 10 CFR Part 2. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Allowing the licensee to choose the decommissioning method is not recommended, due to the usual pressures to cut costs despite the obvious dangers. (**CL-10/10**)

Comment: UNDER NO CIRCUMSTANCES SHOULD A FACILITY BE ALLOWED THE OPTION OF CHOOSING THE METHOD OF DECOMMISSIONING IT WANTS, AS IS THE CURRENT CASE. (**CL-20/61**)

Response: *The licensee owns the facility and is allowed to choose the process for decommissioning consistent with NRC regulations. The comments did not provide new*

information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: Combinations of DECON and SAFSTOR would be the best, however, under no circumstances should SAFSTOR continue past five years. That would enable workers familiar with the plant to be still available, but at the same time allow for the decay of some of the radioactive contaminants which have shorter full hazardous radioactive lives prior to removal, thus lowering worker exposure etc. (**CL-20/62**)

Response: *The licensee owns the facility and is allowed to choose the process for decommissioning consistent with NRC regulations. NRC allows SAFSTOR because, in spite of some disadvantages, there are offsetting advantages, such as reduced worker dose and public exposure, compared with the DECON option. Under the current regulations, the licensee is permitted to begin active dismantlement after a 5-year storage period or continue to maintain the facility in SAFSTOR provided that decommissioning is completed within the 60-year period allowed by the regulations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The NRC effort to approve alternate decommissioning methods constitutes significant uncertainty and an impediment to accurately estimate the real cost of decommissioning nuclear facilities. There is no real assurance that adequate funds will be available to safely and properly decommission the site and provide for remediation of all necessary cleanup. These regulatory and environmental issues do not support generic treatment of environmental impact statements. In fact because of the economic and technical and environmental uncertainties of the rubblization and Entombment options, they should be subject to much more rigorous review than provided by this Supplement. This Supplement gives only cursory attention and unsubstantiated dismissal of potentially very serious environmental consequences of the rubblization, Entombment and Partial site release options. (**CL-48/28**)

Response: *Entombment and partial site release are the focus of current NRC rulemaking that would provide further guidance on these methods of decommissioning a nuclear power facility. The staff stated in Section 1.3 that radiological impacts associated with Rubblization would receive a site-specific environmental assessment during the staff's review of the license termination plan. Additionally, providing alternative decommissioning options to licensees does not necessarily introduce uncertainty into the estimate of the cost of decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: And we were tacitly or directly promised a 50-year cooling period for the nuclear power plants. I can go back and drag out some of those documents if you want to see that. And two-year cooling periods for Yankee Rowe before it's chopped up and decommissioned is unthinkable. You know, we will not approve of and we will fight diligently in every opportunity and arena we have a hot, quick and dirty decommissioning which violates the promise of future—safety to future generations. (**AT-B/16**)

Response: *NRC regulations in 10 CFR 50.82 that cover decommissioning do not require a "cooling period." Amendment of NRC regulations is outside the scope of this Supplement. NRC rulemaking procedures are found at 10 CFR Part 2. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Any of the methods proposed would require long time maintenance and monitoring, but keeping it in its original location would mean that the community would be familiar with it, it would be visible, and the community would be likely to care about its monitoring. In fact, involving the community in the whole process could utilize their experience and encourage their help. (**CL-10/9**)

Comment: The lowest possibility of releasing contamination into the environment requires entombing radioactive structures, systems and components in a long-lived substance, maintaining and monitoring it, until the radioactive level is reduced to a safe level, which would take many years. (**CL-10/7**)

Comment: Although the alternatives [decommissioning options] proposed for decommissioning nuclear facilities all sound reasonable, the proposal in general has one major problem, which is the NRC's lack of credibility due to past errors and cover-ups. (**CL-10/1**)

Response: *The comments are not specific and did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.2.3.3 Entombment

Comment: One of the things that your GEIS did not consider is termination of a license under entombment. (**CH-C/7**)

Response: *The purpose of this Supplement is to evaluate the impacts associated with the process of decommissioning. Issues related to the regulatory process for terminating the license for entombment are outside the scope of this Supplement. As stated in Section 3.2.3,*

the NRC issued an Advance Notice of Proposed Rulemaking (ANPR) (66 FR 52551, dated October 16, 2001) to solicit early public comment in developing changes to its regulations to permit entombment as an option in decommissioning nuclear power plants. As stated in Section 3.2.3 for the ENTOMB1 option, "The Staff makes no assumptions as to when the license would be terminated and whether it would be terminated under the restricted or unrestricted provisions of 10 CFR Part 20, Subpart E. These decisions would likely be addressed as part of the staff's rulemaking effort related to entombment explained above." Although absent in draft Supplement 1, similar language has been added to the description of the ENTOMB2 entombment option. For this reason, the comment resulted in a change to the Supplement.

Comment: And you said that for that restricted release use is going to need analysis on a site by site basis. Then why are you dealing with entombment in a generic EIS? (**CH-C/15**)

Response: *As stated in Section 1.3, the Supplement considers the environmental impact of those activities conducted during decommissioning. The Supplement does evaluate nonradiological impacts to the environment that occur after the license is terminated but only those resulting from activities that were conducted during decommissioning. Some of those impacts can be assessed generically and have been in this Supplement. The Supplement does not consider the radiological impacts that might occur after the license is terminated. Nor does the Supplement consider nonradiological impacts due to activities conducted after the license is terminated. If a licensee pursues the entombment option, there will be activities necessary to ready the facility for the entombment. The impact, during decommissioning and after, of some of those activities are considered generic by the Supplement. The site-specific assessment required by a proposed restricted release would naturally focus on radiological issues. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 3.2, p. 3-20 - defines two ENTOMB options developed specifically to envelope a wide range of potential options by describing two possible extreme cases of entombment. These extremes are useful in bounding an analysis, however they may be inappropriate for analysis to support a potential rulemaking for this option. (**CL-05/10**)

Response: *The staff agrees with the comment. We state in Section 3.2.3, "Any rulemaking effort on the part of the NRC staff will require an environmental assessment (10 CFR 51.21)." We say further, "The staff is making the assumption that environmental issues arising from any rulemaking effort will be addressed in the rulemaking and its supporting environmental documentation." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Supplement (page 3-16) indicates that ENTOMB is still considered a viable option for decommissioning. Section 3.2.3 notes that the Supplement includes a bounding analysis, but that any environmental issues arising from a subsequent rulemaking on ENTOMB will be addressed in that rulemaking and its supporting environmental documentation. EPA urges NRC to consider in any subsequent analysis of ENTOMB the issue of residual dose and the potential need for state approval of any de facto disposal. (**CL-16/10**)

Response: *NRC published an Advance Notice of Proposed Rulemaking on October 16, 2001 (66 FR 52551) seeking stakeholder input on three proposed regulatory options and whether entombment was a viable decommissioning alternative. The ANPR comment period closed on December 31, 2001. NRC received 19 comments from: six States; eight licensees; the Nuclear Energy Institute (NEI); the U.S. Environmental Protection Agency (EPA); the Conference of Radiation Control Program Director E-24 Committee on Decommissioning and Decontamination (CRCPD E-24 Committee); the Southeast Compact Commission (SCC); and a private individual.*

Generally, the eight utilities and NEI stated that they would like to have entombment available as a decommissioning option; however, none unequivocally committed to using entombment in their decommissioning process. Some Agreement State commenters endorsed the Part 20 dose limits, with one State adding that a time limit to reach the dose rates should be considered. Although one State advocated extending the decommissioning period beyond 60 years, most were silent on the decommissioning regulations in Part 50. The staff notes that there was no consensus on a preferred option. NRC staff has considered the comments received and has prepared a paper transmitting the Staff's recommendations to the Commission. As of the date of this publication the Commission has not acted on the staff's recommendations.

Since the development of a proposed rule on entombment is clearly outside the scope of this Supplement, the comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Page 3-24 mentions the containment ceiling being lowered to the top of the pressurizer for a PWR under the ENTOMB2 option. Appendix E, page 9 lists this action as optional. This action needs to clearly be listed as optional on pages 3-24, 3-25, and 3-31. SCE&G believes this action should be optional as listed in Appendix E due to the extreme effort to lower the ceiling of a massive building such as the reactor building and yet maintain it intact for entombment purposes. (**CL-19/1**)

Response: *The scenarios for entombment are non-prescriptive and were developed to reasonably envelop a typical entombment. The staff developed the scenarios based on the*

limited past United States experience in entombing reactors and experience from other countries. The comment did not provide new information relevant to this Supplement and will not be evaluated further. However, the Supplement was revised for clarification.

Comment: Also, on page 3-24 “low density concrete grout” is mentioned. Grout is not lightweight, but concrete can make use of lightweight large aggregate to lower the weight per volume. Therefore, SCE&G recommends concrete be used in place of grout on pages 3-24, 3-25, 3-31, and 3-33. (**CL-19/2**)

Response: *Chapter 3 was revised and the term “concrete” was used in place of “grout”.*

Comment: The Supplement properly addresses the ENTOMB decommissioning option. Issues related to the ENTOMB option after the facility has terminated its NRC license and entered the entombment period are outside the scope of this GEIS. Power reactor entombment is not construction of a LLW disposal facility - it is properly classified as a decommissioning scenario, which creates an assured storage facility for radioactive material to decay in place, until it no longer represents a hazard considering future public use of the site. The clear distinction between entombment as a decommissioning scenario and a LLW disposal facility may be found in the ability to reuse the site in the future for other purposes. Regulation governing LLW-disposal facilities does not contemplate future use of the site, restricted or unrestricted. Future use of an entombed site will be dictated by the dose-based performance criteria found in 10 CFR Part 20, Subpart E. (**CL-31/3**)

Response: *The comment is supportive of the discussion of entombment as a decommissioning option. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: While the Supplement addresses two entombment options stating they have prepared as extreme cases to envelop a wide range of potential options, there should be additional language early in Section 3.2.3 ENTOMB clarifying that utilities are likely to develop entombment scenarios based upon their site-specific needs. (**CL-31/18**)

Response: *Section 3.2.3 was revised to include a statement that licensees will adopt the entombment option to fit their specific site requirements*.

Comment: So I’m really interested in this entombment rule making process and I promise you that we will have a lot to say about that because that really is the only option for what to do with these plants. (**AT-B/17**)

Response: *The comment is on the NRC entombment rulemaking effort, which is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: You need to keep it where it is and somehow seal it off, and then you have to monitor it for years and years and years because none of this goes away. (**AT-D/9**)

Response: *The staff makes the assumption for the purposes of developing an entombment scenario for this Supplement that there "would be a monitoring program period as long as 20 to 30 years to demonstrate that there was isolation of the contamination and adequate permanence of the structure" (see Section 3.2.3). If isolation were not adequately demonstrated in this amount of time, it is likely that mitigation would be required along with further monitoring. This comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I'm real happy to see entombment is coming up and getting more discussion because it is the area that we look to, the avenue that we think will yield the most protection for the public ultimately. (**AT-G/1**)

Response: *The comment is supportive of the discussion of entombment as a decommissioning option. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The thing that really jumped up and disturbed me was about the middle of the paragraph. It says, "All decommissioning activities were assumed to determine their potential for radiation exposures that may result in health effects to workers and the public. This section considers the impacts to workers and the public during decommissioning activities performed up to the time of the termination of the license. And potential radiological impacts following license termination are not considered in this supplement…I don't think that you can remove the long-term radiological impacts of using entombment as a decommissioning method from this environmental impact… but if you're going to pursue entombment as a disposal option which according to your slide in the 1988 draft or '88 GEIS was assumed not to be a viable alternative, you really need to look beyond license termination into the long-term radiological impacts because that stuff is going to be there forever until it decays away. (**CH-C/1**)

Comment: As mentioned at the December 6, 2001 public meeting in Chicago, the scope of the Draft Supplement is inadequate in its evaluation of long-term radiological exposure to the public for the reactor entombment decommissioning method. (**CL-17/1**)

Response: *For license termination to occur, the radiological impacts following license termination must meet the criteria defined in 10 CFR Part 20, Subpart E. These criteria would apply to license termination for any of the decommissioning options including entombment. If the entombment process used did not allow the site to meet the license termination criteria, then the license would not be terminated. Current criteria for license termination is given in 10 CFR Part 20, Subpart E. These criteria were established by a 1997 rulemaking. The staff evaluated the impacts of the site-release criteria in NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities." As stated in Table 1-1, the radiological impacts following license termination are outside the scope of this Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: And depending upon what system structures and components you put into the containment building, that time period of potential radiological hazard may be relatively short, it could be really long. (**CH-C/2**)

Response: *The staff agrees with the comment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: If you take a look at the date of this NUREG-1496 being 1997, that was also in a time frame when entombment really wasn't being talked about. NRC held their first meeting on entombment as a viable reactor decommissioning option in December of 1999. So I doubt that those long-term radiological impacts are assessed in this EIS, referenced in NUREG-1496. (**CH-C/4**)

Response: *NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," does not specifically discuss entombment of power reactors. It does, however, assess the impact of specific radiological criteria and long-term radiological impacts that may result following termination of the license of a nuclear facility. The analysis clearly envelopes the entombment concept, and the long-term impacts would be those identified in NUREG-1496. Furthermore, if the proposed entombment was not within the bounds of the 1997 assessment, then the assessment would not be applicable to whatever option or scenario the licensee chose. Additionally, the radiological impacts following license termination are outside the scope of this Supplement, as indicated in Table 1-1. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Entombment is basically the isolation of contaminated reactor stuff from the environment. Now, if you, and that's just a rough estimate on a definition. But if you look at definitions of disposal, it's going to be pretty similar. (**CH-C/8**)

Comment: By definition entombment is disposal of low-level radioactive waste in the containment structure. (**CL-17/7**)

Response: *As stated by one of the commenters on the draft Supplement (CL31/3), power reactor entombment is not the same as construction of a LLW disposal facility. The LLW disposal facility is designed and constructed to accept waste from other locations and store it in a manner that allows it to decay in place until it no longer represents a hazard. A reactor entombment is designed to isolate waste generated at that location in a manner that protects public health and safety and the environment. The clear distinction between entombment as a decommissioning scenario and a LLW disposal facility may be found in the ability to reuse the site in the future for other purposes. Regulation governing LLW disposal facilities does not contemplate future use of the site, restricted or unrestricted. Future use of an entombed site will be dictated by the dose-based performance criteria found in 10 CFR Part 20, Subpart E and may allow future reuse of the site. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The one thing this GEIS did not consider is regulatory authority as to whether or not the NRC can license the disposal or in essence allow entombment as a reactor decommissioning option in agreement states, because in agreement states, it's those states such as Illinois that has licensing authority over the disposal of low-level radioactive waste in the state. (**CH-C/9**)

Comment: Entombment could potentially, in the State of Illinois, create seven disposal facilities. Your GEIS does not address the potential conflict with other state or other federal statutes as it relates to authority of the disposal of low-level radioactive waste. That being the Federal low-level radioactive waste policy act of 1980 as amended in 1985 which specifically gave states the responsibility for providing for the disposal of low-level radioactive waste generated within their states. (**CH-C/11**)

Response: *The NRC staff agrees that the Supplement does not evaluate the regulatory implications of an entombment of a power reactor within the borders of an Agreement State. Such a discussion is clearly outside the scope of this Supplement. As stated in Section 3.2.3, the NRC is considering the development of changes to its regulations pertaining to the entombment option for decommissioning nuclear power plants. The public and the Agreement States will have an opportunity to participate in the development of the regulations in the rulemaking process. Since the development of a proposed rule on entombment is also*

clearly outside the scope of this Supplement, the comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: So, what you're saying is you're going to set something in motion, i.e. entombment in motion, you're going to allow a nuclear plant operator to take all the contaminated system structures and components, put them in a containment building as part of this GEIS and you're not concerned at what's going to happen at license termination? Because that's in essence what you just said. I mean, in terms of radiological exposure. (**CH-C/14**)

Response: *The Supplement does not set anything in motion, nor does it authorize or allow entombment of a power reactor. For an entombment of a power reactor to occur, the licensee either has to obtain an exemption from certain regulations or the NRC, through the rulemaking process, has to change the regulations. The Supplement is focused on evaluating the impacts from activities associated with the decommissioning process. One of the decommissioning options that historically has been identified is entombment. This Supplement evaluated the environmental impacts from the preparation activities for two entombment scenarios. Radiological criteria for any license termination (even those granted on a case-by-case basis) are given in 10 CFR Part 20, Subpart E. The license cannot be terminated without compliance with the site-release criteria. The staff has evaluated the radiological impacts of meeting these criteria at the time of, and subsequent to, license termination in NUREG-1496, "Generic Environmental Impact statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities." Both the future NRC rulemaking effort for entombment and the impacts associated with the NRC's site-release criteria are outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Doesn't that set the utility up for a great risk exposure to go down the path of entombment and find out that 40, 50 years, whatever time frame they elect when they try to terminate their license of someone saying, no, you can't do that? I mean, because of the radiological impacts? (**CH-C/16**)

Response: *For license termination to occur, the radiological impacts following license termination must meet the criteria defined in 10 CFR Part 20, Subpart E. If the criteria were met, then the license can be terminated. The staff cannot generically speculate on the potential for denying license termination after 40 to 50 years of entombment. As stated in Table 1-1, the radiological impacts following license termination are outside the scope of this Supplement. The comment is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: On October 16, 2001, the NRC published an advance notice of proposed rulemaking regarding entombment options for power reactors. Even with that notice and this draft Supplement, the NRC has yet to evaluate the long-term environmental impacts associated with entombment of power reactors. (**CL-17/4**)

Comment: So, what I see happening here is you're setting yourself up with entombment…you're not looking at the long-term radiological impacts to the residents of the State of Illinois or the residents of Connecticut or whatever state it may be. (**CH-C/5**)

Response: *For license termination to occur, the radiological impacts following license termination must meet the criteria defined in 10 CFR Part 20, Subpart E. The long-term impacts would be those identified in NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities." As stated in Table 1-1, the radiological impacts following license termination are outside the scope of this Supplement. The comments are out of the scope of this Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: NO WAY SHOULD ENTOMB I OR ENTOMB II BE ALLOWED. (**CL-20/63**)

Comment: One of the important and obvious things to be said about decommissioning nuclear power plants is that it is expensive, potentially dangerous and nearly unprecedented. We appreciate that entombment is now being considered. (**CL-42/1**)

Response: *The comments are matters of opinion and are general in nature. The comments do not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: I am opposed to the following proposal(s) in the EIS: NRC opens up two "entombment" options. (**CL-26/4**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC opens up two "entombment" options. (**CL-43/3**)

Comment: NRC opens up two "entombment" options. (**CL-48/38**)

Response: *As stated in Section 3.2.3, the staff evaluated impacts associated with preparing the facility for a hypothetical entombment. Two scenarios were developed. Consideration of impacts in a Supplement to a GEIS resulting from two hypothetical scenarios does not in any way allow for an entombment of a power reactor. For an entombment of a power reactor to*

occur, the licensee either has to obtain an exemption from certain regulations or the NRC, through the rulemaking process, has to change the regulations. The Commission has independently issued an advance notice of proposed rulemaking on entombment options for power reactors (66 FR 32551), as discussed in Section 3.2.3, to invite early input from stakeholders on issues related to entombment. Based on comments on the proposed rulemaking, the staff may propose changes to the regulations. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: Just one example is letting the concrete reactors erode naturally which is extremely unsafe. (**CL-32/2**)

Response: *The entombed power reactor would likely employ numerous engineered barriers to contain any radiological contamination. Radioactive contamination inside the entombed structures would be fixed so that migration of material in the engineered structure would be minimized or eliminated. Additionally, there would likely be a monitoring program in place for some period of time to ensure that the contamination was isolated from the environment. Finally, there would have to be institutional controls to ensure that the structure and monitoring were secure over an extended period of time. Simply abandoning the site and allowing the concrete of the containment to erode away was never considered an option for entombment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: We concur with the GAO findings as reported in GAO-02-48, "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could be Improved," dated December 2001. GAO reported the following conclusions:

"The NRC staff's decision that entombment might reduce decommissioning costs is questionable."

"According to NRC's staff, 'very expensive remedies' could be required if an entombment configuration proved unable to adequately isolate radioactive contaminants over the 100-year or longer [up to 300-years by NRC projections] time period needed for radioactive decay. Given the length of time involved, states are concerned that they will have to pay remediation costs should an entombment fail." (**CL-48/32**)

Response: *The staff understands that additional costs may be incurred if decommissioning methods do not adequately remove the radiological hazard. The cost comparison does not include costs associated with the failure of any of the engineered barriers and a release of radioactive contamination to the environment. However, the cost analyses are performed assuming that the licensee appropriately decontaminates or adequately isolates the radioactive*

contaminants during the entombment process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: This method would be the most likely to reduce exposure to workers and the public, and would not require workers familiar with the original construction. (**CL-10/8**)

Response: *The staff agrees that the most likely scenarios for an entombment of a power reactor would reduce radiological exposure to both the work force and the public when compared to the immediate DECON decommissioning option. Although none of the options "require" workers familiar with the original construction, it is the staff's position that all three options would benefit from the experience and knowledge of workers familiar with the plant design, construction, and operation. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Entombment [has been] taken to an aesthetic level. You've got like contaminated soil, maybe even mill tailings if we could figure out how to get them there—fill everything in and just build out soil barriers, barriers, barriers, make it a pyramid, make it vast, make it huge—sell tickets for the first few generations. And I even think possibly the geometric—the geology of this might even be an earthquake that just keeps falling in on itself. You hit it with something, it just keeps falling in on itself. Now there's a question of subterranean—what's the subterranean issue here and, you know, forget practicality, forget cost, which I would like to do that, I mean I really would not like cost to be much of a factor here. We need to do what it takes. So probably you need some subterranean things, definitely a site-specific idea I've got here. And then let's plant spider worts around it because everybody knows that spider worts are shown to—they have these little blue hairs, maybe they're called stamens or something that's the pollinator part of it, and they are like these incredible plants that—there's this perfect correlation for the amount of radiation exposure it gets. These little things turn pink, these little hairs turn pink. And it's been like studied and it's a good correlator. So we need to plant the spider worts, which is basically a weed and then we need to teach the people how to analyze. You know, we can't forget the technology of microscope. That's pretty easy—lenses. And the site-specific advisory board and actually, you know, this sounds kind of corny, but I'm your artist speaker tonight—the nuclear priesthood has been talked about seriously. Religion is probably a good model for long memory. (**AT-G/5**)

Response: *The issue of marking the entombed facility so that it is recognized in the future has been discussed by scientists for years. The comment is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

0.2.3.4 Rubblization

Comment: Because of the potential presence of highly radioactive "hot particles" in unexpected areas through the plant, particularly in the reactor containment building, the rubblized materials proposed for on-site disposal could be more than just "slightly" contaminated. Contrary to the Draft Supplement, at page I-7, for example, I think it is important to note that the rubblization of concrete could have radiological impacts as well as non-radiological ones. (**CL-51/8**)

Response: *The Supplement states that the radiological aspects of Rubblization on onsite disposal of slightly contaminated material would be addressed in a site-specific manner at the time that the LTP is submitted. The site-specific LTP will provide a mechanism for the NRC staff's evaluation of the licensee's plans to dispose of rubblized concrete on site. The radioactive material that remains at the site after the license has been terminated must meet the dose criteria for license termination given in 10 CFR Part 20. All radioactive material removed from the site must be disposed of in a licensed low-level waste facility in accordance with 10 CFR Part 61. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Georgians for Clean Energy requests that the "rubblization" method of decommissioning be removed from the final EIS. Chopping up a plant and storing it on site not only sounds ridiculous but also is grossly negligent of the fact that there are facilities designed, built and licensed to handle radioactive materials. A point supported by the GAO report cited earlier in these comments. (**CL-08/20**)

Comment: I think if people thought we're going to be rubblized and have a waste dump out there, they might not have been so welcoming to these facilities. (**AT-C/3**)

Comment: We concur with the GAO findings as reported in GAO-02-48 "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could be Improved" dated December 2001. GAO reported the following conclusions: "Aside from questionable cost benefits, rubblization and entombment raise a number of technical issues. For instance, NRC does not intend to require that sites where rubblized radioactive materials would be buried have protection equivalent to offsite disposal facilities for low-level radioactive waste. Disposal facilities for commercial low-level radioactive waste, which are licensed and regulated by NRC or by state (under agreement with NRC), must be designed constructed, and operated according to NRC regulations (or compatible regulations issued by the host state). In addition, to obtain a license to build and operate a disposal facility, the prospective licensee must characterize the facility site and analyze how the facility will perform for thousands of years. However, according to NRC, a rubblized site is not comparable to a low-level radioactive waste

disposal facility…. Nevertheless, 10 CFR Part 61 does not differentiate between what does or does not qualify as a low-level waste disposal action or facility on the basis of the quantity, forms, or range of the low-level radioactive waste to be buried." (**CL-48/33**)

Response: *In a letter dated March 1, 2002 (ML020250068), the NRC responded to the GAO findings and elaborated on its programs and practices. Rubblization (the process of onsite disposal of slightly contaminated material in a manner to meet the site release criteria of 10 CFR Part 20, Subpart E) would not involve the quantity of radioactivity, nor the inventory of radionuclides associated with a commercial low-level waste disposal site. In addition, the range of waste forms are not comparable. Rubblization is considered a viable decommissioning process that is consistent with the requirements of the license termination rule and is not considered low-level waste under 10 CFR Part 61. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Pages 4-30, 4-12 and xii. The Supplement should clarify the circumstances under which rubblization is permitted. It is EPA's understanding that, to date, rubblization has only been permitted after site decontamination. Does the term "rubblization" on page 4-30 refer to the treatment of concrete or structures that have not been decontaminated? Note that page xii indicates that the continued dismantlement of structures that have been radiologically decontaminated falls outside the scope of the Supplement. (**CL-16/67**)

Response: *The staff has clarified the use of the word "rubblization". The staff chose to use the term "demolition" to describe the process of crushing structural material to allow for easy burial or disposal. Demolition debris can be contaminated or uncontaminated. Demolition debris, if uncontaminated, can be disposed of either onsite or offsite without any additional NRC oversight. Demolition debris that is contaminated can be shipped to a low-level waste site or waste processor. Slightly contaminated demolition debris may be disposed of onsite using the process of "rubblization" (the process of onsite disposal of slightly contaminated material in a manner to meet the site release criteria of 10 CFR Part 20, Subpart E). Section 4.3.3.3 and 4.3.8.3 of the Supplement have been revised to reflect the above clarification in terminology.*

Comment: Delete the discussion of "rubblization" on page 1-7 and delete the term "rubblization" in the Glossary (Appendix M). Maine Yankee first utilized this term in a January 13, 2000 letter which served to submit their License Termination Plan (LTP). On June 1, 2001, Maine Yankee filed revision 1 to their LTP. On August 13, 2001, Maine Yankee filed revision 2 to their LTP. In their current LTP, Maine Yankee does not propose to use "rubblization" and no longer utilizes the term. No licensee is currently pursuing the "rubblization" concept as described in Maine Yankee's original LTP submittal. The term which most accurately describes the approach which licensees are currently pursuing is "concrete backfill." Connecticut Yankee described the process as follows in section 4.3.1 of our LTP

submitted on July 7, 2000: Concrete from contaminated structures will be remediated to a level meeting the radiological criteria for unrestricted release of the site. After completion of final status surveys and absent any findings during NRC inspections, concrete building debris from decontaminated structures may be used as backfill and placed into the remaining subsurface building foundations. (**CL-30/4**)

Comment: The burial of radioactively contaminated material as a means of site remediation is unacceptable for property that is to be released for unrestricted use. Rubblization (the burial of contaminated rubble) must not be permitted under any circumstances. The permission to build nuclear reactors hinged upon the utilities' commitments to regulators and the community to restore the site to "green fields." Rubblization is a blatant default on cleanup commitments, is a gross injustice to reactor communities and is a regulatory cave-in to utilities' desires and financial needs. In response to rubblization CAN also incorporates by reference Contention's 5.2 and 5.3 submitted by the organizations to the Commission on March 12, 2001 regarding Haddam Neck Reactor's License Termination Plan (Docket No. 50-213-OLA). (**CL-50/21**)

Comment: "Rubblization", to me reflects a sense that NRC is looking for ways to make it easier to finish the decommissioning process rather than thinking about ways to make it safer or more environmentally sound. And that concerns me. It seems to be driven by how we can facilitate the process, making it happen more quickly or with less cost as opposed to considering the safety issues. All of those issues relate to doing it more quickly and less costly. (**CH-A/11**)

Comment: The fact that the Staff and the Commission have even considered rubblization shows an utter disregard for the health and welfare and safety of the public and the ecosystem upon which life depends. (**CL-20/20**)

Comment: I oppose the concept of rubblization as it is very dangerous. (**CL-29/2**)

Comment: There should be no allowance for the industry to hurriedly raze structures, sweep the radioactive mess under a porous and permeable carpet (or disperse the remains and cleanup materials in many unregulated forms far from the reactor site), cut corners and add risks and contamination to an already precarious cleanup operation. The public must be protected. (**CL-47/9**)

Response: *The NRC staff has decided to retain the discussion of Rubblization in the Final Supplement. Rubblization (the process of onsite disposal of slightly contaminated material in a manner to meet the site-release criteria of 10 CFR Part 20, Subpart E) is considered a viable*

decommissioning process that is consistent with the requirements of the LTP and is not considered low-level waste under 10 CFR Part 61. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: Rubblization (p. 4-14), the breaking of contaminated concrete structures into gravels and blocks cannot be considered an option where: A. the leachate plume could contaminate potable water, B. the leachate plume could contaminate water used for food production such as farming, fishing, seafood harvest, or dairy, C. the leachate plume could contaminate closed bodies of water such as cooling canals or cooling ponds, or D. airborne particles could contaminate food crops, fishing waters, seafood harvesting waters, or dairy areas. All contaminated building materials must be removed from the nuclear plant site. (**CL-14/4**)

Comment: We concur with the GAO findings as reported in GAO-02-48 "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could be Improved" dated December 2001. GAO reported the following conclusions: "Water intrusion is also a major concern for rubblized or entombed sites, and the fact that most nuclear power plants are situated in shallow water table or flood plan locations may limit the viability of these options." (**CL-48/34**)

Comment: Essentially, the agency and industry are proposing that a so-called "low-level" radioactive waste dump can now be grandfathered on a reactor site without a formal permitting and licensing hearing process. The decommissioning utilities will provide an analysis that can "assure" that no ground water movement will occur through the radioactive burial site providing a potential transport mechanism and potential radioactive exposure to the public and environment. The utilities are to provide a "dose model" to "assure" the affected communities that the radioactive site will pose no health risks to present and future public health and the environment. These "assurances" cannot be bona fide by generic treatment and therefore require the availability of site-specific proceedings. (**CL-48/30**)

Response: *Rubblization (the process of onsite disposal of slightly contaminated material in a manner to meet the site-release criteria of 10 CFR Part 20, Subpart E) would require a site-specific analysis during the LTP review. Such a site-specific review would consider the potential for groundwater contamination. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement*.

Comment: The Supplement improperly addresses rubblization by stating it will require a site-specific analysis at the time the license termination plan is submitted. Rubblization should be addressed generically as a part of the decommissioning process. The NRC should continue to

maintain that to the extent that 10 CFR Part 20, Subpart E dose performance criteria are met - and that decommissioning has been performed using the ALARA principle, rubblization has a SMALL environmental impact. (**CL-31/4**)

Comment: Some of my concerns about NUREG-0586 include: the generic approval of rubblization of reactor buildings and leaving them on site. (**CL-38/3**)

Comment: I oppose rubblization but support its designation as site-specific. (**CL-24/4**)

Response: *Both site-specific factors and the licensee's preparation of the demolished demolition debris prior to onsite disposal can significantly affect the dose assessment calculations that are necessary to demonstrate compliance with the licensee termination criteria. As such, a generic analysis cannot be made that would envelop rubblization. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Now, with Supplement 1 to NUREG-0586, the NRC would appear to be paving the way for the very rubblization and possible release into the environment of slightly contaminated material that the AEP rep said could not happen. The vehicle to allow this (rubblization) would appear to be the declaration of more decommissioning issues "Generic" rather than "Site-Specific," thus preempting the right of local residents to raise concerns during the License Termination Plan review. (**CL-38/1**)

Comment: NRC's proposal to allow "rubblization" (defined as: "the demolition of onsite concrete structures. Rubblizing these structures could result in material ranging from gravels to large concrete blocks, or a mixture of both.") of concrete structures at the reactor site to take place without opportunity for public intervention until after the action is completed is outrageous. (**CL-47/14**)

Comment: NRC allows "rubblization" (crumbling the concrete reactor building) of nuclear reactors, without opportunity for public intervention until the action is completed. (**CL-48/36**)

Comment: We adamantly disagree with the possibility of rubblization as a method of decommissioning. Chopping up a plant and storing it on site not only sounds ridiculous, but also is grossly negligent of the fact that there are facilities designed, built and licensed to handle radioactive materials. Plant owners never told communities near nuclear plants that they were also accepting a permanent nuclear waste dump. Rubblization is an egregious assault on the public participation process and a devious example of corporations casting aside those communities that supported them over the years. (**AT-A/37**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC allows "rubblization" (crumbling the concrete reactor building) of nuclear reactors, without opportunity for public intervention until the action is completed. (**CL-26/2**)

Comment: [Georgians for Clean Energy] recognizes that nuclear plant owners and the NRC never told communities near nuclear plants that they were also accepting a permanent nuclear waste dump. Rubblization is an egregious assault on the public participation process and a devious example of corporations casting aside those communities that supported them over the years. (**CL-08/22**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC allows rubblization (crumbling the concrete reactor building) of nuclear reactors, without opportunity for public intervention until the action is completed. (**CL-43/1**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow rubblization (crumbling the concrete reactor building) of nuclear reactors, without opportunity for public intervention until the action is completed. (**CL-44/5**)

Comment: Rubblization poses some specific risks to the surrounding communities and the site workers, as the rubblized material could contaminate via air, soil, and water pathways. Thus, Public Citizen insists that it is only appropriate that the affected communities surrounding the reactor site be given opportunities to review rubblizing plans and procedures, and that this issue be addressed on a site-specific basis. (**CL-47/15**)

Comment: However, the rubblization process must account for the permeation of porous concrete structures (containment dome, basemat, and walls) with radioactivity much deeper than surface contamination that would be sand blasted during a decontamination process. Activated concrete would be rubblized and would thus constitute so-called "low-level" radioactive waste. Long-lasting radioactive elements such as cesium-135 and strontium-90 are present with many other fission products and radioisotopes in the concrete and should not be ignored or defined away. No data are provided in this Supplement to justify rubblization and onsite or offsite disposition. Thus, local communities have every right to participate legally (in adjudicatory proceedings) and be provided with information - full disclosure of such planning. (**CL-48/29**)

Comment: I utterly oppose "rubblization" with no opportunities for meaningful public intervention ahead of time. (**CL-33/7**)

Comment: It is extremely important for the NRC to level with the public about the potential hazards of the concrete debris and related rubble from the dismantled plants. (**CL-51/7**)

Response: *Rubblization (the process of onsite disposal of slightly contaminated material in a manner to meet the site release criteria of 10 CFR Part 20, Subpart E) is considered a site-specific issue and would be addressed during the LTP review. Since the LTP is approved by amendment to the facility license, the public will have the opportunity to participate in the review. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: If rubblization were technologically achievable, where on a plant site could the wastes be stored in perpetuity? Would that be above grade or below? (**CL-51/14**)

Response: *An explanation of rubblization and the location of the demolition debris is given in Section 1.3. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The question goes to the issue of the rubblization and the language in the GEIS that puts part of it out of scope and part of it is discussed as being covered under the generic environmental impact statement supporting the license termination rule. The heart of the comment and question really gets at the issue that from our perspective is not yet covered in that license termination rule and the assumptions embedded in that GEIS. And that has to do with the scenario of what happens and what are the assessments for the radiological materials post license termination. The rubblization is one angle that begs that question...The question is do you need to assume some refurbishment scenario post-license termination?...The question the industry asks is how do we address that? Do we come up with some scenario and refurbishment that would account for that? What would that scenario look like? We need that information so that we can do those assessments....Again, the issue is post-license termination. How do you assess a potential risk to a member of the public from that material?...The question is, is there some unique pathway that needs to be assessed for this material, such as an intruder pathway?...Our understanding was this GEIS would sort of beef that up because of this new idea; however, it appears that was sort of left out of scope and appropriately maybe so. Perhaps that is in the scope of the license termination rule. (**AT-E/1**)

Response: *The License Termination Rule does not contemplate post-license termination assessments for radiological hazards. The staff finds that the site-release criteria are sufficiently conservative to protect public health and safety and the environment for any reasonable post-license termination use of the site. The expectation is that any potential pathway would be addressed during the site-specific review of rubblization that occurs during the LTP review. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: We concur with the GAO findings as reported in GAO-02-48 "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could be Improved" dated December 2001. GAO reported the following conclusions: "rubblization represents a departure from NRC's past licensing practice, which emphasized shipping low-level radioactive wastes from decommissioning sites to disposal sites. Although NRC has estimated that rubblization could save a licensee from $10 million to $16 million in waste disposal costs during decommissioning, its Advisory Committee on Nuclear Waste has concluded that technical factors, such as the depth of radioactive contamination and the volume of rubblized waste, could significantly diminish the potential cost savings. The Advisory Committee also believes that evaluating radioactive material content and doses from rubblization, both at the site and in local groundwater, may prove difficult and expensive." (**CL-48/31**)

Response: *Rubblization requires a site-specific analysis, as noted in Section 1.3 of the Supplement. The staff acknowledges that technical factors related to the site and the licensee's actions could significantly influence the cost savings. Additionally, the staff acknowledges that it may be difficult to demonstrate that the material can be safely disposed of in the below-ground structures on site. These and other factors have led the staff to conclude that the radiological effects of rubblization would necessarily have to be considered on a site-specific basis. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I find it hard to believe that the massive structures of concrete and steel reinforcing bars found in a typical commercial power plant could be rubblized. The complexity and size of the task seem overwhelming. What technologies could be used to dismantle the base mat of the Callaway reactor building, for example: 13,400 tons of concrete plus 1,470 tons of intertwined #18 reinforcing steel bars? Do most 1,000-megawatt pressurized water reactor containment building have similar base mats? (**CL-51/12**)

Response: *The staff believes that if a licensee chose to rubblize a portion of their facility and dispose of the slightly contaminated rubble onsite they would only rubblize above-ground structures. Rubblizing a base mat for a reactor would not be necessary or required. The deconstruction industry is very effective in rubblizing reinforced concrete and it is done quite frequently. San Onofre recently rubblized several uncontaminated structures onsite, separating the reinforcing steel from the concrete. The effort was accomplished without incident. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.2.4 Safety of Decommissioning

O.2.4.1 Issues Related to Terrorist Events

Comment: Getting onto a brief comment on security, as many things are being reviewed in light of September 11, the decommissioning of nuclear reactors should be no exception. From what I've heard today, it sounds like there will be some sort of analysis of security issues and I hope that's directly relating to this decommissioning document. As we know, the draft EIS is grossly deficient in ensuring that security measures are taken to protect our homeland security from threats of sabotage at a nuclear plant. Georgians for Clean Energy request that a thorough amended review of necessary security measures be compiled by the NRC and added to the supplement. (**AT-A/12**)

Comment: If there is the possibility of release during decommissioning, then that should be something that should be accounted for especially in light of concerns of attack. (**CH-A/9**)

Comment: The terrorist attacks of September 11, 2001 have raised many issues concerning the currently, inadequate security of our nation's nuclear reactors. Because decommissioning creates opportunities for release of spent fuel and structures contaminated with radioactive material, the Final GEIS should revisit the appropriate security needed during decommissioning. (**CL-11/12**)

Comment: While EPA did not identify security issues during the GEIS scoping process, the events of Sept. 11 have brought them to the forefront of public concern. EPA suggests that NRC include in the final Supplement a general discussion on how the Commission is addressing security from terrorism at plants undergoing decommissioning. (**CL-16/9**)

Comment: I do want to talk about the physical protections and the existing regulations under 10 CFR 73.55. I guess I could state this as more or less of a question. For example, what measures will the Commission employ during decommissioning to protect against radiological sabotage? (**AT-F/2**)

Comment: Even 10 CFR 73.55 falls short in our estimation in the preparations for such a scenario. 73.55 considers only primary physical security barriers for vehicles, for isolation zones, for access to the plant, for detection of intrusion and what not. For example, it mentions that there [would] be bullet resistant walls, floors and doors in reactor control rooms. Well plainly this 10 CFR 73.55 needs to be updated because this is woefully inadequate to consider anything which is now possible after September the 11th. (**AT-F/4**)

Comment: Security must be upgraded, not downgraded. (**CL-20/74**)

Comment: EVERY SITE, OPERATING OR NOT OPERATING, IS A PRIME TERRORIST TARGET AS I HAVE SAID FOR DECADES. (**CL-20/79**)

Comment: It ought to be equally obvious that a serious accident or terrorist act in this industry could be catastrophic, leaving immense fatalities, injuries, future cancer victims and vast areas uninhabitable for years. (**CL-42/3**)

Comment: A reduced security force at a decommissioned nuclear plant increases the threat of terrorism. A thorough amended review of necessary security measures during decommissioning of nuclear facilities [due to 9/11] must be compiled by the NRC and added to the supplement. (**CL-53/2**)

Comment: The danger to the public from a terrorist act is a function of the total level of radiation that exists on one given site. We cannot do anything about the total level of radiation in a global sense, but through government regulations we could do something about the amount of radioactive material that is stored at any one location. (**SF-C/6**)

Comment: But I think that there is an overall concern, which I know that this doesn't address, and that is the vulnerability of nuclear power plants to various acts of terrorists. And I don't think it should be ignored, and I think that we should be very concerned about it. (**SF-C/3**)

Comment: Before September 11th, I probably felt that the SAFSTOR approach was one of the best things, to let them sit for 10, 20 years, and let the radioactive level decrease significantly before you try to disperse it. I no longer think that. And yet I just heard, well, the licensees have 60 years to decide, and they can do anything they want. And I don't think that's a danger that the public should put up with. (**SF-C/4**)

Response: *NRC and other Federal agencies have heightened vigilance and implemented initiatives to evaluate and respond to possible threats posed by terrorists, including the use of aircraft against commercial nuclear power plants. Malevolent acts remain speculative and beyond the scope of a NEPA review. NRC routinely assesses threats and other information provided to them by other Federal agencies and sources. The NRC also ensures that licensees meet appropriate security levels. The NRC will continue to focus on prevention of terrorist acts for all nuclear facilities and will not focus on site-specific evaluations of speculative environmental impacts. While these are legitimate matters of concern, they should continue to be addressed through the ongoing regulatory process as a current and generic regulatory issue that affects all nuclear facilities and many activities conducted at nuclear facilities. The NRC has taken a number of actions to respond to the events of September 11, and plans to take additional measures. However, the issue of security and risk from malevolent acts at nuclear*

power plants is not unique to decommissioning facilities and, therefore, is not within the scope of a Generic Environmental Impact Statement (GEIS) on decommissioning of nuclear power plants. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: With regard to the threat of attack, I think this relates to our second point. The document was prepared after September 11th, but it doesn't seem to respond to September 11th. We think the document should be responsive to the events of September 11th. What is NRC going to do to make sure that facilities are protected and secure during decommissioning? Has that changed in response to the threat of terror attack? We think it should. (**CH-A/8**)

Comment: In light of September 11th it is now abundantly clear that nuclear materials are desired by terrorist organizations. Our nation's operating nuclear power plants represent terrorist targets, but so too does the nuclear waste they generate. Since a decommissioned nuclear power plant would have a greatly reduced security force, the closed plant could provide an easier opportunity for terrorists to obtain nuclear materials. In the case of plants like Hatch that have outdoor storage of nuclear waste, the notion of a reduced security force is even more troubling. Georgians for Clean Energy again stresses the need for a full evaluation of security measures to be assessed prior to issuing a final GEIS. (**CL-08/3**)

Comment: NRC staff mentioned at the public meeting on 12/12/01 that a full, top-to-bottom review of security concerns would be conducted. Georgians for Clean Energy urges that this review be done prior to the issuance of the final generic impact statement for decommissioning (GEIS). (**CL-08/34**)

Comment: The massive destruction of September 11th accomplished by the Al Qaeda terrorists has rendered the Waste Confidence Policy ineffective and obsolete. No reasonable person can be assured that high-level nuclear waste can be safely stored at plant sites under present conditions. The GEIS fails to consider the consequences of acts of terrorism and acts of war perpetrated by suicidal zealots against spent fuel facilities at decommissioned nuclear plant sites. This failure of the GEIS needs to be remedied. (**CL-14/6**)

Comment: In the aftermath of September 11th, NRC and licensees must address earlier assumptions that decommissioning was less dangerous than operation and that security measures and insurance could be reduced because of it. Nuclear fuels pools as well as on site dry cask storage of high-level waste are targets for terrorism. In fact decommissioned sites could be selected as targets because there is less security and oversight during decommissioning and the monitoring of the ISFSI. NRC must require increased security and the

reinstatement of insurance provisions. Additionally, emergency preparedness drills and the EPZ should be reestablished. KI should be stockpiled in communities since the potential for off site consequences from a terrorist attack is possible. (**CL-50/28**)

Comment: The threat of terrorism: With terrorism now a legitimate concern in the United States, the potential of a suicide assault on a nuclear plant - whether the plant is operable or decommissioned - must be assessed plant by plant, not generically. (**CL-51/21**)

Comment: THE SPENT FUEL IS THE ULTIMATE IN TERRORIST TARGETS. (**CL-20/80**)

Response: *Malevolent acts affecting the physical security of nuclear power plants is an important issue for all reactors, both operating and permanently shut down, and is not unique to reactors in the decommissioning process. Shortly after the events of September 11, 2001, the NRC initiated a comprehensive review of its security requirements at nuclear power plants to ensure that the appropriate level of protection is in place for both operating and decommissioning reactors. The safety review will transcend the entire NRC licensing framework (operating reactor licensing, license renewal, decommissioning etc.) to fulfill NRC's responsibilities under the Atomic Energy Act. The findings resulting from the NRC's comprehensive review of its security requirements and whatever actions the Commission determines to be appropriate will be required of decommissioning reactors. Comments related to physical security considerations at decommissioning facilities have been forwarded to the appropriate program office within the NRC for consideration during the Commission's comprehensive review of security requirements. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Indeed, under the current plan, facilities under SAFSTOR will have fewer personnel at the site even though the radioactivity of the material will still be high. With less security, these facilities are at greater risk for attack. (**CL-11/13**)

Comment: Since a decommissioned nuclear power plant would have a greatly reduced security force, the closed plant could provide an easier opportunity for terrorists to obtain nuclear material. (**AT-A/14**)

Response: *Changes in the level of security at a nuclear power plant during decommissioning would be related to the type of activities and the area that requires protection. The Commission has initiated activities to reassess security issues in light of recent terrorist activities with the principal objective of maintaining public health and safety. While these are legitimate matters of concern, they should continue to be addressed through the ongoing regulatory process as a current and generic regulatory issue that affects all nuclear facilities. Comments related to physical security considerations have been forwarded to the appropriate program office within*

the NRC for consideration. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: If an organization like ours can spot a train carrying very dangerous radioactive waste, any terrorist organization can do the same thing. You've got to take that into consideration. (**AT-B/11**)

Comment: Re 9/11: I direct you to a quote from a recently published German report concerning the vulnerability of the Castor containers to terrorism: "The fact that all the technical data used in the report can be accessed by terrorists does not imply that a more restrictive policy towards information is required. Rather, it should be regarded as an argument against the use of a technology which is, at the time, hazardous and complex to a large degree, creating a conflict between the necessary societal discussion on the one hand and the protection of society from terrorist attacks on the other." (**CL-27/3**)

Response: *NRC routinely assesses threats and information provided to the NRC by other Federal agencies and other sources and ensures that licensees meet appropriate security levels. This issue will remain a priority for the NRC even during the transportation of the spent fuel. However, as discussed in Section 1.0, transportation of the spent fuel is outside the scope of the Supplement. Comments related to physical security considerations have been forwarded to the appropriate program office within the NRC for their consideration. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.2.4.2 Safety of Decommissioning

Comment: We're also concerned about safety. With reduced staffing as mentioned in the document, there's an increased risk of accident [and] the threat of attack on these sites with huge environmental and human consequences. (**CH-A/7**)

Response: *The missions of the NRC include the protection of public health and safety and protection of the environment. Staffing reductions at decommissioning power facilities are made commensurate with the reduction in risk associated with the facilities' permanently shutdown condition. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Every shut down reactor can take us a step closer to a sustainable energy future but, unfortunately, reactor shut down is not the threshold of safety, where the public can be assured that no health or environmental dangers will originate from the site. (**CL-47/6**)

Comment: Since many nuclear contaminants are extremely long-lived and dangerous to humans and the environment, decommissioning measures need to be handled most carefully, as our future generations literally will depend on how well the job is done today. (**AT-A/10**)

Comment: The notion presented by industry and others that decommissioning is inherently safe because the plant is no longer operating is a deceptive argument that confuses the public. Due to the nature of radiation, even after shutdown, parts of the plant, as we know, remain highly contaminated and extremely radioactive. The nuclear waste, such as the spent fuel produced by the plant during operation generates heat and emits radiation for thousands of years after the plant is shut down. Therefore, there is risk to the workers at the plant and to the local communities during decommissioning. (**AT-A/11**)

Response: *Decommissioning results in a reduction of the risks associated with the nuclear power plant. No major decommissioning activities take place until the fuel has been permanently removed from the reactor. Those risks associated with nuclear power plant operation are eliminated when the spent fuel is permanently removed from the reactor and placed in spent fuel storage. The risks continue to decrease as contaminated structures and systems are cleaned up and dismantled and the contaminate material is shipped offsite. Risks associated with storage of spent fuel are also reduced over time but are outside of the scope of this review. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The NRC must address the subject of radiation dangers after decommissioning HONESTLY, USING THE BEST INDEPENDENT RESEARCH, including: --exposure of children --exposure of the weak, the ill, the elderly --offsite contamination --credible, not arbitrary, environmental impact categories FOR EACH STEP OF A DECOMMISSIONING. (**CL-36/6**)

Response: *Potential radiological impacts following license termination that are related to activities performed during decommissioning are not considered in this Supplement, as discussed in Table 1-1. Such impacts are covered by NUREG-1496, Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities and given in regulations in 10 CFR Part 20. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The workers were not prepared. They didn't—whatever the—the moon suits they were supposed to wear or something, they often didn't. And it was—I mean it's dangerous. (**AT-D/2**)

Response: *Radiological conditions that workers are likely to be exposed to dictate the need and type of protective clothing to be used for a specific task. The industry has a remarkably good safety record when it comes to radioactive contamination and exposure. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It affects people's health. Workers especially who are not warned, who are not protected. (**AT-D/11**)

Response: *Training is required including notification of hazards for each specific job that involves the actual or potential exposure to radiation. In addition, there are regulations controlling the occupational doses to the workers. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.2.4.3 Risk-Informed Regulations

Comment: The U.S. Nuclear Regulatory Commission (NRC) has applied extraordinary effort to risk-inform reactor oversight but, save for Appendix G of this report, has avoided translation of environmental impacts from dose based-language to risk-based language. (**CL-13/1**)

Response: *The commenter is correct. The Supplement does not use risk-based language for the major portion of the Decommissioning Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The whole approach—the whole probablistic approach to risk is inappropriate. You must assume that whatever can go wrong will go wrong and that should be the level at which your risks are evaluated, not some unrealistic dream-like assessment of probability that isn't real world anymore. (**AT-B/12**)

Response: *The use of probabilistic risk assessments (PRA) as a tool to support regulatory decision making is a well established process that has been fully vetted, publically discussed, and widely accepted. The use of PRA by the industry and NRC staff complements the staff's deterministic approach to evaluating safety and supports the more traditional defense-in-depth philosophy. One of the primary reasons to employ a PRA approach is to achieve greater realism and effectiveness in evaluating and regulating what precisely is important and safety-significant. Evaluating every conceivable accident scenario without regard to its probability of occurrence is not realistic, wasteful of resources, and does not lead to good regulatory decisions. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Instead, the NRC has chosen to abandon its former regulatory philosophy (defense in depth and redundancy of safeguards) in favor of the far less restrictive and less protective approach (performance-based and risk-informed). (**CL-52/22**)

Response: *The NRC staff has not chosen to abandon its former regulatory philosophy. Defense-in-depth, which includes redundancy, remains a principal element of the NRC safety philosophy. Any application of risk-informed or performance-based regulation must be entirely consistent with the principals of providing for defense-in-depth and maintaining adequate safety margins. See Regulatory Guide 1.174, "An approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis", July 1998, for a detailed discussion of the NRC's regulatory guidance on risk-informed decision making. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.3 Decommissioning Process

Comment: The location of intake and outfall structures in the lake alone requires site-specific analysis. As written, the Draft GEIS does not make clear whether an intake/outfall structure on the facility is considered part of a previously disturbed area. If deemed part of the previously disturbed area, any work on the intake/outfall structure will be deemed generic and the impact small. (**CL-11/6**)

Response: *Chapter 4 of the Supplement has been extensively revised and the concept of "previously disturbed area" is no longer the criteria for initiating a site-specific analysis. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 3-5, Section 3.1.2, Lines 31-33 and Page 3-8, Lines 13-16. The document states on page 3-5 that "the impacts of dismantling all SSCs (structures, systems and components) that were built or installed at the site to support power production are considered in this Supplement." It then states on page 3-8 that the Supplement does not evaluate switchyards which "may remain on the site." If they are dismantled, would they be evaluated? (**CL-16/17**)

Response: *None of the facilities that have recently permanently ceased operation have dismantled their switchyards. However, if licensees choose to remove the switchyards it could be accomplished with little or no impact to the environment. The staff, in deciding the scope of the Supplement, attempted to place reasonable limits on the analysis. Since historically*

licensees generally maintained the switchyard the staff chose to not include it in the assessment of potential impact. The comment did not provide new information relevant to this supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Could you explain to me what that [previously disturbed area] would mean for an intake for water for cooling at the facility. Would that, does anything happen to that intake position during decommissioning? (**CH-A/3**)

Response: *Chapter 4 of the Supplement has been extensively revised and the concept of "previously disturbed area" is no longer the criteria for initiating a site-specific analysis. The intake structure, for the purpose of this Supplement, is considered within the operational area (the concept that replaced "previously disturbed area"). The licensee may choose to remove the intake structure during decommissioning, could wait until after the license is terminated to remove the intake structure, or could choose to leave the structure in place. The text was revised in several sections of this Supplement to better describe this issue.*

Comment: Major component removal should not be approved with the submission of a Post Shutdown Decommissioning Activities Report (PSDAR). A clear definition must be established to clarify what constitutes major and minor component removal. Approval of decommissioning plan should be required before major decommissioning activities begin. The PSDAR does not afford the community effective input into the decommissioning process since this document is a skeletal outline of generalized activities planned by the licensee. (**CL-50/7**)

Response: *Major decommissioning activities are clearly defined in 10 CFR 50.2. Regulatory Guide 1.184, Decommissioning of Nuclear Power Reactors, July 2000, provides additional clarification on major and minor components and what can be removed prior to submission of the PSDAR. The NRC regulations do not require the approval of a decommissioning plan prior to the commencement of major decommissioning activities. The purpose of the PSDAR is to inform the public and the NRC of the licensee's plans for the decommissioning of the facility. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The original site maps and drawings and photos made during construction should be consulted (some building techniques may have changed) all modifications and revisions should be tracked down. All vent systems should go through both HEPA (for the chemicals) and sand filters. Additional containment should be added around spent fuel pools including over the top and beneath it, extra supports, new liners. They will suffer serious embrittlement and activation, same goes for the casks. Such issues must be addressed. (**CL-20/72**)

Response: *Licensees are required by 10 CFR 50.75(g) to keep records of information important to the safe and effective decommissioning of the facility. Records of spills or unusual occurrences as well as "as-built" drawings and modifications to structures, systems, and components are covered by this requirement. The licensee is also required to use procedures and processes to accomplish decommissioning in a safe manner and to keep doses to the public and to the workers As Low As Reasonably Achievable (ALARA). The staff does not prescribe specific requirements related to facility decommissioning. The detailed suggestions made by the comment are outside the scope of this environmental assessment. The staff does, however, oversee the decommissioning process to ensure that appropriate regulatory requirements are being met. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The License Termination Plan (LTP) should be established, reviewed by the public and approved by the NRC before site remediation begins. (**CL-50/18**)

Response: *The NRC regulations require that the licensee submit the License Termination Plan (LTP) approximately two years prior to expected termination of the license. This could, depending on the decommissioning option chosen, be anywhere from approximately 3 to 58 years after permanent cessation of operation. Therefore, the current regulations (10 CFR 50.82) allow for site remediation to begin prior to submission and approval of the LTP. The regulations require that the NRC staff conduct a public meeting related to the LTP submittal in the vicinity of the plant. Since the LTP is approved by amendment to the facility license, the public will have the opportunity to participate in the review. Amendment of NRC regulations is outside the scope of this Supplement. NRC rulemaking procedures are found in 10 CFR Part 2. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: But things that shouldn't have been done did happen and things—you know, when they were washing some of the surfaces to prepare for cutting apart and shipping the wash water—I've spoken about this to some of the people already. It just went into the ground. It was supposed to be contained and it wasn't. And other things like that, that happened that were not supposed to happen, but they do happen. (**AT-D/5**)

Response: *Although infrequent, inadvertent releases of radioactive material during decommissioning occurs, the amount and consequences of those releases in the past have been minor and pose no threat to public health and safety. Past Releases to the environment have been remediated or determined to be of inconsequential health risk. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: One idea that we've talked about for a long time, and we actually had a big meeting about it and I think the idea is probably still alive, the site-specific advisory board. (**AT-G/4**)

Response: *Licensees at many decommissioning facilities have developed site-specific advisory boards that are composed of elected officials, technical experts, and members of the local public. These boards have been used as a means of keeping the public informed regarding the decommissioning process and to provide public input to the utility. The NRC encourages the use of these boards and frequently attends the meetings. However, NRC regulations do not require the formation of these advisory boards, nor is the NRC involved in their formation or their maintenance. This subject is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: My direct experience is limited to having heard an eyewitness account of the decommissioning of Yankee Rowe. This person reported a whole list of unfortunate incidents that released contamination into the air and groundwater, contaminating workers on site who were not wearing protective clothing, and possibly contaminating people along the rail and truck routes where parts of the plant were being transported. (**CL-10/3**)

Response: *Occasional releases of radioactive material have occurred at Yankee Rowe during decommissioning. Such events have been documented, investigated, and determined not to pose any risk to public health and safety. Specific information on the decommissioning at Yankee Rowe can be found in the NRC's ADAMS information system under docket number 050-00029. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Technical Specifications and what the facility was allowed to dump under the license are outdated and bear no resemblance to current knowledge and should be junked and the whole thing done over. (**CL-20/14**)

Response: *The comment is nonspecific. The Technical Specifications for the decommissioned facility are modified as decommissioning progresses through the license amendment process. Releases of radioactive material from the facility must be consistent with the regulations. The release limits are the same for decommissioning plants and operating plants. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: To find out the extent of past problems, and contamination levels, IT IS VITAL THAT THE NRC, THE LICENSEE (as some are new owners/licensees), AND THE CONTRACTORS AND SUB-CONTRACTORS, GET ALL REPORTS OF ACCIDENTS,

LICENSEE EVENT REPORTS, VIOLATIONS, INSPECTION REPORTS, SPILLS AND CONTAMINATION EVENTS FROM THE DOCKET FOR THE REACTOR AND SITE IN QUESTION. (**CL-20/22**)

Response: *The staff agrees that those NRC staff members responsible for the oversight of the facility decommissioning should have access to and become familiar with the relevant NRC documents. Licensees are required by 10 CFR 50.75(g) to keep records of information important to the safe and effective decommissioning of the facility. Records of spills and unusual occurrences as well as "as-built" drawings and modifications to structures, systems, and components are covered by this requirement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: NRC must stipulate, that ALL CONTRACTORS AND SUB-CONTRACTORS RIGHT DOWN TO THE BACK-HOE OPERATORS MUST BE HIGH SCHOOL GRADUATES. Cleanup cannot just be dished out to any contractor, all involved should not only have a sterling track record, but experience in nuclear fields. There should be a radiation biologist on site, plus a health physicist, plus a wildlife biologist with a knowledge of radiation effects, plus there must be federal and state oversight ON THE SITE at all times. (**CL-20/23**)

Response: *Qualifications and educational requirements for various licensee positions are specified in the regulations in 10 CFR Part 50 and are outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: ALL workers must have self-contained breathing systems (moon-suits). (**CL-20/32**)

Response: *Requirements for personnel protection are outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The use of high pressure water sprays is obscene. (**CL-20/69**)

Response: *High-pressure water sprays have been used to decontaminate structures, systems, and components and are an effective and safe method of decontamination. The use or non-use of specific decommissioning equipment is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Methodology must be established to locate and collect for proper disposal contaminated tools, soils, concrete blocks, plywood and other building materials that may have been taken offsite by workers during reactor operation such as was the case at Connecticut Yankee and Yankee Rowe. (**CL-50/15**)

Response: *Licensees, as part of their radiological control procedures, have established requirements to limit the spread of radioactive contamination from tools. The recovery of contaminated material improperly released from facilities undergoing decommissioning is outside the scope of this document. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It is obvious that the reactor vessel should NEVER be cut up, but do what was done with the Trojan vessel (p.G-18, remove the whole thing offsite) (**CL-20/58**)

Response: *Although the intact shipment of the reactor vessel greatly reduced the dose to the workers and the cost of removal, it was only facilitated because of the proximity of the Trojan Nuclear Plant to the low-level waste site at Hanford, Washington, the ability to use the Columbia River, a navigable river that allowed the barge transport for the reactor vessel, and the ability of Hanford to take the vessel for disposal. The industry has had experience in removing reactor vessel internals and, in the case of Shoreham, did segment and dispose of the reactor vessel. Such activity has been performed safely in the past and without serious injury or release of radioactivity to the environment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: However, the vessel should have additional shielding placed around it prior to placement on the heavy haul trailer, and upon arrival at the disposal site it should be further encased in what would amount to a giant burial cask. (**CL-20/59**)

Response: *Licensees must comply with NRC standards for allowable offsite radiation; regulations for transportation of waste materials are in 10 CFR Part 20, Subpart K. Additional shielding beyond that required by NRC regulations is not required to protect the health and safety of workers or members of the public. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Removing the vessel offsite massively reduces worker doses, water contamination and the contamination to the local community and the environment. (**CL-20/60**)

Response: *The comment was not specific and did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I noticed that it said cutting methods included abrasive water G-17, but in any case where there is plutonium contamination or depleted uranium metal, that all is meant to be cut under heavy oils and much else besides. Since many of the components will have been contaminated with plutonium, or were made of depleted uranium (when is the NRC going to tell the public that DU is NOT radioactive waste?) (**CL-20/57**)

Response: *Abrasive cutting of structures, systems, and components has been used frequently in decommissioning operations (Trojan, Fort St. Vrain, Haddam Neck). Such activities require stringent contamination control measures and occur inside buildings or structures, such as the containment building, which are designed to contain radioactive contamination. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: No structural remains should be sent to local landfills. (**CL-20/75**)

Response: *Only materials that have been carefully surveyed and determined to have no detectable radiation are allowed to be released from the plant. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.4 Out-of-Scope Issues

O.4.1 Reuse of Materials Offsite

Comment: In a related issue, there continues to be a gap in regulations concerning the release of slightly contaminated solid materials. In both partial site release without a license termination plan and license termination for the entire site, residual radioactivity may remain as long as the exposure criterion of 10 CFR 20 Subpart E is satisfied. Conversely, this same residual radioactivity is treated as licensed material prior to license termination--regardless of how little the amount, concentration, or dose significance--and can only be disposed of at a licensed facility. This double standard poses an incentive to retain radioactive material onsite until the license has been terminated to avoid potentially excessive costs for radwaste disposal, while creating a longer term risk for additional site cleanup required by other regulator authority or court of law. While we recognize that the U.S. Nuclear Regulatory Commission (NRC) is seeking to resolve this discrepancy through study by the National Academy of Sciences, and further agency deliberation, this process may take several years. Prolonged delay contributes to the erosion in public understanding and confidence in government policy as well as the lack

of resolution mentioned above for licensees. Public policy is needed to define the quantitative dose and radionuclide characteristics that have no discernible public health consequences. (**CL-01/8**)

Comment: The release of scrap metal from power reactors undergoing decommissioning will present a far more insidious problem than orphan sources, by greatly increasing the volume of radioactive scrap arriving at, and the frequency of alarms at, metals companies. This poses a serious problem for the suppliers and transporters, who must manage and arrange for the ultimate disposition of the rejected scrap. It would have a similarly enormous adverse impact on the smaller producers, foundries, scrap dealers and processors, fabricators, and end product manufacturers. Metals companies experiencing several alarms daily would continue to incur enormous costs, either unfairly increasing their manufacturing costs or compelling them to raise detection levels to above background, thereby exposing themselves to increased risk of inadvertently melting sealed sources. Receipt of even slightly elevated levels of radioactively contaminated scrap imposes enormous costs on metals companies. (**CL-03/6**)

Comment: No radioactively contaminated parts should be allowed into consumer use, commerce, or unregulated disposal. (**CL-39/3**)

Comment: Georgians for Clean Energy also opposes any efforts by the nuclear industry or licensee of a decommissioning nuclear plant to “recycle”—and I use that in quotes—radioactive materials for release into the marketplace. It is appalling that there may be an option for companies involved in a technology that can cause its own facilities to become radioactive, to financially benefit from selling the hot garbage to unsuspecting citizens in the form of daily household products. (**AT-A/38**)

Comment: Georgians for Clean Energy also opposes any efforts by the nuclear industry or licensee of a decommissioning nuclear plant to “recycle” radioactive materials for release into the marketplace. No facilities should be able to sell their demolition debris. Instead, it should be dealt with as regulated nuclear waste since the bulk of the materials will be radioactively contaminated. (**CL-08/23**)

Comment: The radioactive components, parts, liquids i.e. anything part of or to do with or emanating from the structures and the site MUST NEVER BE RE-CYCLED, OR RE-USED. (**CL-20/109**)

Comment: NRC MUST IMMEDIATELY CEASE ALLOWING, OR THINKING OF ALLOWING, RADIOACTIVELY CONTAMINATED SOIL TO BE RE-USED FOR ANYTHING. (**CL-20/110**)

Comment: Has the NRC no common sense at all? Releasing radioactively contaminated materials into daily consumer use and commerce and unregulated disposal is a direct assault on humanity. Don't let this happen. (**CL-23/1**)

Comment: Although it is not certain, a strong possibility exists that power reactors could release scrap metal that has a serious impact on the environment, such as by contaminating the soils or groundwater underneath a scrap yard or by escaping detection and becoming melted inadvertently in a metal company furnace. Furthermore, certain isotopes in scrap metal that escape detection before melting may accumulate and concentrate in emission control systems at metals company facilities, to the extent that metals producers could generate low-level wastes ("LLW") or mixed wastes. (**CL-03/3**)

Comment: Even if NRC eventually does establish dose-based clearance standards for solid materials, thousands of tons of scrap metal with residual radioactive contamination still would be released into the economy or sent to LLW or industrial waste landfills. (**CL-03/4**)

Comment: The economic and socioeconomic impacts of decommissioning, coupled with the lack of health-based release criteria using dose-based standards, create a disturbing incentive for the nuclear power industry to release as much surplus metal as it can into the economy and market it as useful material, rather than incurring additional disposal costs when the scrap metal meets general regulatory release guidelines but may contain levels of residual radioactivity unacceptable to metals producers. NRC's recognition of these economic and socioeconomic impacts and its concurrent failure to consider the impacts of contaminated scrap metal on the metals industries create the mistaken impression that the agency has covered all of the significant impacts of decommissioning. (**CL-03/8**)

Comment: We oppose any unlicensed disposition of long-lasting radioactivity from the nuclear fuel chain activities. As long as radioactive materials remain, someone should retain a license for those materials, and responsibility for them. That burden should not be shifted to the states and local communities without clear acknowledgment of the stewardship responsibility for that material. (**CL-48/17**)

Comment: I specifically oppose any release of contaminated materials during decommissioning or other times/procedures. (**CL-38/7**)

Comment: Concerning the scope of this hearing and to what extent the radioactive contamination levels that are permitted to be released from regulatory control for decommissioning are being used to release radioactive materials routinely. (**SF-D/2**)

Comment: We would oppose any release of contaminated materials during decommissioning or other times. (**SF-D/3**)

Comment: I Firmly oppose the “release” of radioactively contaminated materials into daily consumer use and commerce and unregulated disposal. (**CL-24/5**)

Comment: I stand firmly against the “release” of contaminated materials into daily consumer contact and commerce or unregulated disposal. (**CL-25/11**)

Comment: I stand firmly against the “release” of radioactively contaminated materials into daily consumer use and commerce or unregulated disposal. (**CL-26/15**)

Comment: I oppose the release of radioactive contaminated materials into daily consumer or commercial uses. (**CL-29/3**)

Comment: I stand firmly against the “release” of radioactively contaminated materials into daily consumer use and commerce or unregulated disposal. (**CL-37/1**)

Comment: The Supplement indicates that portions of a nuclear reactor site could be released from regulatory control prior to the site operator's license termination. This would relieve the nuclear utility of responsibility and liability for portions of sites (be they materials or real property) while still being licensed for the control of the entire site. Public Citizen is completely opposed to any such practice, which would allow radiation/radioactively-contaminated materials and wastes to be released, reused, or recycled, without restriction, into the unregulated industrial, commercial, and public environment. (**CL-47/16**)

Comment: Subsequent uses of these “slightly contaminated” materials and wastes—in roadbeds, or construction, consumer products, or other objects individuals may contact—will each add to the radiation doses received without knowledge or consent of the recipient. (**CL-52/16**)

Comment: NRC defines decommissioning, in part, to include the “release of property for unrestricted use….” and the “release of property under restricted conditions…” NIRS stands firmly against the “release” of radioactively contaminated materials into daily consumer use and commerce or unregulated disposal. (**CL-48/49**)

Comment: The NRC must NOT permit “release of property for unrestricted use” or under “restricted conditions.” To permit the release of radioactively contaminated materials into daily consumer use and commerce, or to allow unregulated disposal of such materials is abhorrent. Bin Laden might approve of such an interesting experiment; I trust that the NRC does not and will not. (**CL-36/7**)

Comment: MIRC appreciates the opportunity to comment on the draft Supplement and urges NRC to consider in the final Supplement to the GEIS the environmental impacts of releasing radioactively contaminated scrap metal into the economy for unrestricted use, as well as the economic impacts on the metals industries and related socioeconomic impacts. (**CL-03/9**)

Comment: The Supplement does not discuss the potential environmental impacts of releasing scrap metal or other solid materials pursuant to NRC's unrestricted release guidance, except to state that licensed facilities must comply with standards in 10 CFR. Part 20, limiting the sum of allowable internal and external doses to individual members of the general public to 0.1 rem per year. NUREG-0586 at 4-26 (Allowable doses to individual members of the public following license termination are limited to 25 millirem per year during the control period and 100 millirem per year after the end of institutional controls. See 10 CFR § 20.1402) (**CL-03/2**)

Comment: IF NRC, EPA, THE DOE AND OTHERS DO NOT STOP THIS INSANE RUSH TO REUSE, RECYCLE, DUMP AND COVER ETC. NUCLEAR MATERIALS, RADIOACTIVE MATERIALS, ACTIVATED MATERIALS ETC., WITHIN FIFTY YEARS NO LIVING BEING WILL BE BORN WITHOUT SOME TYPE OF DEFORMITY, GENETIC ABNORMALITY, CHROMOSOME ABERRATION ETC AND THE IMMUNE SYSTEMS OF EVERY LIVING BEING WILL BE SERIOUSLY COMPROMISED DUE TO RADIATION SUPPRESSING THE IMMUNE SYSTEM RESPONSE, AND ALL BECAUSE WE WILL BE COMPLETELY ENGULFED IN A MIASMA OF MANMADE, OR MAN ENHANCED, RADIOACTIVE CONTAMINATION. (**CL-20/112**)

Comment: These exposures from multiple unmonitored, unlabeled, uncontrolled sources are in no way accounted for, but they are additive and cumulative for the individual. They violate the fundamental tenet of radiation protection: viz., that the recipient of a radiation dose that is in addition to naturally-occurring background exposures should receive a benefit equal to or greater than the risk incurred. (**CL-52/17**)

Comment: IT MUST FORBID THE MELTING, SMELTING OR RE-USE OF RADIOACTIVELY CONTAMINATED METALS, PIPING, PLASTICS, WOOD, (INCLUDING FORBIDDING THE BURNING OF WOOD), ASPHALT, AND SO ON. (**CL-20/111**)

Comment: As we have previously commented in other dockets, there should be no release of radioactively contaminated material of any kind into consumer use or into general commerce. Disposal of all materials from decommissioning needs to be regulated, regardless of whether they are radioactive or not. (**CL-40/4**)

Comment: The NRC should not permit radioactive materials or wastes to be released into the environment. That is the basic message, the rightful demand of all those who will be affected negatively by releases. (**CL-52/18**)

Comment: Because the costs of sequestration ("disposal") of wastes is high, and deemed to be a "burden" for the licensee, the agency continues its endeavor to allow massive deregulation—release, recycle, and re-use—of radioactively-contaminated materials and wastes and their entry into the "free market" for resale and reuse in a host of consumer products. (**CL-52/15**)

Response: *During the decommissioning process, solid materials may not be released, recycled, or reused if there are detectable levels of licensed radioactive material present. Solid materials are carefully surveyed before release. The NRC has an initiative underway to consider the reuse or recycling of slightly contaminated solid material. This issue is being considered in an open forum and is outside the scope of the Supplement. Comments on the reuse or recycling of solid material will be forwarded to the appropriate NRC office for consideration. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Since at least as early as 1974, NRC has espoused a policy of "unrestricted release" of solid materials, including scrap metal, from nuclear fuel cycle facilities, without any specific, health-based release criteria. Unlike NRC requirements applicable to gaseous and liquid releases from nuclear facilities, there are no specific criteria governing releases of solid materials by licensees. Requests to release solid material are approved on a case-by-case basis using existing regulatory guidance and license conditions. (**CL-03/1**)

Response: *The release criteria for scrap metals and other solid material from nuclear power reactors are not "health-based" because the release criteria are based on demonstrating that there is no detectable contamination on the material. While these criteria do not have a specific dose or risk basis, they are considered to be protective of public health. The NRC has an initiative underway to consider the reuse or recycling of slightly contaminated solid material. This issue is being considered in an open forum and is outside the scope of the Supplement. The evaluation of environmental impacts from the release of potentially contaminated solid materials is not within the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.4.2 Partial Site Release

Comment: To categorize as "generic" "the release" from regulatory control portions of sites before they are completely decommissioned is not responsible. (**CL-39/2**)

Response: *The Supplement does not categorize partial site release as "generic". It does indicate that a proposed rule was issued on September 4, 2001 for partial site release prior to license termination. The partial site release rule does not advocate the release from regulatory control, portions of the site before they are completely decommissioned. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I utterly oppose allowing portions of sites to be released from regulatory control before the whole site is released. (**CL-33/8)**

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC allows portions of sites to be "released" from regulatory control before the whole site is released. (**CL-43/2**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow portions of sites to be "released" from regulatory control before the whole site is released. (**CL-44/6**)

Comment: NRC allows portions of sites to be "released" from regulatory control before the whole site is released. (**CL-48/37**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC allows portions of sites to be "released" from regulatory control before the whole site is released. (**CL-26/3**)

Response: *The partial site release rule does not advocate the release from regulatory control portions of the site before they are completely decommissioned. The rule requires that portions of a site released prior to NRC approval of the License Termination Plan must meet the same criteria as the entire site would at license termination. In providing public review of a proposed partial release, the NRC notices receipt of a licensee's proposal for a partial site release, regardless of the potential for residual radioactivity, and makes it available for public comment. The NRC is also required to hold a public meeting in the vicinity of the site to discuss the licensee's request for approval, or license amendment application in the case of impacted property, as applicable, and obtain comments before approving the release. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement*.

Comment: Again THERE MUST NEVER BE A PARTIAL OR FULL SITE RELEASE. ALL PROPERTY DEEDS MUST STATE THE SITES ARE NOT ONLY RADIOACTIVE, BUT SUPERFUND SITES, AS THAT IS WHAT THEY ARE. THE RIVER, LAKE, OCEAN BEACH

STRETCH OR WHATEVER IS NEXT TO THE SITE SHOULD BE POSTED AS RADIOACTIVE ALSO, EVEN IF THE SEDIMENT IS REMOVED, AS IT IS IMPOSSIBLE TO GET EVERYTHING. (**CL-20/73**)

Response: *A power reactor site or portions of a power reactor site that are released prior to termination of the reactor license would not qualify as a Superfund site with respect to a radiological hazard because the site or portion of the site would not be released from the NRC license until the licensee could demonstrate that the property posed no immediate or long-term radiological danger to the public. How former sites are identified, posted, or described in property deeds is outside the scope of NRC's mandate and regulations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the text of the Supplement.*

Comment: Partial release of property for unrestricted use should not be allowed until the LTP has been established, reviewed by the public, approved by the NRC and implemented on the given piece of land. Furthermore, methodology should be established for preventing recontamination of the released property through environmental migration e.g. rain, wind, etc and future decommissioning activities i.e. excavating, tracking or relocating contaminated materials. (**CL-50/19**)

Response: *The partial site release rule requires that portions of a site released prior to NRC approval of the License Termination Plan must meet the same criteria as the entire site would at license termination. In providing public review of a proposed partial release, the NRC notices receipt of a licensee's proposal for a partial site release, regardless of the potential for residual radioactivity, and makes it available for public comment. The NRC is also required to hold a public meeting in the vicinity of the site to discuss the licensee's request for approval, or license amendment application in the case of impacted property, as applicable, and obtain comments before approving the release. The partial site release rule does not specifically address methodologies for preventing recontamination of the released property. Licensees, however, have the same continuing responsibilities for controlling radiological releases onto property previously released for unrestricted use as they do for releases onto any other unrestricted areas adjacent to the site. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.4.3 Disposal of Low-Level Radioactive Waste

Comment: The draft GEIS says that low-level radioactive waste disposal is not part of the scope of this GEIS. However, this would appear to be contradicted by the definition of decommissioning (pg. xii), and by the scope, the release and removal of Sites, Systems and Components (SSCs). (**CL-38/6**)

Response: *The disposal of low-level waste (LLW) is not within the scope of this Supplement as it is an activity performed at a facility that is separately licensed or regulated. Sections 1.2, "Process Used to Determine the Scope of this Supplement," and 1.3, "Scope of this Supplement," address low-level waste and how it is considered in this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including:] "Low-level" Radioactive Waste Isolation; (**CL-02/6**)

Comment: You talk about burying it somewhere, well everybody is in danger when you do this kind of thing. (**AT-D/7**)

Response: *The disposal of LLW is not within the scope of this Supplement, as it is an activity performed at a facility that is separately licensed or regulated. LLW facilities are sited in areas that are away from surface water and where the groundwater is located at depths sufficiently beneath the trenches to minimize nuclide migration. Sites and the surrounding areas are monitored using a system of wells to determine whether radioactive material is migrating into the groundwater. A combination of natural site characteristics and engineered safety features is used to ensure the safe disposal of LLW. In addition, restrictions of types and amounts of waste disposed of at a site, as well as the technical analysis performed as part of the licensing review to demonstrate compliance with performance objectives in NRC regulations, maintain the safety of LLW disposal. The natural characteristics of an LLW disposal site are relied on in the long-term, and they should promote disposal-site stability and attenuate the transport of radionuclides away from the disposal site into the general environment. Sites generally must possess the following characteristics: (1) relatively simple geology, (2) well-drained soils free from frequent ponding or flooding, (3) lack of susceptibility to surface geological processes, such as erosion, slumping, and landslides, (4) a water table of sufficient depth so that groundwater will not periodically intrude into the waste or discharge onsite, (5) lack of susceptibility to tectonic processes, (6) no known potentially exploitable natural resources, (7) limited future population growth or development, and (8) capability of not being adversely impacted by nearby facilities and activities. Engineered barriers are man-made structures designed to improve the natural site characteristics to isolate and contain waste. They consist of various engineered system components, including the following: (1) a layered earthen cover, (2) a disposal vault, (3) a drainage system, (4) waste forms and containers, (5) backfill material, and (6) an interior moisture barrier and low-permeability membrane. Regulations specify the*

allowable radiation dose from the LLW facilities to the workers and to the public. Evaluation of the environmental impacts associated with the disposal of low-level waste is outside the scope of this Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: The on site disposal of radiological demolition debris (rubblization) is considered in the GEIS. With rubblization abandoned at Maine Yankee, the cumulative effect of disposal of the debris at a licensed facility elsewhere is not considered. This makes no sense. Nor does it make sense to "lose" impacts when contaminated materials are shipped to handling facilities for recycling. Different choices made at the decommissioning site will result in different impacts to workers and other citizenry offsite and away. These effects should not be artificially separated from the environmental impacts of decommissioning simply because they are exported. (**CL-13/19**)

Response: *The disposal of low-level waste (LLW) is not within the scope of this Supplement, as it is an activity performed at a facility that is separately licensed or regulated (see Section 1.3). Regulations related to LLW disposal are in 10 CFR Part 61 and 10 CFR Part 20, Subpart K, of the Code of Federal Regulations. The staff did consider cumulative impacts. Section 4.2 has been changed for clarification.*

Comment: If such a tent system were used, afterwards it would be disposed of as rad waste. (**CL-20/35**)

Response: *If the tent system was contaminated and the contamination could not be removed to undetectable levels then the tent or the contaminated portions of the tent would have to be disposed of as LLW. The disposal of low-level waste (LLW) is not within the scope of this Supplement, as it is an activity performed at a facility that is separately licensed or regulated. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In addition to recomputing the cost of LLW disposal, the reopening of Barnwell has indefinitely postponed the siting of a waste facility in Pennsylvania. (**CL-02/29**)

Response: *The factors influencing the siting of regional-compact burial sites is outside the scope of the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The fact is, wherever this radioactively contaminated refuse winds up - from spent fuel to contaminated rags - it can't be contained forever and will reach the environment, which is why it must go to a remote location, below ground (none of this idiot parking lot out in Utah or

Nevada cask storage either) in a dry, geologically sound (as far as possible in a moving planet) location where monitoring could alleviate problems that arise prior to reaching the public and wildlife. NRC must recognize that this "solution" - while not a perfect solution, as there is no perfect solution to the nuclear waste issue, is the solution that has been gone back to repeatedly over the decades, after thousands of studies contemplating what to do with the waste failed to identify anything better, or safer. What NRC and industry are proposing in this Draft, flies in the face of thousands of prior studies by some of the world's most renowned people who understand the horror of the dilemma, and of their conclusions. Leaving all this contamination on sites around the nation to contaminate and kill hundreds of communities is simply barbaric and must be stopped at all costs. (**CL-20/114**)

Comment: The nuclear industry is leaving humankind a legacy of devastation, epitomized by its long-lived and highly dangerous nuclear waste. They are unable to solve their waste problem and now, when faced with the eventual shutdown of their plants, are unwilling to take measures to ensure that the public is protected. (**AT-A/43**)

Response: *The NRC has stated in its regulations: "The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impact for at least 30 years beyond the licensed life for operation (which may include the term of renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent fuel-storage installations." Further, the Commission believes there is reasonable assurance that at least one mined geological repository will be available in the first quarter of the 21st century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time. The evaluation of environmental impacts from the disposal of LLW and spent fuel is outside the scope of the Supplement (see Section 1.3). The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: There still remains a mountain of radioactive waste after shut down, including the reactor itself and, typically, an incredibly dangerous stockpile of irradiated reactor fuel. Whereas the reactor itself and the equipment and materials of the central facilities are often treated as the object of decontamination, it must be noted that the previous operation of the plant has dispersed radiation and contamination that did not regard the facility's fence line as a barrier. Any serious approach to decommissioning a site must take this into account. (**CL-47/7**)

Response: *Nuclear power facilities were licensed with the expectation that there would be routine releases of detectable radioactivity to the air and water surrounding the site. Such releases are controlled and limited to levels considered adequate to protect public health and*

safety. Radiological impacts of releases during plant operations are limited by criteria set forth in 10 CFR Part 20. Offsite remediation due to routine plant release is not warranted. The evaluation of environmental impacts from the disposal of LLW and spent fuel is outside the scope of the Supplement (see Section 1.3). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Allowing NRC to determine whether waste can or will remain after a reactor license is terminated is contrary to the policy of the respective compacts and in direct disregard of the federal low-level radioactive waste framework established by Congress. (**CL-17/9**)

Response: *Material that could be classified as low-level waste would not be left behind after license termination. Any radioactive contamination left behind after license termination must meet the License Termination Criteria given in 10 CFR Part 20, Subpart E. Materials that cannot meet these criteria are considered to be low-level waste and would have to be disposed of at a licensed low-level waste facility before the license could be terminated. Therefore, any radioactive material remaining onsite after license termination would not be considered radioactive waste. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Inherent in the decision to operate the reactors is an acceptance on the part of the generator and the regulator of the production of long-lasting radioactive waste and radioactive and chemical contamination of large volumes of resources. Decommissioning should include responsibly managing that material, not denying its existence. (**CL-48/10**)

Response: *Although long-term storage of spent fuel and low-level waste is not within the scope of the Supplement, as described in Section 1.3, NRC is committed to ensuring that both spent fuel and low-level wastes are managed to prevent detrimental health impacts to the public. The NRC has stated in its regulations: "The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impact for at least 30 years beyond the licensed life for operation (which may include the term of renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent fuel-storage installations." Further, the Commission believes there is reasonable assurance that at least one mined geological repository will be available in the first quarter of the 21st century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time. LLW facilities are sited in areas that are away from surface water and where the groundwater is located at depths sufficiently beneath the trenches to minimize nuclide migration. Sites and the surrounding areas are monitored using a system of wells to determine if there is any leakage of radioactivity into the groundwater. A combination of natural*

site characteristics and engineered safety features is used to ensure the safe disposal of LLW. In addition, restrictions of types and amounts of waste disposed of at a site, as well as the analysis performed as part of the licensing to demonstrate compliance with performance objectives in NRC regulations, increase the safety of LLW disposal. The natural characteristics of an LLW disposal site are relied on in the long-term, and they should promote disposal-site stability and attenuate the transport of radionuclides away from the disposal site into the general environment. Sites generally must possess the following characteristics: (1) relatively simple geology, (2) well-drained soils free from frequent ponding or flooding, (3) lack of susceptibility to surface geological processes, such as erosion, slumping, and landslides, (4) a water table of sufficient depth so that groundwater will not periodically intrude into the waste or discharge onsite, (5) lack of susceptibility to tectonic processes, (6) no known potentially exploitable natural resources, (7) limited future population growth or development, and (8) capability of not being adversely impacted by nearby facilities and activities. Engineered barriers are man-made structures designed to improve the natural site characteristics to isolate and contain waste. They consist of various engineered system components, including the following: (1) a layered earthen cover, (2) a disposal vault, (3) a drainage system, (4) waste forms and containers, (5) backfill material, and (6) an interior moisture barrier and low-permeability membrane. Regulations specify the allowable radiation dose from the LLW facilities to the workers and to the public. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Limerick, Oyster Creek, Peach Bottom, Salem, and Three Mile Island are among the nation's nuclear generating stations currently serving as "temporary" repositories for low-level radioactive waste. Limerick, Peach Bottom, and Three Mile Island do not meet the standards set by the Appalachian Compact in regards to a permanent LLW facility. (**CL-02/30**)

Response: *The NRC has historically discouraged the use of onsite storage as a substitute for permanent disposal, but has not limited the amount of time that the waste can be stored. However, LLW is normally stored onsite on an interim basis before being shipped offsite for permanent disposal. Onsite storage facilities are designed to minimize personnel exposure. High-dose-rate LLW is isolated in a shielded storage area and is easily retrievable. The lower dose-rate LLW is stacked or stored to maximize packing efficiencies. The NRC has guidelines regarding the storage facility, including the following: (1) shielding used should be controlled by dose-rate criteria for both the site boundary and any adjacent offsite areas and (2) a liquid drainage collection and monitoring system should be present. The drain should be routed to a radwaste processing system. The regulations related to LLW disposal are in 10 CFR Part 61 and 10 CFR Part 20 Subpart K. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Anything dumped or buried from the past practices on site must also be dug up and removed. (**CL-20/21**)

Response: The licensee is required to conduct a site characterization study to determine the location and extent of radioactive contamination. The LTP addresses the issue of onsite buried waste and soil contamination. Site remediation is addressed by the LTP. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: YOU CAN'T BURN IT/INCINERATE IT, IT GOES OUT THE STACK AND POLLUTES THE STACK, YOU CAN'T WASH IT, IT WINDS UP ALL OVER THE PLACE AND IN THE WATER, IT IS ALWAYS THERE, THE DEADLY, INVISIBLE KILLER. AT MOST YOU CAN TRY AND CONTAIN IT. (**CL-20/71**)

Response: *Companies licensed to incinerate radioactive waste are regulated by the NRC and EPA. Effluents are monitored and controlled prior to release and limited by NRC and EPA regulations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: None of the mixed-waste should be dealt with as mixed waste (i.e. a combination of chemical/hazardous and radioactive) because MIXED WASTE FALLS THROUGH ALL REGULATORY CRACKS, BUT IT SHOULD BE TREATED AS RADIOACTIVE WASTE. (**CL-20/77**)

Response: *The disposal of mixed waste falls under NRC regulations (10 CFR Part 61, "Licensing requirements for land disposal of radioactive waste") and EPA regulations for disposal of hazardous waste (40 CFR Part 260 through 40 CFR Part 270). Offsite disposal of mixed waste is outside the scope of the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: WASTE OILS SHOULD NOT BE SENT TO VENDORS FOR INCINERATION OR RECYCLING OR REUSE AS THEY ARE CONTAMINATED. (**CL-20/78**)

Response: *Contaminated waste oil will be dealt with in an appropriate manner consistent with NRC and EPA regulations. Offsite disposal of LLW is outside the scope of the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: One of the things that has to be acknowledged I think or anticipated is the failure of the United States nuclear waste program on all levels, so that low-level dumps are not getting established, high-level dumps are not getting established. Therefore, we may really have to keep a lot more of this radiation on site than we had anticipated. (**AT-G/2**)

Comment: No facility exists for the permanent disposal of the nation's high-level waste (irradiated reactor fuel), and only one burial site, in Barnwell, SC, is currently available to most reactors for the rest of their wastes (their so-called "low-level" wastes, which ultimately could include the rubble and dismantled components from decommissioned plants). That one "low-level" waste facility however, that is serving most of the nation, is expected to be closed in the near future to non-Southeast-United States reactors. (**CL-51/22**)

Response: *The NRC has stated in its regulations: "The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impact for at least 30 years beyond the licensed life for operation (which may include the term of renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent fuel-storage installations." Further, the Commission believes there is reasonable assurance that at least one mined geological repository will be available in the first quarter of the 21st century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time. LLW facilities are sited in areas that are away from surface water and where the groundwater is located at depths sufficiently beneath the trenches to minimize nuclide migration. The natural characteristics of an LLW disposal site are relied on in the long-term, and they should promote disposal-site stability and attenuate the transport of radionuclides away from the disposal site into the general environment. Sites generally must possess the following characteristics: (1) relatively simple geology, (2) well-drained soils free from frequent ponding or flooding, (3) lack of susceptibility to surface geological processes, such as erosion, slumping, and landslides, (4) a water table of sufficient depth so that groundwater will not periodically intrude into the waste or discharge onsite, (5) lack of susceptibility to tectonic processes, (6) no known potentially exploitable natural resources, (7) limited future population growth or development, and (8) capability of not being adversely impacted by nearby facilities and activities. Engineered barriers are man-made structures designed to improve the natural site characteristics to isolate and contain waste. They consist of various engineered system components, including the following: (1) a layered earthen cover, (2) a disposal vault, (3) a drainage system, (4) waste forms and containers, (5) backfill material, and (6) an interior moisture barrier and low-permeability membrane. Regulations specify the allowable radiation dose from the LLW facilities to the workers and to the public. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.4.4 Spent Fuel Maintenance, Storage, and Disposal

Comment: I find nothing in this thick document where [it] addresses at all the generic, or under generic or site-specific issues the impact and the effects on the structure, systems and components of an event which happens during decommissioning. And, of course, the radioactive fuel pools are the principle source in that case of radioactive contamination. (**AT-F/3**)

Response: *Section 4.3.9 addresses accident analysis, including those involving the spent fuel pool. Details of potential accidents are in Appendix I. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Draft says, p.1-6, that NRC and the Commission are not considering the issue of spent fuel storage (in a pool or in one of those ridiculous casks outside in plain view for every terrorist to see) as part of decommissioning. The excuse is that its dealt with under other license aspects. (**CL-20/25**)

Response: *The commenter is correct in noting that the issue of spent fuel storage is outside the scope of this Supplement for reasons discussed in Section 1.3, "Scope of This Supplement." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It also says that the Commission has made a finding that the DEADLY, RADIOACTIVE SPENT FUEL BE STORED SAFELY AND WITHOUT SIGNIFICANT ENVIRONMENTAL IMPACTS FOR AT LEAST THIRTY YEARS BEYOND THE LIFE FOR OPERATION ETC. ETC. (**CL-20/26**)

Comment: [In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including:]Spent Fuel Isolation. (**CL-02/5**)

Comment: When California's nuclear plants received licenses for construction and operation, promises were made that high-level radioactive waste would be removed within a few years. Every deadline to open a safe and permanent repository for high-level radioactive waste has been missed. Therefore, the issue has grown; we are not accessing only the decommissioning of a power plant, but dealing also with storage and transportation of lethal substances unforeseen when licenses were granted. (**CL-53/4**)

Comment: One of the things it (the 60 year period) presumes is that there's going to be a viable option for removing the spent fuel from the site. And I'm just wondering if anybody could

talk a little bit about the relationship there, because I am one of many people who believe that Yucca Mountain is not a foregone conclusion, although probably that is not your view here, but there is significant opposition to it from some rather more powerful actors than us in the State of Nevada. (**SF-B/5**)

Comment: Can the Commission identify a pragmatist, physicist, chemist, policy analyst, or behavioral scientist who is willing to testify that radiological decommissioning can be achieved with the fate of Yucca Mountain in perpetual limbo and the three current "low-level" radioactive waste facilities limited by finite capacity and geopolitical considerations? (**CL-02/13**)

Comment: Spent fuel "disposal" is an unresolved and hugely problematic area. Each reactor produces approximately 20 to 30 tons of high-level radioactive waste per year. There is presently, and at least until 2010, nowhere to put this waste. The technology to safely manage spent fuel for an indefinite period of time does not exist. There is no location to permanently store spent fuel and high-level radioactive waste (HLW) generated by nuclear power plants. (**CL-02/21**)

Comment: Aggravating the critical shortage of HLW storage space is the bleak estimate for the completion of Yucca Mountain, the designated repository for high-level nuclear waste. The earliest date this repository could be available is 2010. Lynn M. Shishido-Topel served as the Overseeing Commissioner of the Illinois Commerce Commission testified, also predicted that the amount of spent fuel generated by 2000 will be 40,000 metric tons (MTU). This amount of waste would exceed Yucca Mountain's capacity, and the State of Nevada has demonstrated that Yucca Mountain will probably hold about 20% of the total 85,000 MTU of spent fuel earmarked for the facility. (**CL-02/23**)

Comment: Isolation of high-level radioactive waste, which is primarily composed of spent fuel, can not be separated from radiological decommissioning. The earliest Yucca Mountain will be available is in the year 2010. Nuclear generating stations can not be decommissioned or decontaminated with the presence of HLW onsite or inside the reactor vessel. Aggressive decontamination process will be precluded, necessitating utilities to place retired reactors into extended-DECON or SAFSTOR. If a long-term solution to spent fuel isolation is not found in the immediate future, some of the nation's nuclear generating stations will be shut down prematurely due to an absence of spent fuel storage capacity. (**CL-02/26**)

Comment: It ought to be equally obvious that a satisfactory waste isolation solution evades us (we do not agree with Secretary Abraham that Yucca Mountain is a suitable repository based on science - the DOE itself admits that the site is not geologically suitable and the GAO raises serious questions about the selection process). (**CL-42/2**)

Response: *Although long-term storage of spent fuel is not within the scope of the Supplement, as described in Section 1.3, "Scope of This Supplement," NRC is committed to ensuring that both spent fuel and low-level wastes are managed to prevent detrimental health impacts to the public. The NRC has stated in its regulations: "The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impact of at least 30 years beyond the licensed life for operation (which may include the term of renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent fuel-storage installations." Further, the Commission believes there is reasonable assurance that at least one mined geological repository will be available in the first quarter of the 21st century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time. The comments do not provide new information relevant to this Supplement and will not be evaluated further. The comments do not result in a change to the Supplement.*

Comment: I probably have a question in there because I wasn't sure, reading through the document itself, where, like the outdoor storage facilities at Plant Hatch and elsewhere—how they are dealt with after the plant itself is decommissioned and if the license is terminated. I'm not sure how that works and who's responsible and I would like more clarification on that. (**AT-A/16**)

Response: *Both operating plants and plants that have permanently ceased operations and are decommissioning have the option to store their spent fuel in dry cask storage outside on a specially constructed concrete pad. The facility is called an Independent Spent Fuel Storage Installation or ISFSI. An ISFSI can be constructed and operated either under the same licensee that is used for an operating or decommissioning facility (called a "Part 50 license" in reference to the location in the Code of Federal Regulations that describes the license requirements) or under a site-separate license (called a "Part 72 license" in reference to the location in the Code of Federal Regulations that describes the licensing requirements for the ISFSI). Licensing the ISFSI separately under Part 72 license allows completion of the decommissioning of the power reactor and its associated structures, systems and components while retaining a license for the ISFSI. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Furthermore, some nuclear plants, like Hatch have overflowing volumes of nuclear waste that are now being stored outdoors which impacts the environment and could affect decommissioning. (**AT-A/25**)

Comment: Some nuclear plants, like Hatch, have overflowing volumes of nuclear waste that are now being stored outdoors which impacts the environment and could affect decommissioning. (**CL-08/7**)

Response: *Some of the spent fuel at Hatch is stored in an ISFSI located onsite. The ISFSI is licensed under the provisions of 10 CFR Part 50. The spent fuel at Hatch is stored in accordance with the regulations in 10 CFR Part 50 and/or 10 CFR Part 72. However, the impacts from an ISFSI are outside the scope of this Supplement, as discussed in Section 1.3. The impacts that an onsite ISFSI might have on decommissioning activities were considered to be insignificant since it is an independent facility located some distance from structures, systems or components that are likely to be removed during decommissioning. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: How will onsite, outdoor nuclear waste storage dumps, [also known as Independent Spent Fuel Storage Installations—ISFSI] like at Plant Hatch, be affected by decommissioning? How will the licensee of an ISFSI be impacted by events that may happen during decommissioning, i.e. what if there is an accident nearby and the casks are damaged or the site is rendered inaccessible? (**CL-08/27**)

Comment: Those issues are of grave concern. What happens, if during decommissioning terrorists take out three spent fuel casks blasting them to kingdom come OR two casks had a major problem and needed to be opened under shielding inside the spent fuel pool and there was either no room in the spent fuel pool or the cask came apart while trying to move it due to embrittlement of the cask from the radioactive decay heat coming off the spent fuel? (**CL-20/27**)

Response: *ISFSIs are generally located far enough away from structures and systems being dismantled or demolished during decommissioning that an accident during decommissioning would be unlikely to adversely impact the ISFSI. If a cask were to be damaged by some means, the licensee would be required to decontaminate the area and re-secure the spent fuel. Although difficult, such activity is technically feasible and could be accomplished relatively quickly. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The GEIS does not consider the impacts of spent fuel storage. We believe this to be based on artificial distinctions. Both Maine Yankee and Haddam Neck have identified establishing an Independent Spent Fuel Storage Facility as a " critical pathway" in decommissioning. ISFSI construction has been regulated under the very same Part 50 license that

will be terminated upon successful decommissioning. Only then will a Part 72 license be issued. The ISFSI is in the middle of a decommissioning site and physically inseparable from decommissioning. Its impacts should be considered among the impacts of decommissioning in the GEIS. (**CL-13/18**)

Comment: Nuclear corporations should not be allowed to decommission reactors under an operating license through a series of amendments nor should they be allowed to create an Independent Spent Fuel Storage Installation (ISFSI) under an operating reactor license when they are decommissioning. Decommissioning reactors installing ISFSI's should be required to go into a Part 72 license to provide adequate regulatory oversight protect public health and safety. The Part 72 general license provision for creating an ISFSI at an operating reactor was never intended to cover a decommissioning reactor when regulatory oversight is minimized. (**CL-50/23**)

Response: *Both operating plants and plants that have permanently ceased operations and are decommissioning use ISFSIs. ISFSIs are not unique to decommissioning plants. The initial development of the decommissioning regulations occurred in the early 1980s. At that time, the NRC and the industry assumed that by the time facilities began decommissioning, the U.S. Department of Energy's (DOE) high-level waste repository would be accepting spent fuel for ultimate disposal. Therefore, spent fuel onsite during decommissioning was not expected to be an issue. Consequently, development of regulations related to ISFSIs occurred separately from the development of decommissioning regulations. Since the ISFSI may in some cases remain at the site longer than a nuclear facility that is undergoing immediate decommissioning, it is appropriate that ISFSIs be capable of being licensed separately. The decommissioning of the ISFSI is also handled separately from the decommissioning of the nuclear power plant. Site-specific ISFSI licenses require the evaluation of the ISFSI separately from the remainder of the facility although other site activities adjacent to the ISFSI are considered to evaluate their impact on the storage of the spent fuel. An ISFSI can be constructed and operated either under the same license that is used for an operating or decommissioning facility (called a "Part 50 license" in reference to the location in the Code of Federal Regulations that describes the license requirements) or under a site-separate license (called a "Part 72 license" in reference to the location in the Code of Federal Regulations that describes the licensing requirements for the ISFSI. ISFSI licensing, siting, construction and operation are outside the scope of the GEIS on decommissioning (see Section 1.3). The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Until the spent rods are removed from local nuclear power plants the decommissioning rules should be tightened, not loosened. Your proposal may have seemed reasonable earlier this year but we live in a very different world now. It can no longer be business as usual at the NRC. (**CL-25/4**)

Response: *The Supplement provides an assessment of impacts related to the decommissioning process. The Supplement does not (1) establish policy, (2) establish or revise regulations, (3) impose requirements, (4) provide relief from requirements, or (5) provide guidance on the decommissioning process. The regulations for maintenance and storage of spent fuel are given in 10 CFR Parts 50 and 72 and are summarized in Appendix L of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In the case of plants like Hatch, that have outdoor storage of nuclear waste, the notion of a reduced security force is even more troubling. (**AT-A/15**)

Response: *Nuclear power plants are regulated under 10 CFR Part 50 during both plant operation and decommissioning. Typically once a plant permanently ceases operation there is a gradual reduction in security requirements commensurate with the reduction of risk associated with the various structures, systems and components. However, security around the spent fuel pool remains at levels commensurate with those at an operating nuclear facility. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The excess storage—I mean the storage in pools, but there's a whole lot setting out in dry casks very vulnerable to whatever comes along, whatever happens. I mean the whole thing is just—I don't know how in the world they're going to deal with it. (**AT-D/4**)

Response: *Although long-term storage of spent fuel is not within the scope of the Supplement, as described in Section 1.3, "Scope of This Supplement," NRC is committed to ensuring that both spent fuel and low-level wastes are managed to prevent detrimental health impacts to the public. The NRC has stated in its regulations: "The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impact of at least 30 years beyond the licensed life for operation (which may include the term of renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent fuel-storage installations." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: As early as 1995, concerns about Yucca Mountain's integrity surfaced from scientists at Los Alamos National Laboratories. Dr. Charles Bowman warned that plutonium would remain after the steel casks holding the nuclide dissolved. Plutonium could then migrate and concentrate. And in February 1999, the scientific peer review panel for Yucca Mountain commissioned by the U.S. Department of Energy (DOE) produced a "highly critical" report. "The review panel said the model [DOE'S computer model] has so many uncertainties - like the corrosion rates of waste containers, the area's vulnerability to earthquakes and how climate

changes would affect rainfall - that its reliability was limited. In February, 1999, the scientific peer review panel for Yucca Mountain commissioned by the U.S. Department of Energy (DOE) produced a "highly critical" report. 'The review panel said the model [DOE's computer model] has so many uncertainties - like the corrosion rates of waste containers, the area's vulnerability to earthquakes and how climate changes would affect rainfall - that its reliability was limited." (**CL-02/24**)

Comment: A satisfactory waste isolation site evades us. Yucca Mountain is not a suitable geologic repository based on science – the DOE itself admits that the site is not geologically suitable; storage canisters will be required to protect the waste from exterior environmental contamination. Additionally, the GAO raises serious questions about the selection process. (**CL-46/3**)

Comment: I don't think there is any good way to treat the long-term storage of radioactive waste. I don't think Yucca Mountain is the answer, for darn sure, for various reasons. Also at Lawrence Berkeley Lab the group that's the Earth science group has done the study on groundwater transportation. And I know from some of my associates there that they think it is not a satisfactory location for long-term storage. (**SF-C/5**)

Response: *The spent fuel repository planned for Yucca Mountain is the subject of a separate NRC licensing action. Uncertainties of specific parameters are being evaluated at this time and will ultimately be addressed in the licensing action and the specific documents associated with it at that time. High-level waste disposal is outside the scope of this Supplement, as discussed in Section 1.3, "Scope of This Supplement." The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Furthermore, on October 4, 1999, LeBoeuf, Lamb, Green & MacRae, filed a complaint alleging a conflict of interest by the Department of Energy in their selection and awarding of $16 million legal contract to Winston & Strawn. Former general counsel to the Energy Department, R. Jenney Johnson, in a sworn affidavit, stated: "[A] situation has been created which an entity [Winston & Strawn] will pass judgment on its own work." (**CL-02/25**)

Comment: Years ago, when people spoke of some type of monitored, retrievable spent fuel storage, they meant monitored, so repairs could be made by remote control if needed, and retrievable so problems could be addressed. Spent fuel is the stuff that the Department of Energy has been charged with trying to contain for approx. 10,000 years removed from the biosphere. (**CL-20/81**)

Response: *High-level waste disposal is outside the scope of this Supplement as discussed in Section 1.3, "Scope of This Supplement." The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement*.

Comment: THE SPENT FUEL IS THE MOST SERIOUS ISSUE THERE IS. ANYONE WHO DOES NOT UNDERSTAND THAT SPENT FUEL CANNOT BE LEFT WHERE IT IS ON SITE, IN POOLS OR ISFSI'S BEYOND A VERY LIMITED NUMBER OF YEARS, BUT MUST BE PLACED DEEP UNDERGROUND, IN A DRY LOCATION, GEOLOGICALLY AS SOUND AS POSSIBLE, MONITORED FOR ETERNITY, DOES NOT UNDERSTAND RADIATION OR THE NUCLEAR ISSUE AND SHOULD NOT BE WORKING FOR THE NRC. NRC MUST SET THE TIME WHEN THE SPENT FUEL SHOULD ALL BE REMOVED OFFSITE AS NO LATER THAN TWO YEARS AFTER THE LAST CORE OFFLOAD HAS SPENT TEN YEARS IN THE SPENT FUEL POOL, I.E. FROM SPENT FUEL REMOVED FROM THE REACTOR INTO THE SPENT FUEL POOL AND THEN THE TEN YEAR "COOL DOWN" PLUS TWO YEARS, AFTER WHICH IT MUST BE MOVED. IF SUCH A DEADLINE IS NOT DECIDED, AND SET, COMMUNITIES ARE GOING TO BE STUCK WITH IT, WITH AWFUL CONSEQUENCES. (**CL-20/84**)

Response: *Although long-term storage of spent fuel is not within the scope of the Supplement, as described in Section 1.3, "Scope of This Supplement," NRC is committed to ensuring that both spent fuel and low-level wastes are managed to prevent detrimental health impacts to the public. The NRC has stated in its regulations: "The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impact of at least 30 years beyond the licensed life for operation (which may include the term of renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent fuel-storage installations." Further, the Commission believes there is reasonable assurance that at least one mined geological repository will be available in the first quarter of the 21st century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time. The comment proposes limits for the onsite storage of spent fuel. The Supplement does not (1) establish policy, (2) establish or revise regulations, (3) impose requirements, (4) provide relief from requirements, or (5) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.4.5 License Extensions

Comment: Likewise, there is no experience in decommissioning nuclear reactors that have operated beyond the original 40-year license period. (**AT-A/26**)

Comment: The NRC has no experience in decommissioning nuclear reactors that have operated beyond the original 40-year license period. (**CL-08/8**)

Response: *The commenter is correct. Nevertheless, the NRC is considering the environmental impacts of decommissioning following the extended operation during the renewal period and, if appropriate, refurbishment activities. License renewal is not within the scope of this Supplement, as it is a licensing activity covered elsewhere in the NRC regulations (see 10 CFR Parts 51 and 54) and in other EISs (see NUREG-1437, its addendum and supplements). The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement*.

Comment: We believe that the decommissioning document has definitely underestimated the impacts of the additional license extension period. In fact, the minimization of that impact I think is a major flaw in the document and that there needs to be a reassessment of all of the impacts, including cost, but also including the aging issues, including the waste issues and other offsite environmental impacts for license extension periods. (**AT-B/8**)

Response: *An analysis performed for NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, indicated that the physical requirements and attendant effects of decommissioning nuclear power plants after a 60-year license renewal (original 40-year license plus an additional 20 years for license renewal) are not expected to differ from those of decommissioning at the end of 40 years of operation. Section 1.3 was changed for clarification of this information.*

Comment: None should be re-licensed - the NRC should be ashamed of re-licensing. (**CL-20/116**)

Comment: I am opposed to any extensions on operating licenses for nuclear facilities of any sort and wish for a move to cleaner renewable energy. (**CL-41/2**)

Response: *License renewal is outside the scope of this Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.4.6 Site Characterization and Final Site Surveys

Comment: Additionally each nuclear power plant has a different historical performance record that may have impacted the surrounding environment in ways that are unique to the facility. What makes it acceptable to ignore these operating histories when decommissioning? (**AT-A/24**)

Response: *Licensees are required by 10 CFR 50.75(g) to "keep records of information important to the safe and effective decommissioning of the facility in an identified location until the license is terminated." These records include records of spills, etc. Prior to termination of an operating license, the NRC must determine that the terminal radiation survey and associated documentation demonstrate that the facility and site are suitable for release in accordance with the criteria for decommissioning in 10 CFR Part 20, Subpart E. Title 10 CFR Part 51.53(d) requires that the "Supplement to the Applicant's Environmental Report–Post Operating License Stage," which must be submitted with the License Termination Plan, update the "Applicant's Environmental Report– Operating License Stage" to reflect any new information or significant environmental change associated with the applicant's proposed decommissioning activities or with the applicant's proposed activities with respect to the storage of spent fuel. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In order to provide a complete and up-to-date environmental profile of the site, the Supplement should direct licensees to summarize the following in their site-specific NEPA analyses (and as appropriate in the PSDAR and LTP): (a) pre-plant construction environmental reports (for plants constructed before the enactment of NEPA) and environmental impact statements (EISs) regarding the impacts of plant construction and operation, (b) environmental reports and/or assessments that were prepared during the period the plant was in operation regarding the impacts of plant operation, (c) significant requirements and changes in the licensee's environmental permits, and (d) changes in the environmental parameters of a facility site during operation and the impacts of any such changes (see also Response to Comment #6-A, page A-11). (**CL-16/7**)

Response: *The purpose of the Supplement is to provide an environmental analysis of the impacts associated with the decommissioning process. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The historic undocumented burial of nuclear waste onsite at nuclear power stations must be investigated, surveyed and mitigated by station owners under the decommissioning plan. As the U.S. General Accounting Office (GAO) May 1989 "NRC's Decommissioning Procedures and Criteria Need to Be Strengthened" (GAO/RCED-89-119) reports in its Executive Summary: "For almost 25 years, NRC allowed licensees to bury radioactive waste onsite without prior NRC approval. NRC required the licensees to retain records on the amounts and substance buried rather than provide them to NRC. In five of the eight cases GAO reviewed, licensees buried waste onsite, but four licensees either did not keep disposal data or the data are incomplete. In one case, NRC terminated a license and 10 years later learned that radioactive material had been buried on the site. Also, NRC generally does not require licensees to monitor for groundwater or soil contamination from buried waste. All five licensees have found ground water contaminated with radioactive substances. At four sites, some of the contamination appears to have resulted from the buried waste—the contamination at one site was 400 times higher than EPA's drinking water standards allow. At another site, the contamination was 730 times higher, but the source was not known." (**CL-48/15**)

Response: *The NRC has addressed the issues in the GAO report in a letter to U.S. Senator Joseph I. Lieberman from Richard A. Meserve, Chairman U.S. NRC dated, March 2002 (ML020250068); however, the comment does not relate to commercial nuclear reactors. 10 CFR 50.75(g) requires power reactor licensees to maintain records of activities or events that could influence decommissioning. Additionally, licensees are required to conduct a site characterization study to support remediation efforts outlined in their LTP. During the review of the LTP, the NRC staff focuses attention on the possibility of groundwater contamination and soil contamination. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: An inventory of all the radioactivity, radioactive wastes and materials from reactor operation and decommissioning, and independently verified reporting of its disposition (whether onsite or offsite, whether in licensed or unlicensed facilities and specifics of its storage condition) should be a required part of the environmental review and reports. This information must be part of the site-specific Environmental Impact Statement process and fully disclosed at each reactor as site-specific issues, with the opportunity for formal local hearings and legally-binding input. The corporations responsible for the radioactive wastes from nuclear power reactor operations should be required, by NRC, to keep balance sheets of the radioactivity generated by their reactors and the decommissioning process, and track the disposition of that radioactivity whether it is kept onsite, allowed to leak out into the air and water, or shipped to licensed or unlicensed facilities for disposal or processing, and for possible release into household items. (**CL-48/16**)

Response: *The purpose of the Supplement provides an environmental analysis of the impacts associated with the decommissioning process. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. 10 CFR 50.75(g) requires power reactor licensees to maintain records of activities or events that could influence decommissioning. Additionally licensees are required to conduct a site characterization study to support remediation efforts outlined in their LTP. During the review of the LTP, the NRC staff focuses attention on the possibility of groundwater contamination and soil contamination. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: New environmental assessment documents must be required, as old assessments are outdated and have been found to be inaccurate both on and offsite. (**CL-50/11**)

Response: *This Supplement is an update to an existing environmental impact statement. In addition, NRC decommissioning regulations at 10 CFR 50.82 require (1) that environmental issues be addressed in the post-shutdown decommissioning activities report and (2) that the licensee include a supplement to its environmental report part of the License Termination Plan. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Many questions regarding decommissioning require site-specific and reactor-specific analyses. The Callaway plant, for example, here in Missouri, is located about 5.5 miles away from the Missouri River, the source of the plant's cooling water and the depository for its liquid effluent. It would seem that testing would be needed of the unusually long effluent-discharge pipe in order to determine where leakage may have occurred during the plant's operation and where soil excavation may therefore be required as a part of the

decommissioning. Sediment samples would be needed where the discharge pipe releases the plant's effluent into the Missouri River. Without such site-specific analyses, a determination of the extent of the riverbed's contamination would not be possible. (**CL-51/2**)

Response: *This Supplement deals with the impacts of decommissioning. Identification of onsite, contaminated areas is an integral part of the decommissioning process. Licensees are required to conduct a site characterization study to radiologically characterize the site and to support remediation efforts outlined in the LTP. One of the stated purposes of this document is to identify and assess the impact of decommissioning activities generically so that a site-specific assessment is not needed. The cooling water system, from intake structure through the discharge structure, is an integral part of the plant and is on owner-controlled land. It is, therefore, considered to be onsite. NRC will not terminate an operating license until the radiation survey and associated documentation demonstrate that the facility and site are*

suitable for release in accordance with the criteria for decommissioning in 10 CFR Part 20, Subpart E. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: This Draft 1 references MARSSIM. In its introduction, Draft "Marssim" did not address all sorts of things from contamination on vicinity properties through contaminated subsurface soil, water, construction materials and on and on. All of which must be cleaned up/have the contamination removed. They showed a lack of understanding of the groundwater cycle, and groundwater issues JUST LIKE THIS DRAFT DOES. (**CL-20/17**)

Comment: Methodology must be established to determine the extent of underground rad waste contamination and burial. The Multi-Agency Radiological Site Survey and Investigation Manual (MARSSIM) establishes measurement criteria for only 6 inches below the surface of soil. MARSSIM does not address the serious problem of locating and remediating underground contamination. Before 1980, the NRC in fact allowed the burial of rad waste onsite. A General Accounting Office (GAO) investigation found that the routine burial of rad waste 4 feet deep at reactor sites before 1980 occurred without adequate documentation. (**CL-50/26**)

Response: *The MARSSIM provides detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. It was prepared by the Department of Defense, The Department of Energy, the Nuclear Regulatory Commission, and the Environmental Protection Agency and discusses contamination of surface soil and building surfaces in detail. The MARSSIM specifically states that since other media (e.g., groundwater, surface water, subsurface soil, equipment, and vicinity properties) are potentially contaminated at the time of the final status survey, modifications to the MARSSIM survey design guidance and examples may be required. Identification of onsite contaminated areas is an integral part of the decommissioning process. NRC will not terminate an operating license until the radiation survey and associated documentation demonstrate that the facility and site are suitable for release in accordance with the criteria for decommissioning in 10 CFR Part 20, Subpart E. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Nuclear reactors, through planned and unplanned radioactive releases, can create plumes of contamination, which migrate offsite. Yankee Rowe currently has a plume, which reached springs, feeding into the Deerfield River where residents recreate. Connecticut Yankee has plumes of tritium and other radionuclides which have migrated into the aquifer and the Connecticut River for decades. Accountability (i.e. remediation and/or long-term monitoring) for plumes of contamination that have offsite consequences must be established. (**CL-50/13**)

Response: *The purpose of this Supplement is to provide an environmental assessment of the impacts associated with the decommissioning process. It is not the place to establish or revise NRC regulations. Procedures for revising NRC regulations are found in 10 CFR, Part 2. NRC will not terminate an operating license until the radiation survey and associated documentation demonstrate that the facility and site are suitable for release in accordance with the criteria for decommissioning in 10 CFR Part 20, Subpart E. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Furthermore, accountability must be established for routine NRC-regulated releases, which have accumulated in the discharge pathways. Big Rock Point, Millstone Unit 3 and other reactors have identified contaminated sediment caused by such releases. Remediation must capture such plumes both onsite and off. (**CL-50/14**)

Comment: Reactor contaminants in the sediments in the EPA studies included cesium-134 and -137, cobalt-58 and -60, manganese-54, and antimony-125. With evidence that these isotopes were able to bypass the liquid waste filters, it would seem probable that other fission, activation and corrosion products could have, too. And of course some reactor isotopes are extremely long-lived. Nickel-59, mentioned above, is produced when the nickel-58 in stainless steel captures electrons. Since the EPA found corrosion products in the sediment of several metals for which they tested, is it not possible that other metals subjected to the reactor's hostile environment (repeated cycles of temperature and pressure, high neutron fluxes, harsh chemicals, etc.) may also have degraded or dissolved, and migrated out of the plant? (**CL-51/3**)

Comment: Could they be detected in the sediment if tested? Some of the corrosion products identified in the oxide layer ("crud") of various reactors include isotopes of iron, zinc, molybdenum, tungsten, titanium, and carbon. Nickel-59, mentioned above, is produced when the nickel-58 in stainless steel captures electrons. Since the EPA found corrosion products in the sediment of several metals for which they tested, is it not possible that other metals subjected to the reactor's hostile environment (repeated cycles of temperature and pressure, high neutron fluxes, harsh chemicals, etc.) may also have degraded or dissolved, and migrated out of the plant? (**CL-51/4**)

Response: *Nuclear power reactors were licensed with the expectation that there would be routine airborne and liquid releases of radioactivity to the environment and that the releases would be detectable. The licensee is allowed to release gaseous and liquid effluents to the environment, but the releases must be monitored and meet the requirements of 10 CFR Part 20, Appendix B, Table 2. Therefore, although contaminants may be present and*

detectable offsite, the release limits have been designed and proven to be protective of the health and safety of the public and the environment. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

O.4.7 License Termination Criteria

Comment: Can you explain what the differences are between the actual impacts on a population of say 10,000 for the two options of non-restricted use and restricted use at the end of the decommissioning. And number two is what are the two levels of acceptable risk for the two options of leaving the site—leaving the site really clean, which is unrestricted use, or leaving the site restricted? (**AT-B/2**)

Comment: The question was 25 millirems where? (for unrestricted release) (**AT-B/3**)

Response: *The criteria for license termination are discussed in Section 2.2.2. For sites that have been determined to be acceptable for unrestricted use, there are no requirements for further measurement of radiation. For sites that have been determined to be acceptable for license termination under restricted conditions, additional measurements of radiation are required for sites that have residual radioactivity in excess of 1 mSv/yr (100 mrem/yr), but less than 5 mSv/yr (500 mrem/yr). These measurements are to be made by a responsible government entity or independent third party, including a governmental custodian of a site. The measurements are to be carried out no less frequently than every 5 years to ensure the institutional controls remain in place as necessary to meet the criterion of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: I also utterly oppose defining decommissioning, in part, to include the "release of property for unrestricted use" and the "release of property under restricted conditions"—in other words, releasing radioactively contaminated materials into daily consumer use and commerce and unregulated disposal. How can you contemplate such a thing!!!!!!!!!!!!!! (**CL-33/20**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC defines decommissioning, in part, to include the "release of property for unrestricted use.." and the "release of property under restricted conditions." (**CL-43/14**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow NRC to define decommissioning in part, to include "the release of property for unrestricted use.." And the "release of property under restricted conditions." It is entirely inappropriate and

scientifically ludicrous to allow "release" of highly radioactive contaminated materials into daily consumer use and commerce, or unregulated disposal, or the recycling of such materials into any form which causes public exposure with radioactivity contaminated materials. (**CL-44/13**)

Response: *The criteria for license termination are described in Section 2.2.2. The release of the property occurs only after the license termination criteria are met. The purpose of this Supplement is to provide an environmental assessment of the impacts associated with the decommissioning process. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or 4) provide guidance on the decommissioning process. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC states that the portion of the decommissioning regulations (10 CFR 20 section E and its Environmental Impact Statement, NUREG 1496) that set the 25, 100, and 500 millirems per year allowable public dose levels from closed, decommissioned nuclear power sites, are not part of the scope of the Supplement. (**CL-43/13**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow NRC to assert that the portion of decommissioning regulations (10 CFR 20 section E and its EIS, NUREG 1496) set the 25, 100 and 500 millirems per year allowable public dose levels from closed, decommissioned nuclear plants sites, and are not part of the scope of the Supplement. I disagree, and consider the inclusion of exposure from closed decommissioned plants a necessity to develop an accurate and realistic analysis of cumulative impacts. (**CL-44/12**)

Comment: NRC states that the portion of the decommissioning regulations (10 CFR 20 section E and its Environmental Impact Statement, NUREG 1496) that set the 25, 100 and 500 millirems per year allowable public dose levels from closed, decommissioned nuclear power sites, are not part of the scope of this Supplement. (**CL-48/48**)

Response: *Chapter 1, Introduction, addresses how the scope of the Supplement was determined. Regulations pertaining to restricted or unrestricted release of a site were promulgated as part of the 1997 rulemaking on radiological criteria for license termination of NRC-licensed nuclear facilities. The rulemaking relied on by the "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," NUREG-1496, July 1997. Site release criteria are outside the scope of this Supplement. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the*

decommissioning process. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: The trans-solutional problem of complete site decontamination is here evident: the NRC does not require the return of a decommissioned facility and site to its preoperational radiation level. (**CL-52/14**)

Response*: Naturally occurring radioisotopes in the building materials would make such a standard impossible to achieve. For those facilities in which soil or building contamination exists, it would be extremely difficult to demonstrate that an objective of "return to background" had been achieved. In addition, the removal of soil or concrete to "pre-existing background" levels is generally not desirable from the perspective of risk to public health and safety and protection of the environment. For example, at some point, the removal of increasingly larger volumes of concrete and soil would also result in a greater net risk from transportation accidents. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It really may matter to you, Ms. Hickey, that the license termination document details one level of exposure while the draft EIS on decommissioning details another level of exposure. (**AT-B/6**)

Response: *The comment is not specific and the staff is unable to respond. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Twenty-five millirems additional per year of exposure added to an increasing background, which is certainly manmade—and I say manmade. I mean women had very little to do with the decision making that went into increasing the background radiation that all of us are exposed to. But 25 millirems per year additional exposure is way too much....This is a roulette game. So the dose is way out of line for the restricted use, not to even mention the unrestricted use, which I'll get distressed if I do, so I won't. (**AT-B/15**)

Response: *The NRC's regulatory limits for radiological protection are set to protect workers and the public from the harmful health effects of radiation on humans. The limits are based on the recommendations of standards-setting organizations. Radiation standards reflect extensive scientific study by national and international organizations (the International Commission on Radiological Protection [ICRP], the National Council on Radiation Protection and Measurements [NCRP], and the National Academy of Sciences [NAS]) and are conservative to ensure that the public and workers at nuclear power plants are protected. The NRC radiation exposure standards are presented in 10 CFR Part 20, "Standards for Protection Against*

Radiation," and are based on the recommendations in ICRP 26 and 30. The purpose of this Supplement is to provide an environmental assessment of the impacts associated with the decommissioning process. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. The acceptability of the site release criteria is outside the scope of the Supplement (see Section 1.3). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: I think the one other question I had was as I recall when the first statement was issued, there was a discrepancy between the NRC radiation exposure floor, threshold level, and the EPA level. Is that still out there? I think yours is 25, theirs is 4 to 15 or something for the same exposure. (**AT-C/5**)

Response: *NRC continues to rely on the findings from two international organizations, the International Commission on Radiation Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP). Both organizations have acknowledged the difficulty in setting acceptable levels of risk for the public; however, both ICRP and NCRP have established a dose of 1 mSv/yr (100 mrem/yr) to an individual member of the public as the level that is acceptable for exposure to radiation from sources other than medical procedures. The ICRP and the NCRP further established the need to reduce this annual dose rate by using the principle of "optimization," considering the cost-effectiveness of additional dose reduction. Following these recommendations, the NRC adopted a level of 0.25 mSv/yr (25 mrem/yr) as the value for residual radioactivity at a site under consideration for license termination. EPA's radiation dose limit of 0.15 mSv/yr (15 mrem/yr) results from a different technical analysis for establishing an acceptable risk to the public and a value for residual radioactivity other than that of NRC where radiation is the only contaminant considered. In addition, the NRC also has a "cleanup" requirement of "As Low As Reasonably Achievable" (ALARA). The use of the ALARA requirement usually results in a site that is below the EPA's requirements as well. Nuclear reactors are licensed by the NRC, and the NRC is responsible for making the safety and environmental determination for termination of the license. Therefore, licensees are required to meet the NRC's requirements for residual radioactivity. However, since the NRC value of 0.25 mSv/yr (25 mrem/yr) is a limit, a licensee can choose to further reduce the value of residual radioactivity at a site to achieve annual dose values less than 0.25 mSv/yr (25 mrem/yr). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: THERE SHOULD BE ABSOLUTELY NO UNRESTRICTED USE OF THE PROPERTY EVER. THE ADDITIONAL EXPOSURE IS TOTALLY INSANE (**CL-20/12**)

Response: *Unrestricted use is described in Section 2.2.2. The purpose of the Supplement is to provide an environmental assessment of the impacts associated with the decommissioning process. The 1997 rule establishing site release criteria allows for termination of the license without continued restrictions on the site. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements or (4) provide guidance on the decommissioning process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I am opposed to the following proposal(s) in the EIS: NRC ignores radiation exposures to children and other vulnerable members of the population and creates a fictitious highest exposed "critical group" based on unsubstantiated assumptions. (**CL-26/6**)

Response*: The staff believes the author of the comment is referring to the effects of radiation exposures to the public from the site following license termination. The acceptability of the site release criteria is outside the scope of the Supplement. However, the dose models that were used to develop the site release criteria evaluate the persons receiving the highest dose as the maximally exposed individual. This person is a resident farmer. Doses were calculated to children and other vulnerable members of the population; however, their doses were lower because of the types of activities they were involved in. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.4.8 Beyond License Termination

Comment: There are still radioactive dangers after decommissioning. (**CL-29/1**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC ignores radiation dangers after decommissioning is done and utility is relieved of liability. (**CL-43/4**)

Comment: The proposed rules ignore radiation dangers after decommissioning. (**CL-25/7**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC ignores radiation dangers after decommissioning is done and utility is relieved of liability. (**CL-26/5**)

Comment: I utterly oppose ignoring radiation dangers after decommissioning is done and utility is relieved of liability. (**CL-33/9**)

Comment: The nuclear facility's land, even after decommissioning, must not be allowed to revert to public or private use, even if the NRC believes that the radioactivity on the land is less than 25 millirems per year. Additionally, in no circumstances should future buildings, structures, etc. be built atop the former nuclear site. The draft GEIS mentions that tourism activities are planned for the Trojan nuclear plant in Oregon after decommissioning. Under no circumstances should that be allowed at any of these sites. Bringing tourists or school groups to nuclear plants that are running now is not acceptable. It's dangerous. I was just in Oregon for my honeymoon, and I just can't imagine going and touring that site. There are a lot of beautiful things in Oregon but the Trojan plant ain't one of them. (**AT-A/39**)

Comment: The nuclear facility's land, even after decommissioning, must not be allowed to revert to public or private use even if the NRC believes that the radioactivity on the land is less than 25 millirems per year. Additionally, under no circumstances should future buildings, structures, etc. be built atop the former nuclear site. (**CL-08/24**)

Comment: Even after all fuel is removed from the site and the entire structure is removed, the site will still be radioactive forever and still need a security person, basic maintenance person. (**CL-20/42**)

Response: *The acceptability of the site release criteria and its potential for affecting public health and safety and protection of the environment after license termination is outside the scope of the Supplement (see Section 1.3). Potential radiological impacts following license termination are covered by the "Final Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," NUREG-1496, which supported the development of 10 CFR Part 20. Current criteria for license termination, given in 10 CFR Part 20, Subpart E, and shown in this Supplement in Section 2.2.2, stated that the Commission has established a 0.25 mSv/yr (25 mrem/yr) total effective does equivalent to an average member of the critical group as an acceptable criterion for release of any site for unrestricted use. This Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements, or (4) provide guidance on the decommissioning process. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The NRC must continue to monitor sites FOREVER after license termination in case of sudden increases in radiation levels from a source on the site no one had either considered or knew was there. (**CL-20/88**)

Comment: What agency or governing body is responsible for monitoring the site after the decommissioning is deemed "complete"? How do the licensee and a government agency, such as the NRC, which is mandated to protect the public health, allowed to walk away from a site that will essentially remain radioactive forever? (**CL-08/31**)

Response: *Structures, systems, and components onsite will be surveyed during the final radiation survey and contamination levels will be reduced to the level necessary for termination of the license. All structures, systems, and components that have radioactive contamination that could exceed the criteria would be decontaminated or dismantled and shipped to a low-level-waste disposal site. The licensee must keep records of information during the operating phase of the facility that would be used to identify where any spills or other occurrences involving the spread of contamination would be located. In addition, because the radioactive material will have been removed from the site, there would be no mechanism for further contamination or radiological releases, and any radiation levels would only be reduced over time due to natural decay. Therefore, there would not be any significant increase in onsite radiation levels some time in the future. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: For a site decommissioning that results in a license termination for unrestricted use, the long-term radiological impacts to the public may well be within acceptable limits. However, for a decommissioning that results in a license termination with restricted site use the potential exists for long-term radiological impacts to the public to be far above acceptable limits. The draft Supplement does not consider this potential. While narrowly focusing the radiological studies to the decommissioning process, the NRC does not consider those potential long-term impacts to the public. (**CL-17/3**)

Response: *Licensees are allowed by regulations in 10 CFR Part 20, Subpart E, "Radiological Criteria for License Termination," to release the site for restricted use. The impacts following a restricted release license termination will not be considered by this Supplement because the impacts are highly site-specific and would require a site-specific analysis. The site-specific analysis would be included in the License Termination Plan submitted to the NRC for review and approval by the license amendment process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: To allow utilities to have no liability after decommissioning is done when the proposals are seen as "generic" does not provide any protection to local citizens. Accountability for our actions is important and utility companies should not be exempt from that. (**CL-39/4**)

Response: *The consideration of liability is outside the scope of this Supplement. The criteria for license termination are discussed in Section 2.2.2. Termination of the NRC license does not eliminate the utility's liability. The missions of the NRC include the protection of public health and safety and protection of the environment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Decommissioning should never be deemed to be complete until the entire site is no longer radioactive. We understand that this means extremely long-term oversight of the reactor sites. Some of the decommissioning wastes, such as the nickel compounds, have extremely long half-lives and remain dangerous for millennia. Liability for the site needs to remain with the utilities and the NRC must retain regulatory control over the entire site. (**CL-40/3**)

Response: *For those sites in which structures or buildings are left it would be extremely difficult or impossible to demonstrate a "return to background" or that the site is "no longer radioactive." Naturally occurring radioactive materials in the building materials, soils, the presence of radon gas, and cosmic rays would make such a standard impossible to achieve. Termination of the license does not eliminate the licensee's liability for the site. The criteria for license termination are described in Section 2.2.2. The release of the property occurs only after the license termination criteria are met. The purpose of this Supplement is to provide an environmental assessment of the impacts associated with the decommissioning process. The Supplement does not (1) establish or revise regulations, (2) impose requirements, (3) provide relief from requirements or (4) provide guidance on the decommissioning process. The consideration of liability is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Residual contamination left at a site whose license was terminated for unrestricted use could be perceived as disposal of low-level radioactive waste. (**CL-17/6**)

Response: *The material that remains at the site after the license has been terminated must meet the license termination criteria in 10 CFR Part 20, Subpart E, or it can not have been left at the site. Material that cannot meet these criteria would have been considered to be low-level radioactive waste and would have to have been disposed at a licensed LLW facility before the license could be terminated. Therefore, any low-level radioactive waste left on site after license termination would not be considered as radioactive waste. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Since the NRC would no longer have regulatory authority over the site, what governmental institution or corporation would be entrusted with the long-term collection, monitoring and analyses of the groundwater samples? (**CL-51/16**)

Comment: Okay, so who's responsible then for a site that has restricted use. Because I couldn't quite tell. Who would actually protect the public? (**AT-B/4**)

Response: *For sites that have been determined to be acceptable for license termination under restricted conditions, additional measurements of radiation are only required for sites that have residual radioactivity between 1 and 5 mSv/yr (100 and 500 mrem/yr) to the average member of the critical group. These measurements are to be made by a responsible government entity or independent third party, including a governmental custodian of the site. The institutional controls remain in place as necessary to meet the criterion of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group (Section 2.2.2). The licensee is responsible to provide sufficient funds to carry out responsibilities for control and maintenance of the site (Section 2.2.2). The NRC regulations do not specify the institutional controls. The institutional controls are established during the NRC staff review of the license termination plan (LTP). The LTP is incorporated into the license by amendment so an opportunity to request a hearing would be provided. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Who would determine if remediation were needed; who would be liable for the costs of offsite contamination or other accidents? (**CL-51/17**)

Response: *For sites that have been determined to be acceptable for unrestricted use, there are no requirements for future measurement of radiation levels. It is not expected that these radiation levels would change, other than to be reduced over time, because the radioactive material will have been removed from the site, and there would be no mechanism for further contamination or radiological releases. For sites that have been determined to be acceptable for license termination under restricted conditions, additional measurements of radiation are only required for sites that have residual radioactivity between 1 and 5 mSv/yr (100 and 500 mrem/yr) to the average member of the critical group. These measurements are to be made by a responsible government entity or independent third party, including a governmental custodian of the site. The institutional controls remain in place as necessary to meet the criterion of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group (Section 2.2.2). The licensee is responsible to provide sufficient funds to carry out responsibilities for control and maintenance of the site (Section 2.2.2). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Who would be responsible to protect against the inadvertent recycling of radioactively contaminated building rubble and soil into new construction or as fill, a possibility mentioned but basically discounted in SECY-00-0041, a letter about rubblized concrete dismantlement, from William Travers, NRC Executive Director for Operations, to the Commissioners (February 14, 2000). (**CL-51/18**)

Response: *During the decommissioning process for power reactors, materials may not be released, recycled, or reused if there are detectable levels of licensed radioactive material present. These materials are carefully monitored and controlled before release. If contaminated equipment or debris is inadvertently released from the site and it presents a risk to public health and safety or a risk to the environment then the material would be recovered and disposed of in a licensed disposal facility. Responsibility for recovery of the material would be determined on a case by case basis. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The transformation of the nation's abandoned nuclear power plants into de facto waste facilities is worrisome from environmental, safety and national security standpoints. (**CL-51/23**)

Response: *Nuclear power plants will not be abandoned. NRC oversight at the facility will continue until the license terminated. There are two categories of uses for the facility after license termination: unrestricted use and restricted use. For sites that have been determined to be acceptable for unrestricted use, there are no requirements for further measurement of radiation levels. It is not expected that these radiation levels would change, other than to be reduced over time, because the radioactive material will have been removed from the site and there would be no mechanism for further contamination or radiological releases. For sites that have been determined to be acceptable for license termination under restricted conditions, additional measurements of radiation are only required for sites that have residual radioactivity between 1 and 5 mSv/yr (100 and 500 mrem/yr) to the average member of the critical group. These measurements are to be made by a responsible government entity or independent third party, including a governmental custodian of the site. The institutional controls remain in place as necessary to meet the criterion of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group (Section 2.2.2). The licensee is responsible to provide sufficient funds to carry out responsibilities for control and maintenance of the site (Section 2.2.2). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: THERE NEVER SHOULD BE A LACK OF INSTITUTIONAL CONTROL EITHER. (**CL-20/13**)

Response: *NRC has regulations in place to monitor sites until license termination. At that time, if the facility is categorized for restricted use, the institutional controls remain in place as necessary to meet the criterion of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group (Section 2.2.2). The licensee is responsible to provide sufficient funds to carry out responsibilities for control and maintenance of the site (Section 2.2.2). If it meets the criteria for unrestricted use, there are no required institutional controls. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: To enforce no liability after they leave is simply criminal. (**CL-34/4**)

Comment: The owner must remain fully liable. (**CL-36/5**)

Response: *The consideration of liability is outside the scope of this Supplement. However, termination of the NRC license does not eliminate the utility's liability. The criteria for license termination are discussed in Section 2.2.2. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The federal government (the U.S. Atomic Energy Commission and its progeny) initiated and funded the promotion of nuclear power. How, then, can it walk away from the long-term surveillance of the plant sites, even though it will have declared the residual radioactive contamination to be at permissible levels? (**CL-51/25**)

Response: *The criteria for license termination are discussed in Section 2.2.2. For sites that have been determined to be acceptable for unrestricted use, there are no requirements for further measurement of radiation. For sites that have been determined to be acceptable for license termination under restricted conditions, additional measurements of radiation are required for sites that have residual radioactivity in excess of 1 mSv/yr (100 mrem/yr) but less than 5 mSv/yr (500 mrem/yr). These measurements are to be made by a responsible government entity or independent third party, including a governmental custodian of a site. The measurements are to be carried out no less frequently than every 5 years to ensure the institutional controls remain in place as necessary to meet the criterion of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In effect, the NRC plans to wash its hands of any responsibility for the long-term damage that may result from reactor decommissioning (and that of other nuclear licensee'

facilities and activities). It is the state or municipality and community in which a plant is located and the residents that will be required to bear the burdens of injury and costs of further clean-up after the NRC has vanished. (**CL-52/11**)

Response: *Compliance with the Radiological Release criteria found in 10 CFR Part 20, Subpart E, will result in protection of the public health and safety. Once the licensee can demonstrate that the Radiological Release Criteria will not be exceeded, no further cleanup is necessary. Therefore, the State or municipalities would not incur any additional costs. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.4.9 Ownership

Comment: [In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including:] Joint Ownership. (**CL-02/9**)

Response: *Joint ownership of a nuclear facility is not uncommon and is an outgrowth of anti-trust consideration. This comment relates to nuclear power facilities in general and is outside the scope of this Supplement. However, a number of power facilities undergoing decommissioning have joint owners and no significant problems in this arrangement have been identified. The decommissioning funds will be available for decommissioning a permanently shutdown reactor, regardless of ownership. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The most disturbing and financially bizarre component of radiological decommissioning is the relationship between a “power reactor license” and the “minority power reactor licensee.” Unlike “power reactor licensees,” “fractional licensees” are not subjected or mandated by the Nuclear Regulatory Commission to empirically verify, report or monitor record keeping relating to nuclear decommissioning funding mechanisms. In some instances, even Public Utility Commissions lack the ability to mandate or regulate savings levels from “fractional licensees”, e.g., Rural Electric Cooperatives. (**CL-02/35**)

Response: *Although the facility may be owned by multiple owners, the licensee is a single entity and is responsible for complying with the financial assurance requirements of 10 CFR 50.75. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: How will the facility licensee, in our case, Southern Nuclear, benefit from later sale of the nuclear plant's land to a new owner? Also, how will the land be tracked after it's deemed "safe" and the licensee sells it…especially in cases where there may be a leak or a release of radiation into the environment after the initial sale occurred? For instance, isn't it in the best financial interest of the licensee, in our case Southern Nuclear, to use the fastest and least expensive decommissioning option so that the license can be terminated and they can sell the land before deficiencies can be found in the manner in which a plant was decommissioned? (**CL-08/28**)

Response: *Once the license is terminated, the NRC has no regulatory authority over activities at the site, and the owner of the site is no longer subject to NRC regulations. If the condition of the facility at the time the license is terminated is such that the regulations allow the site to be available for unrestricted use, then there will not be any sources of radioactive contamination to result in a leak or significant release of radioactive material into the environment. The economic benefits to the utility after license termination are not within the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Since deregulation, numerous nuclear plants have changed hands. To "Cushion" the transition from regulated monopoly to competitive marketplace, many states allowed"electric utilities" to recover "stranded costs." Rate payers are saddled with paying for the industry's uneconomical investments, i.e., "stranded costs." "Two of the most "bullish" nuclear corporations, Exelon and PPL, recovered over $8.3 billion in "uneconomical investments." This figure does not include the millions in savings Exelon and PPL have accrued by unilaterally devaluing the combined PURTA and Real Estate tax assessments for their nuclear generating stations.

The Susquehanna Steam Electric Station is the most glaring example of a company "devaluing" their property at the expense of taxpayers, while billing the same hostage rate payer for uneconomical investments, and exposing this rate payer/taxpayer to further financial exposure related to the underfunding of nuclear decommissioning.

In the of Winter 1999-2000, PPL unilaterally devaluated the combined PURTA and Real Estate tax assessments for the SSES. Prior to the 1998 Joint Petition for Negotiated Settlement, the nuclear power generating units were assessed by PP&L at approximately $1 billion. PPL now claims that the SSES is only worth $74 million or the same amount as the valuation of the Columbia Hospital. Not only did the Berwick School District and Luzerne County experience revenue shock, but PPL refused to pay or escrow any monies they owed to Luzerne County and the Berwick School district while the case was being appealed.

PPL's behavior is all the more egregious in an era where nuclear plant's value on the open-marker are equal to, or in excess, of fossil generating stations. For example, Entergy and Dominion resources engaged in a bidding war to purchase the Fitzpatrick and Indian Point 3 nuclear generating stations from the New York Power Authority (NYPA). The sale established a record high. (**CL-02/32**)

Response: *The Supplement provides an environmental assessment of the impacts associated with the decommissioning process. Discussions on the source of funds for the decommissioning trust fund are outside the scope of the GEIS. Furthermore, the comment relates to operating nuclear power facilities and not decommissioning facilities and is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The General Accounting Office has slammed the NRC for its lack of oversight of transfers and mergers in the nuclear industry and had not verified that new owners would have guaranteed access to the decommissioning charges that their affiliated utilities would collect, in some cases, plus, a host of other safety and other issues were raised, all of which are troubling. The NRC must immediately address problems, and should demand that companies provide enough money for oversight - to include security staff, maintenance staff, nuclear engineers, radiation safety officers etc. - essentially forever. (**CL-20/41**)

Response: *In a letter dated March 1, 2002 (ML-020250068), the NRC responded to the GAO findings and elaborated on its programs and practices. The Supplement provides an environmental assessment of the impacts associated with the decommissioning process. Discussion of access to the decommissioning trust funds by new owners of facilities is outside the scope of the GEIS. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Utility deregulation has put the ownership of these plants in hands that are not as responsible as they once were. Plymouth MA suffers financially because of the loss of tax revenue from the Pilgrim Plant - we cannot assume the additional risk these rules would place on us. (**CL-25/3**)

Response: *This comment relates to the power market and the effects of deregulation in general and is outside the scope of this Supplement. Licensees are required to satisfactorily maintain the decommissioning trust fund for the facility under the provisions of 10 CFR 50.755.*

They are required to periodically report the status of their trust fund to the NRC. The NRC has the responsibility to review the progress the licensee is making in fully funding the trust fund for decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

O.4.10 Financial Assurance

Comment: Second, we're concerned about the financial viability of the companies that own these sites. During a 60-year period, the companies may go bankrupt and that may leave the sites unaccounted for. We're also worried about the uncertainty associated with the cost of disposing radioactive material later. We understand that safe store is preferred because of lower costs later, but because of Yucca Mountain and other uncertainties about disposal, we're concerned about those hanging costs. (**CH-A/6**)

Comment: But what happens to a facility that shuts down prematurely and they haven't actually collected sufficient funds for what's necessary for decommissioning and then, they go bankrupt? And that situation still poses a risk. (**CH-A/15**)

Comment: Does any one of sound mind or body residing within the Commission really think that a nuclear power plant can be radiologically decommissioned if the funding is inadequate and the plant is prematurely shut down? (**CL-02/12**)

Comment: Prematurely shutdown reactors place an additional financial strain on the licensee. (**CL-02/42**)

Comment: There's a financial assurance gap here, I feel, and this has been mentioned several times tonight. I'll say two syllables—Enron....And I could be wrong about this but I thought the money was somewhat linked to the rate base and all these plants are not operating for their design life. And so I'm real concerned that the fund was never—the goal was never set correctly to begin with and that we would fall short on raising the money, it may not be enough....Is there assurance or something for a corporation a couple of generations removed from the corporation that actually originally licensed and built the plant? (**AT-G/3**)

Response: *If a facility shuts down prematurely before the decommissioning trust is fully funded, or if it unexpectedly finds itself having to shift to a more costly decommissioning option, the facility license holder is still obligated to fund the entire cost of decommissioning. Most power generators are diversified and are able to continue to add funds to their decommissioning trust fund. To date, none of the license holders of prematurely shutdown power reactor facilities have defaulted on their decommissioning funding obligation. Bankruptcy does not necessarily mean that a power reactor licensee will liquidate. To date, the NRC's experience with bankrupt power reactor licensees has been that they file under Chapter 11 of*

the Bankruptcy Code for reorganization, not liquidation (for example, Public Service Company of New Hampshire, El Paso Electric Company, and Cajun Electric Cooperative). In these cases, bankrupt licensees have continued to provide adequate funds for safe operation and decommissioning, even as bondholders and stockholders suffered losses that were often severe. Because electric utilities typically provide an essential service in an exclusive franchise area, the NRC staff believes that, even in the unlikely case of a power reactor licensee liquidating, its service territory and obligations, including those for decommissioning, would revert to another entity without direct NRC intervention. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: However, the Nuclear Regulatory Commission has steadfastly refused to address the fundamental problem that has created and perpetrated financial gaps between "target" (2) decommissioning funding and actual assets on hand to complete radiological decommissioning (3). In fact, the Commission has no statutory authority to compel "electric utilities" to physically raise, maintain, secure and account for radiological decommissioning funding. The NRC can authorize and mandate a preferred "mode of decommissioning", but the Commission lacks the ability to ensure the existence of adequate funding levels. i.e. accretible external sinking funds.

The NRC's GENERIC Environmental IMPACT STATEMENT (GEIS) on DECOMMISSIONING of NUCLEAR FACILITIES-NUREG-0588: DRAFT SUPPLEMENT DEALING WITH DECOMMISSIONING of NUCLEAR POWER REACTORS does not adequately factor the financial disconnect between NRC "Funding targets" and actual and realized funding pools accrued by "electric utilities." Moreover, there remains a chronic shortfall between "targeted" funding levels and actual costs for nuclear decommissioning. (4) (**CL-02/2**)

Comment: The GEIS failed to address the issue of nuclear plant "devaluation" and revenue shock. (**CL-02/33**)

Response: *While the process for decommissioning nuclear power facilities is now well established, the cost of decommissioning varies from one nuclear facility to the next. The variability is due to the major factors listed in the Supplement (Section 4.3.11.2). Cost estimates (at the time of licensing, 5 years before anticipated shutdown, with the Post-Shutdown Decommissioning Activities Report submittal, 2 years following shutdown, and 2 years preceding the anticipated termination of the license) are site-specific, and provide a method of re-evaluating the decommissioning costs at various times and stages in each facility's life. The regulations to ensure the availability of decommissioning funds were originally established in 1988, and site-specific decommissioning cost estimates are required as provided in 10 CFR 50.75 and 10 CFR 50.82. Failure to comply with NRC regulations is a violation of the facility license and the NRC could take enforcement action to compel the licensee to comply*

with the provisions of 10 CFR 50.7. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: Funding targets to bring a site back to "Greenfield' are set by the Nuclear Regulatory Commission and do not include spent fuel disposal or non-radiological decommissioning. However, the NRC has no rate making authority and electric utilities must go before state utility commissions to recover funding levels "suggested" by the NRC. But the Companies are not mandated by the federal government to submit detailed funding plans until two years prior to site closure. In addition, if a utility has been saving for DECON, but SAFSTOR is necessitated, the funding package becomes grossly inadequate. (**CL-02/39**)

Response: *Radiological decommissioning activities continue until the licensee requests termination of the license and demonstrates that radioactive material has been removed to levels that permit termination of the NRC license. Once the NRC determines that the decommissioning is completed, the license is terminated. At that point, the NRC no longer has regulatory authority over the site, and the owner of the site is no longer subject to NRC authority. As a result, activities performed after license termination (to meet other requirements, e.g., additional state requirements such as additional radiological decontamination, removal of structures, site grading, etc.), and the resulting impacts are outside the scope of this Supplement. These activities may include site restoration. The return of the site to Greenfield conditions is specifically stated to be out of scope of the Supplement (Section 1.3, "Scope"). Experience to date has shown that licensees have been able to change decommissioning options (such as DECON to SAFSTOR) without significant financial difficulties. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: As of this filing, no commercial nuclear power plant has been decommissioned, decontaminated, and returned to free-release. Nuclear decontamination and decommissioning technologies are in their infancy and several identifiable industrial trends are apparent when reviewing the Nuclear Regulatory Commission's treatment of prematurely shutdown reactors: There is a reluctance to undertake, initiate or finance decommissioning research. (**CL-02/41**)

Response: *The statement is not true; two commercial nuclear power plants (Shoreham and Ft. St. Vrain) have been decontaminated and decommissioned and the sites released for unrestricted access. The U.S. Department of Energy (DOE) has funded significant decommissioning-related research over the past 10 years. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Georgians for Clean Energy does not believe that the GEIS adequately addresses decommissioning costs. Though assurances were made at the public meeting in Atlanta that decommissioning funds are adequate, real-world examples have proved otherwise. For instance, in the current world of mega-mergers of electric utilities and sudden dissolution of energy giants such as Enron, there is little guarantee in place that companies will be able to pay for the full costs of decommissioning. Additionally, we are concerned that the method of decommissioning a nuclear power plant is determined more by the cost implications to the licensee than the overall ramifications of leaving a contaminated site for the local communities. (**CL-08/10**)

Response: *NRC staff would not speculate on how the financial collapse of one corporation affects the financial soundness of power generators as a whole. There is, in fact, reasonable assurance that utilities will have the resources to fund decommissioning. Industry experience to date has not revealed problems in securing adequate funds in the decommissioning trust fund to complete decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Furthermore, a report issued this December by the U.S. Government Accounting Office, "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could Be Improved--GAO-02-48," brings to light many concerns about the lack of adequate funding available for decommissioning activities. The following statement by the GAO makes it apparent that the NRC needs to improve, "However, when new owners proposed to continue relying on periodic deposits to external sinking funds, NRC's reviews were not always rigorous enough to ensure that decommissioning funds would be adequate. Moreover, NRC did not always adequately verify the new owners' financial qualifications to safely own and operate the plants. Accordingly, GAO is making a recommendation to ensure a more consistent review process for license transfer requests." (**CL-08/12**)

Comment: Georgians for Clean Energy requests that this extensive report be thoroughly reviewed by the NRC staff, be printed in it's entirety as an appendix in the final GEIS as the report did not come out before the draft GEIS was issued, and that the recommendations by the GAO be studied and incorporated into the final GEIS. Additionally, the public participation process should be extended to allow for proper review of this important report. (**CL-08/13**)

Comment: Additionally, ownership of nuclear facilities has changed for more than half of the nuclear power plants in the United States through mergers and transfers. This shuffling of ownership has raised much uncertainty about the availability of adequate funds for the eventual decommissioning of the nuclear facilities. As reported by GAO December 2001 "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could Be Improved" NRC reviews of financial arrangements exchanged in these transfers and mergers "were not always

rigorous enough to ensure that decommissioning funds would be adequate. Moreover, NRC did not always adequately verify the new owners' financial qualifications to safely own and operate the plants." (**CL-48/23**)

Response: *In a letter dated March 1, 2002 (ML-020250068), the NRC responded to the GAO findings and elaborated on its programs and practices related to licensee financial qualifications and decommissioning funding assurance. Based on the industry experience to date and the decommissioning funding requirements in 10 CFR 50.75, the NRC staff has no reason to believe that the decommissioning trust funds are inadequate. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The NRC needs to pay attention to decommissioning costs proposed by Georgia nuclear utilities during rate cases and other proceedings so there is not a situation created where much needed monitoring and maintenance is ignored simply because there was no regulatory attention to the real cost of decommissioning. (**CL-08/16**)

Response: *Decommissioning activities continue until the licensee requests termination of the license and demonstrates that radioactive material has been removed to levels that permit termination of the NRC license. Once the NRC determines that the decommissioning is completed, the license is terminated. At that point, the NRC no longer has regulatory authority over the site, and the owner of the site is no longer subject to NRC authority. As a result, activities performed after license termination (to meet other requirements, e.g., additional state requirements, not subject to NRC authority) and the resulting impacts are outside the scope of this Supplement. These activities may include any other than NRC-required monitoring, including site restoration. The return of the site to Greenfield conditions is specifically stated to be outside the scope of this Supplement (Section 1.3, "Scope"). Most power generators are diversified and are able to be flexible in case of a change in plans (such as a change in decommissioning method). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: How is the funding of decommissioning costs guaranteed to be met by a company in a day and age where gigantic utility companies can collapse at any moment, as has recently happened with Enron? (**CL-08/29**)

Response: *NRC staff would not speculate on how the financial collapse of one corporation affects the financial soundness of power generators as a whole. There is, in fact, reasonable assurance that utilities will have the resources to fund decommissioning. Furthermore, the decommissioning trust fund is specifically set up to prevent licensees from accessing the fund for money other than for decommissioning. To date, none of the license holders of prematurely*

shutdown facilities have defaulted on their decommissioning funding obligation. Bankruptcy does not necessarily mean that a power reactor licensee will liquidate. To date, the NRC's experience with bankrupt power reactor licensees has been that they file under Chapter 11 of the Bankruptcy Code for reorganization, not liquidation (for example, Public Service Company of New Hampshire, El Paso Electric Company, and Cajun Electric Cooperative). In these cases, bankrupt licensees have continued to provide adequate funds for safe operation and decommissioning, even as bondholders and stockholders suffered losses that were often severe. Because electric utilities typically provide an essential service in an exclusive franchise area, the NRC staff believes that, even in the unlikely case of a power reactor licensee liquidating, its service territory and obligations, including those for decommissioning, would revert to another entity without direct NRC intervention. Additionally, an NRC licensed facility undergoing decommissioning or a site that is not under license but is undergoing decommissioning under NRC's regulation also warrant remediation under CERCLA as a Superfund site. These statutory provisions might become particularly relevant at sites for which funding is inadequate for cleanup. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: As a result of electric utility deregulation where a competitive market has replaced regulated rates, traditional methods of amassing decommissioning funds through imbedded utility rates have been replaced with by competitive electricity rates. (**CL-48/22**)

Comment: Costs: Because of current efforts to restructure and deregulate the electric power industry, decisions about decommissioning could be driven by economic considerations, not by safety - by efforts to cut costs in order to stay competitive. I believe the electric utilities should not be relieved of liability for their decommissioned reactors. (**CL-51/19**)

Response: *The NRC has published a final policy statement in the Federal Register (62 FR 44071) regarding the adequacy of decommissioning funds. Because of deregulation in the power market, some licensees would cease being an "electric utility," as defined in NRC regulations. Should this occur, periodic deposits to an external sinking fund would no longer be allowed; rather, the NRC requires that a licensee provide funding assurance for the full estimated cost of decommissioning, either through full up-front funding or by some allowable guarantee or surety mechanism. Deregulation would not invalidate the license; as a result, the licensee will still be liable for the safe and complete decommissioning of their facilities. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Objective empirical data clearly demonstrate that the majority of commercial nuclear power plants will not operate through their planned operating life of forty years (40). While the power reactor licensees are entitled to recover a portion of decommissioning funding

through the rate, they are not entitled to a full and complete rebate on “stranded investments”, and shortfalls that will certainly arise due to the under funding of nuclear decommissioning “funding targets.” Shareholders and Board Members of electric utilities and Rural Electric Cooperatives (REC) must assume responsibility for their business decisions. These aforementioned entities aggressively sought to license, construct, and operate nuclear power plants. To allow artificial definitions concerning ownership of nuclear generating stations to insulate those who cogently made capital investments is immoral, unethical, and an endorsement of corporate socialism. That is, shareholders profit from imprudent investment decisions and are accorded relief when error of mismanagement becomes manifest. The Pennsylvania Public Utility Commission cited Nuclear Regulatory Commission guidelines that suggested five criteria for evaluating alternative financing mechanisms for nuclear decommissioning. One of the components of was titled “Intergenerational equity - that the cost of decommissioning be spread equitably to all rate payers throughout the life of the facility.” Unless a more equitable funding formula for nuclear decommissioning is established, rate payers and taxpayers who received little or no direct electrical benefit from nuclear generating, will be financially exposed. The nuclear industry must assume responsibility for their investment strategies. Creating and perpetuating intergenerational debt is reckless and fundamentally inequitable and undemocratic. Future generations may be exposed to gross rate payer inequity if adequate decommissioning funding based on realistic estimates (and not “funding targets”) are not assured. The solution should not be a financial safety net provided by hostage rate payers and taxpayers excluded from internal corporate decision making. “Electric utilities” must assume financial responsibility for their decisions to invest in nuclear power which necessarily means the shareholder should bear a substantial portion of post-deregulation decommissioning expenses. Clearly, a formula must be established that recognizes rate payer and taxpayer equity for the realized service that power reactor licensees provide. It is time for the Nuclear Regulatory Commission to recognize, through its Environmental Impact Statements, that consumers and taxpayers are human beings and not abstract, hypothetical billing invoices. (**CL-02/31**)

Response: *The missions of the NRC include the protection of public health and safety, and protection of the environment. NRC requirements established a framework to ensure that decommissioning of all nuclear reactor facilities will be accomplished in a safe and timely manner, and that adequate funding will be available for this purpose. NRC does not prescribe how the funds are to be raised. The license holder for the facility funds decommissioning costs. Equitability of investment decisions is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Second, we are concerned that over the course of 60 years, the ownership of nuclear plants, financial status of licensees, and decommissioning obligations for many plants could change; if companies have not operated the facility long enough to accrue sufficient funds

for decommissioning, and then go into an extended SAFSTOR period, bankruptcy of the facility owner could jeopardize cleanup at the site. The extended time of storage combined with reduced staffing associated with SAFSTOR could mean that these sites are more likely to be subject to accident, theft of equipment, or attack. (**CL-11/10**)

Response: *If a facility shuts down prematurely before the decommissioning trust is fully funded, or if it unexpectedly finds itself having to shift to a more costly decommissioning option, the facility license holder is still obligated to fund the entire cost of decommissioning. To date, none of the license holders of prematurely shutdown facilities have defaulted on their decommissioning funding obligation. Bankruptcy does not necessarily mean that a power reactor licensee will liquidate. To date, the NRC's experience with bankrupt power reactor licensees has been that they file under Chapter 11 of the Bankruptcy Code for reorganization, not liquidation (for example, Public Service Company of New Hampshire, El Paso Electric Company, and Cajun Electric Cooperative). In these cases, bankrupt licensees have continued to provide adequate funds for safe operation and decommissioning, even as bondholders and stockholders suffered losses that were often severe. Because electric utilities typically provide an essential service in an exclusive franchise area, the NRC staff believes that, even in the unlikely case of a power reactor licensee liquidating, its service territory and obligations, including those for decommissioning, would revert to another entity without direct NRC intervention. Additionally, an NRC-licensed facility undergoing decommissioning or a site that is not under license but is undergoing decommissioning under NRC's regulations also warrant remediation under CERCLA as a Superfund site. These statutory provisions might become particularly relevant at sites for which funding is inadequate for cleanup. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.5 NEPA-Related Issues

O.5.1 Process for Developing the GEIS

Comment: What consideration was given to the location of the facility as a variable in determining? (**CH-B/3**)

Response: *Location of the facility (on the ocean, a lake, a river, etc.) was one of the variables used to determine the potential environmental impacts from decommissioning activities. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I don't know if site location was included in as an Other in the variable. I'd be interested in what kind of depth of analysis went into that if it was a variable that was considered. (**CH-B/4**)

Response: *Location of the facility (on the ocean, a lake, a river, etc.) was one of the variables used to determine the potential environmental impacts from decommissioning activities. Data from sites located on the Great Lakes, the Atlantic and Pacific Oceans; as well as plants located on rivers were used in evaluating the impacts from decommissioning facilities. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I recommend highly that in the future efforts of this sort, the communications to get information about specific plants be with those specific plants or otherwise actions be taken to ensure that all plants are covered. (**CH-D/12**)

Response: *The staff agrees that in many instances direct contact with the licensees yields the most accurate and current information. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I understand that Elk River is the only United States commercial reactor that has been completely dismantled down to its original greenfield state. It so completely disappeared, in fact, that it is not even mentioned in the "Draft Supplement," in the tables of "permanently shutdown plants" (for example, as pages 3-27, 4-44, and Table F-1. (**CL-51/5**)

Response: *The Elk River Reactor was not regulated by the NRC. Elk River was not a commercial reactor and not attached to the electric power grid. It was a 58 megawatt (thermal), boiling water reactor that was owned and operated by the Atomic Energy Commission as part of the demonstration reactor program project. Therefore, it was not included in the permanently shutdown reactors considered in this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.5.2 Public Meetings and Public Participation

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC redefines terms to avoid local, site-specific opportunity to question, challenge and prevent unsafe decommissioning decisions. (**CL-43/9**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC is attempting, with this supplement, to legally justify the removal of the existing opportunities for community

involvement and for legal public intervention until after the bulk of the decommissioning has been completed. This includes such activities as flushing, cutting, hauling and possible rubbilizing of the reactor. (**CL-43/12**)

Comment: While the 9/11 events may call for some more secrecy, in most cases it's a matter of "closing the gates long after the horses are gone." Instead you should adopt a policy of allowing more public participation to ensure public confidence in your process! (**CL-27/2**)

Comment: I would like to start out by addressing the process and how it limits the ability for the public to effectively participate in this and other nuclear-related issues that impact Georgia communities. The technical nature of the issues and an ongoing resistance by nuclear regulators to share accurate information about nuclear threats has always made it difficult for the public to be involved in decision-making involving nuclear energy issues. (**AT-A/2**)

Comment: We have some grave concerns about the process....There is a real problem, I think, with public knowledge about the opportunities for input into NRC's decision making. (**AT-B/5**)

Comment: My executive director asked me to express our concern for we want this process to be transparent. Allow public accessibility to the process, knowledge of the standards. Do no harm. We represent physicians who take the Hippocratic Oath. Take no risks that can be avoided. It seems ridiculous to come in here and say to professionals "be careful." But Adele quoted the too-cheap-to-be-metered promise and there's some credibility problems, so be careful. (**AT-H/1**)

Comment: As I noted at the time, I am concerned about the silence of the draft supplement on public participation in the decommissioning process. Commenters raised these concerns 18 months ago, but the draft supplement does not seem to address them. (**CL-12/1**)

Comment: As I read the supplement, its effect will be to predetermine a number of issues about decommissioning of all public-utility power reactors. This will remove those issues from examination in trial-type proceedings, where licensees' evidence or the NRC's assumptions and conclusions could be tested and exposed to public scrutiny. (**CL-12/2**)

Comment: Unless the public is allowed to intervene in decommissioning proceedings and participate fully in those proceedings, it cannot be certain that trustworthy decisions will result. Your 1996 brochure Public Involvement in the Nuclear Regulatory Process, NUREG/BR-0215, assures us that "the public has an opportunity to participate in NRC's decision making process to decommission a facility." Public participation short of party-intervener status and review of

less than all issues relevant to each plant seems to me a recipe for inadequate decision making. If your agency restricts review, I believe you will be reneging on your promises to the public, as well as violating NRC's laws and regulations and the Administrative Procedure Act. (**CL-12/3**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC redefines terms to avoid local, site-specific opportunity to question, challenge and prevent unsafe decommissioning decisions. (**CL-26/11**)

Comment: I also utterly oppose redefining terms to avoid local, site-specific opportunity to question, challenge, and prevent unsafe decommissioning decisions. (**CL-33/15**)

Comment: I also utterly oppose attempting to legally justify the removal of the existing opportunities for community involvement and for legal public intervention until activities such as flushing, cutting, hauling, and possibly rubblizing of the reactor are complete—in other words, until the damage has irretrievably been done. (**CL-33/18**)

Comment: Please increase, rather than decrease, public participation in every single aspect of the planning, building, and running of Nuclear Power Plants. Please do this even if you don't want to. The public, to you, may seem like a thorn in your side, something that gets in the way of your plans. But a democratic government should not seek to shut their people out of decisions that effect their lives. It is a very sad reflection on the state of our democracy that this seems to be precisely the aim of your draft regulations. Don't you believe in democracy? Are you tired of playing by democratic rules if it means you can't win each and every time? Is democracy too inconvenient for you? If you were busy doing the "right thing" you would be excited and proud to open your process to the public. If you were involved in an honest process, you would be eager to engage your opponents in debate about it. You would not have to stack the deck, hide your process, shut the people out. Shame on you! See if you have the courage to do the right thing! --- And have the courtesy not to send one of those dummy automatic replies! (**CL-35/1**)

Comment: In keeping with appropriate medical and public policy principles, we urge total transparency. United States citizens deserve nothing less than total transparency. (**CL-46/1**)

Comment: We urge that the Commission always lead it's interactions with the public at large by being fully open and informative about the potential dangers, the expense and the limited experience we as a nation have with the decommissioning of nuclear reactors. (**CL-46/2**)

Comment: Any and all decommissioning activities should be performed methodically and with great caution, ensuring that the public is appropriately involved in the processes and thoroughly protected from dangers every step of the way. (**CL-47/4**)

Comment: Further, this move runs counter to NRC's "Openness" Principle of Good Regulation, wherein "Nuclear regulation is the public's business, and it must be transacted publicly and candidly. The public must be informed about and have the opportunity to participate in the regulatory processes*" and to NRC's Organizational Value of "Service to the public, and others who are affected by our work." (both found at http: //www.nrc.gov/who-we-are/values.html) (**CL-47/12**)

Comment: We're concerned that the use of the proceeding may be used to eliminate site-specific evaluation of local concerns. And our concern is the right of local residents will be preempted from raising concerns during the license termination plan review. (**SF-D/1**)

Comment: The elimination of sub part M hearings coupled with the instituting of sub part L further inhibits public participation and is a violation of citizens constitutional rights guaranteed under section 189a of the Atomic Energy Act. (**CL-50/8**)

Comment: The PSDAR skirts accountability and obstructs required public participation. The PSDAR does not require a clear description of the methodologies so that the public can understand what will be taking place during decommissioning. Only with a sufficiently detailed plan, can the public meaningfully research, investigate, formulate comments and questions, and possible objections to the decommissioning activities. A meeting does not afford citizens the level of institutional accountability necessary given the dangers of environ-toxic contamination inherent in the reactor cessation. Informational meetings, as experienced at Yankee Rowe, CT Yankee, Maine Yankee, and Millstone Unit 1 obfuscated, confused, and ignored the concerns of local citizens. Both the Federal District Court and the Appellate Court chastised the agency for this approach. If the community has concerns, and there is no regulatory recourse save one "meeting" with NRC, the Commission will, in fact, create polarization between the community and regulator leading to erosion of public confidence in the NRC. (**CL-50/9**)

Comment: Increasingly, no forum is available to citizens in which to exercise their rights under the Federal Administrative Procedure Act. This is yet another reason that this Supplement is unacceptable and should be withdrawn. (**CL-52/7**)

Comment: These denials of access to the judicial system are currently being extended in the form of NRC's proposed Rule, "Change of Adjudicatory Process," compounding the illegalities inherent in this Supplement. (**CL-52/6**)

Comment: The NRC claims the agency and the industry have accumulated substantial decommissioning experience and that this is justification for hastening the generic treatment of

Environmental Impact Statements. In effect, this eliminates meaningful public involvement in site-specific reviews and prevents the necessary full disclosure of nuclear facility contamination and decommissioning practices. (**CL-48/4**)

Comment: Why, in this same democracy that we hold up so proudly to the world, does the NRC seek to prevent public comment on the basic issue of public health in a nuclear world? (**CL-36/1**)

Comment: Please consider my opposition to many of the proposed Supplements. The public should not be further shut out of the decommissioning process. Nuclear waste is deadly and it's handling should not be downgraded in any way. (**CL-43/16**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC is attempting, with this supplement, to legally justify the removal of the existing opportunities for community involvement and for legal public intervention until after the bulk of the decommissioning has been completed. This includes such activities as flushing, cutting, hauling and possibly rubblizing of the reactor. (**CL-26/14**)

Comment: CWAA supports the comments of NIRS, Public Citizen and the Critical Mass Energy Project. We concur with these organizations that changes in the supplement designed to limit citizen's opportunities to review or challenge decommissioning projects are undemocratic and ill advised. It is imprudent to reduce public oversight of these projects, no matter how much more convenient it seems. (**CL-45/1**)

Comment: Alternative methods being considered by the NRC include "entombment" and "rubblization." These involve leaving more nuclear waste onsite in an effort to reduce industry's short-term decommissioning costs but are likely to increase long-term costs to affected communities once the sites are abandoned after license termination. The proposed alternative methods additionally raise significant technical and environmental impact issues and conflicts with the permanent emplacement of so-called "low-level" radioactive waste at nuclear facility sites not originally licensed as regulated nuclear waste management facilities. The proposed alternative methods are tantamount to creating an unlicensed radioactive waste disposal site. These alternative methods must therefore be subject to review by the affected communities with full disclosure and documentation of the amount of radioactivity, the location and condition of all residual contamination and the types of radioactive contamination that remain onsite. On-site and offsite contamination and radioactivity and associated issues involved with extended institutional control must all be subject to site-specific public hearings. (**CL-48/27**)

Comment: NRC redefines terms to avoid local, site-specific opportunity to question, challenge and prevent unsafe decommissioning decisions. (**CL-48/44**)

Comment: NRC is attempting, with this supplement, to legally justify the removal of the existing opportunities for community involvement and for legal public intervention until after the bulk of the decommissioning has been completed. This includes such activities as flushing, cutting, hauling, and possibly rubblizing of the reactor. (**CL-48/47**)

Response: *The Supplement provides an environmental analysis of the impacts associated with the decommissioning process for power reactors. Comments pertaining to the decommissioning process for power reactors as prescribed by 10 CFR 50.82 are outside the scope of this Supplement. The current regulations were published on July 29, 1996 as part of a comprehensive rulemaking effort related to power reactor decommissioning. The NRC revised its regulations by the Commission's notice and comment rulemaking process.*

Section 2.2 of the GEIS describes the regulatory aspects of the decommissioning process as specified by 10 CFR 50.82, including the options for public participation. In addition to public meetings, the public has certain adjudicatory opportunities that are outlined in NRC regulations at 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders." If the licensee has requested an action requiring a license amendment, then the process for intervening in this action is by requesting or participating in a hearing. For decommissioning reactors, the process will usually follow the regulations in 10 CFR Part 2, Subpart L, "Informal Hearing Procedures for Adjudications in Materials and Operator Licensing Proceedings" (depending on the timing of the request, the process may follow the regulations in 10 CFR Part 2, Subpart A). If the action of concern does not involve a license amendment, then any member of the public may raise potential health and safety issues in a petition to the NRC to take specific enforcement action against a licensed facility. This provision is contained in the NRC's regulations and is often referred to as a "2.206 petition" in reference to its location in the regulations (Chapter 2, Section 206 of 10 CFR). Licensees are permitted to perform activities allowed under their licenses. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: After the tragic events of September 11, this problem has escalated to a point where our organization believes it is highly irresponsible of our Federal government to go forward with making crucial decisions that will affect generations and generations to come. The NRC's Web site, as many of you know, was not available for a time and is currently severely scaled back, making public access to important background information very difficult or impossible. I have spoken with representatives of the U.S. Nuclear Regulatory Commission and they have echoed some of my concerns as they, too, have difficulty gaining information on nuclear industry activity. If people like myself who have the ability to research these issues on a full-time basis along with staff members of the regulatory agencies are having a hard time, imagine the fate of a concerned citizen who has limited time to devote....For citizens concerned about issues at Plant Hatch in south Georgia, unless they have a hard copy of the relicensing

documents, it is difficult for them to look up concerns that would be relevant to today's meeting because those relicensing documents are no longer available online. We did have a link to it on our Web site, but you know, we all know it's not working. (**AT-A/3**)

Comment: Georgians for Clean Energy remains concerned about the ability for the public to effectively participate in this and other nuclear related issues that impact Georgia's communities. Due to the tragic events of September 11th the Nuclear Regulatory Agency's (NRC) Web site was not available for a time and is currently severely scaled back, making public access to important background information very difficult or impossible. (**CL-08/1**)

Comment: SLOMP is troubled by the inability of the public to have adequate access to the NRC Web site. Prior to the censorship, the existence of the Web site had been viewed as a giant step forward in communication between the public and the Commission. (**CL-53/1**)

Comment: Given the difficulty in accessing thorough and accurate information, including potentially relevant material such as the relicensing documents on Plant Hatch in South Georgia, we feel it is important to both extend the public comment period until these documents can be made readily available and to provide more meeting locations to adequately gather public comments. Since nuclear reactors will eventually be decommissioned in many states the public should be given more than just four locations nationwide to voice their concerns. Public meetings should also be held in communities neighboring currently existing nuclear power plants. (**CL-08/2**)

Comment: Moreover, the NRC's public notice, as an example, that went out on November 2 of this meeting, contained an inaccurate link to the public electronic reading room.... Well, for a lot of people that got that link, that's all they'll do, they'll go to that link and it doesn't work and they think they don't know how to use their computer and then they just go home. So again, the accuracy of information that's going out right now, we have to be very aware of when there are mistakes made. (**AT-A/5**)

Response: *The NRC realizes that the Web site was not available to the public for a period of time following September 11, 2001, and has taken prudent steps to make important information available to the public as soon as practicable. The staff extended the comment period for an additional 30 days until January 31, 2002, in part, to provide additional time for members of the public to review appropriate documents relating to decommissioning. Currently, the NRC website has been re-established and the public has access to a large amount of information via the Internet. The subject of license renewal is outside the scope of this Supplement. However, if individuals have questions related to license renewal they should contact the project manager*

of the plant of interest. The NRC website can direct an individual member of the public to the NRC point of contact. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: It is essential to provide more meeting locations to gather public comments. Four locations is not enough, given that we have nuclear reactors that will eventually be decommissioned in many states and the public, as I've said, has had difficulty accessing the information...have more meetings. (**AT-A/7**)

Comment: Once again, that's where having other meetings outside of the area could gather some useful information that may have been missed, and maybe site-specific, that wasn't addressed earlier. (**AT-A/20**)

Comment: Thank you for holding these meetings in four locations around the country, and for encouraging public participation. (**CL-10/12**)

Comment: I'd like to invite you to come to Charlotte. We could, I think, fill up a hearing room so that you could hear from the citizens who are directly affected by your decision making that is on going. (**AT-B/13**)

Comment: Both the NRC and taxpayers would have been better served by sending the draft GEIS to all individuals and groups that have demonstrated interest in safety issues at nuclear plants over the last two decades, with a questionnaire, a comment section, and a self-addressed, stamped envelope. (**CL-53/6**)

Response: *The meeting locations were chosen to provide convenient locations across the country and in each NRC region. The NRC staff identified public interest groups and concerned citizens in the vicinity of all 22 power reactors undergoing decommissioning. Copies of the Draft Supplement were provided to all identified personnel and organizations. Additionally, the NRC and EPA published Federal Register notices identifying the availability of the Draft Supplement. The NRC included the Draft Supplement on the NRC's Web site, issued a press release, and made it available to members of the public through the electronic reading room. Finally, any member of the public seeking to gain a copy of the draft was provided a copy at no charge. In response to concerns expressed by members of the public, the NRC staff extended the public comment period again allowing additional public input. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: The GEIS needs to create a chronological list of all the decommissioning activities that accept public participation. All public participation opportunities such as meetings, hearings, oral comments, written comments, petitions, and interventions need to be listed. At later times when specific dates are known, this list needs to be advertised locally in the affected area. The licensee should also solicit public input on the formulation of decommissioning plans well before the decisions are made. (**CL-14/7**)

Response: *Section 2.2.1 of this Supplement provides a detailed discussion of the decommissioning process and regulations. Additionally, 10 CFR 50.82 describes the process necessary to decommission a facility and identifies instances when public participation is afforded. Also, within two to three months of the licensee's announcement of permanently ceasing operation, the NRC staff holds a public meeting in the vicinity of the plant to describe in detail the decommissioning process. At that time the opportunities for public input are identified. NUREG-1628, "Staff Responses to Frequently Asked Questions Concerning Decommissioning of Nuclear Power Plants," provides a discussion on when and how the public can participate. Copies of the document can be obtained from the NRC Staff. Based on the above sources of information no additional listing of activities that accept public participation is necessary. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The public has not only the "right to know", but NRC and the industry has the duty to fully disclose all related impacts, short and long-term, on and offsite, direct and indirect, as well as cumulative effects resulting from decommissioning to citizens and members of the public living in local communities surrounding the nuclear plants. (**CL-44/15**)

Response: *The NRC staff examined the impacts of decommissioning activities at NRC-licensed nuclear power facilities for cumulative, short- and long-term, onsite and offsite, direct and indirect impacts. This analysis is contained in Section 4.0 of the document. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: NIRS reiterates and incorporates our previous comments and fundamental disputes with regard to the decommissioning GEIS as submitted in formal comments to NRC on July 11, 13 and 14, 2000. Our organizations request that NRC include with this submission all of our organizations' previous comments on this and related rulemakings (including but not limited to the environmental procedures on BRC and those that led to the development of 10 CFR 20 section E, the License Termination Rule). (**CL-48/1**)

Response: *The comments that were received during the scoping process that are within the scope of this document are discussed in Appendix A of the Supplement. Because the scope of this document, as described in Section 1.3, does not include Below Regulatory Concern issues*

or the License Termination process or related rulemakings, they are outside the scope and not addressed in the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: The NRC gave 10 individuals representing 10 different environmental groups only 5 minutes each to express their concerns. Furthermore, it is outrageous that the NRC located these proceedings hundreds of miles from the affected communities-and those who are most concerned about the decommissioning of nuclear plants. (**CL-53/5**)

Response: *At each public meeting, the public is asked to sign up for 5-minute time slots at the beginning of the meeting to ensure that everyone has the opportunity to comment. After these comments are received the remaining time is allocated for further public comment, either from those who did not sign up or for those who wished to express additional comments.*

The meeting locations were chosen to provide convenient locations across the country and in each NRC region. The Staff determined that meetings in additional locations would not have provided enough added value for the expense of holding the meetings. Public meetings was only one of several means for the public to share their comments with the NRC. The other means included email, mail, or hand delivery to the NRC in Rockville, Maryland. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: I would challenge you not to lose any of the comments that have been made about security or any other issue that you consider outside the scope. And make certain that those do surface somewhere. (**AT-B/20**)

Comment: I guess I'd like to just comment that to the public and to many non-profit organizations, generic means you may say this, you may not say that; this is on the table, that is not on the table. And what happens is that people do make comments that affect their communities and affect their safety and if they are indeed outside the scope of a particular process, I would truly love to believe that those comments are not lost. But at this point, my experience doesn't lead me to be sure that's the case. (**AT-B/19**)

Comment: I recognize that it has probably been a waste of my time and will be ignored, therefore I am not bothering to write it again with every paragraph in the right place. (**CL-20/113**)

Response: *All comments and questions received at the meeting became part of the transcribed record. Other comments received from three other meetings, emails and letters were included in the record; the disposition of all public comments makes up this Appendix.*

Comments that pertain to physical security issues have been forwarded to the appropriate NRC office for consideration. Other issues determined to be outside the scope of the Supplement were evaluated for their relevance to on going NRC actions and activities and forwarded to the respective NRC office if appropriate. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: Public participation must be instituted for the creation of the ISFSI. At present, the creation of an ISFSI falls into a regulatory no man's land. At the NRC pre-hearing on the Yankee Rowe LTP, the NRC administrative law judges were instructed by the commission not to address any contentions concerning the storage of high-level radioactive waste. The creation of the ISFSI has serious consequences for each reactor community that could last hundreds of years. That the public can not participate in the process - give comments, request hearings, intervene - is unreasonable and undemocratic. (**CL-50/24**)

Response: *The licensing of an ISFSI is outside the scope of the Supplement (see Section 1.3). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Each reactor community should have representatives trained in MARSSIM and other protocols by the NRC so that they can effectively comment and express their concerns about the adequacy of the procedures being used. (**CL-50/27**)

Response: *Because of the highly technical nature of designing, conducting, and evaluating final site surveys using the MARSSIM protocols, extensive training in statistics, health physics, physics, and mathematics are needed. It is unreasonable to expect the NRC to provide such training to members of the public at each facility location. Trained NRC experts are available to answer specific questions on the design, execution, and results of the surveys. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.5.3 Request for Additional Comment Period

Comment: Therefore, we feel it is important to both extend the public comment period until these documents can be made readily available.... But I think we do need to extend the public comment period to address the inability of getting the information easily. (**AT-A/6**)

Comment: There's a number of decommissioning related documents that have come out for review. And while I appreciate the NRC has been very busy, in addition to this GEIS supplement, the entombment proposed rule making, there's also I think, I got two documents this week regarding decommissioning cost reports and I think the cost estimate formats. If

there is any way that we could not have to get all the comments in the very short comment period, if it could be extended, I'd really appreciate it because it's going to be a very busy December for me. (**CH-D/13**)

Comment: This highlights the need for an extended comment period and careful analysis of this issue. For instance, I'm sure there are a number of nuclear security organizations worldwide that perhaps this draft and others within the NRC could be opened up to get their comments and maybe their suggestions of what they're doing in other countries or whatever, because we're looking at a global assault. (**AT-A/13**)

Response: *The comment period for the Supplement was extended an additional 31 days until January 31, 2002. The comments did not result in a change to the Supplement.*

O.5.4 Determination of Scope

Comment: The NRC scope is clearly associated with the radiological aspects of decommissioning. So, an issue such as rubblization, that has a radiological component, this seems clearly it's within the scope of NRC's review regulation. I do not see the removal of a cooling tower is within NRC's scope. (**BO-B/2**)

Comment: However, while the stated intent of the Supplement is to consider in a comprehensive manner all aspects related to the radiological decommissioning of nuclear reactor facilities, the Supplement sometimes deviates from this intent by delving into activities and impacts related to the removal of uncontaminated structures, systems, and components such as intake structures or cooling towers. While the consideration of these impacts may be useful and helpful, their inclusion without proper caveat may tend to blur the line of NRC jurisdiction. (**CL-04/2**)

Comment: And yet, I note in the document that you also include decommissioning--environmental impacts of decommissioning a nonradioactive system such as cooling towers and discharge pipes. I'd like to understand what criteria NRC will use to determine the acceptability of a licensee's plans in those areas. (**BO-B/1**)

Response: *The Supplement provides an environmental analysis of the impacts associated with the decommissioning process for nuclear power reactors. Clearly part of that decommissioning process involves the removal and disposal of structures, systems, and components that may not be radiologically contaminated. For completeness, and in the spirit of NEPA, the staff chose to include the dismantlement of all structures, systems, and components necessary for power generation on the site. As a result, cooling towers and the diesel generator building were included, but the site training center and visitor information center was not. During scoping, the NRC staff met with EPA and at their urging the staff agreed to look at*

the impacts from activities performed to support dismantlement of nonradiological structures, systems, and components (SSCs) required for the operation of the reactor. This is discussed in Section 1.3, "Scope of This Supplement." The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: The scope is just inadequate. (**CH-C/3**)

Response: *The comment can not be evaluated because it does not provide specific information. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Out-of-scope activities are identified and discussed in Section 1 and Appendix D. It is recommended that "Interim Storage of Greater than Class C Waste" also be identified as an out-of-scope activity, consistent with the final rule published in Federal Register Vol.66, Number 197, dated October 11, 2001. (**CL-06/2**)

Response: *Section 1 and Appendix D have been revised to indicate that the interim storage of Greater-than-Class-C Waste is an out-of-scope issue.*

Comment: Page 1-5, Section 1.3. This section states that except for decommissioning planning activities, the Supplement only considers activities following removal of the fuel from the reactor. The exclusions include "impacts that result directly and immediately from the act of permanently ceasing operations" such as the environmental impacts of ceasing thermal discharges to receiving waters which the Supplement states "is essentially a restoration of existing conditions." This ignores the potentially adverse effects that the thermal discharges may have had on the ecosystem while the plant was operating; and, while the affected ecosystem may recover from the thermal discharges, such recovery may not be the equivalent of restoration to the originally existing conditions. Also, a species may have become established and dependent upon the thermal discharge. (**CL-16/12**)

Response: *As discussed in Section 1.3, impacts related to the decision to permanently cease operations are outside the scope of this Supplement. Efforts to maintain an altered ecosystem appear contrary to the spirit of NEPA. Furthermore, the NRC has no regulatory authority to require the licensee to continue operating the facility in order to avert impacts form permanently ceasing operations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It is absurd that NRC states that "decommissioning activities do not include the maintenance, storage or disposal of spent nuclear fuel, or the removal and disposal of nonradioactive structures and materials beyond that necessary to terminate the NRC license.....

they are not considered as a cost impact because the licensees are not required to accumulate funds for these activities." (See p.4-42).The licensees must be held responsible and accountable for everything about and on the site and generated by the site past, present and future. (**CL-20/43**)

Response: *The Supplement does not state that the licensee is not responsible for the above-stated concerns, only that maintenance, storage, and disposal of spent fuel is not within the scope of this Supplement. The Supplement provides an environmental analysis of the impacts associated with the decommissioning process for power reactors. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It is murderous that potential radiological impacts following licensing/license termination that are related to activities performed during decommissioning are not in the Supplement. This allows the licensee to slowly murder a community as the radiological criteria for license termination by NRC was woefully inadequate anyway. (**CL-20/87**)

Response: *The radiological criteria for license termination are given in 10 CFR Part 20, Subpart E, and further addressed in NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities." For a site to be released as unrestricted, the total effective dose equivalent to an average member of the critical group is 0.25 mSv/yr (25 mrem/yr). The NRC staff believes that these criteria are adequate to protect public health and safety. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I also utterly oppose stating that 10 CFR 20 section E and its Environmental Impact Statement, NUREG 1496, are not part of the scope of this Supplement. (**CL-33/19**)

Response: *10 CFR Part 20, Subpart E, and NUREG-1496 are not part of the scope of this Supplement. The 1997 license termination rule relied on the environmental assessment contained in the "Generic Environmental Impact Statement in support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Facilities," Final report, NUREG-1496, dated July 1997. The public had the opportunity to comment on that draft GEIS and the rulemaking effort at the time that the rule was being developed. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: There are several issues in the Supplement which are briefly addressed and dismissed as "out-of-scope," which we insist need to be dealt with as site-specific issues for any thorough EIS on decommissioning, with full public rights to hearings, review, oversight, and

disclosure maintained. These include: 1. Spent fuel storage and maintenance - The public at each reactor site community should determine how irradiated/"spent" fuel is stored/ dispositioned. If a centralized high-level waste repository is opened at some future date to accommodate the irradiated fuel and high-level waste from a community's decommissioned reactor, the communities that exist along the possible transportation paths should also be involved in site-specific environmental impact reviews/assessments. To exclude spent fuel storage, maintenance, transport, and disposal away from the reactor location from the scope of this GEIS/Supplement, and the opportunity for site-specific EIS reviews, is arbitrary and capricious. 2. Low-level waste disposal at a LLW site - The concept of rubblizing and capping a reactor site and allowing it to function as a low-level waste disposal facility without having the appropriate permitting and licensing hearing process is a serious departure from past NRC licensing practices, and any such "rubblizing" proposal should not be approved without a site-specific EIS review. To exclude this or any similar proposal from a site-specific EIS review, and the scope of this GEIS/Supplement, is arbitrary and capricious. (**CL-47/18**)

Response: *Spent fuel storage is outside the scope of the Supplement, as are transportation and disposal of spent fuel. Both Skull Valley and Yucca Mountain were subjected to site-specific EISs. The staff has stated in the Supplement that the disposal of slightly contaminated rubble onsite (rubblization) would be subject to a site-specific review, as would entombment. Evaluation of the License Termination Plan in support of the rubblization or entombment would allow for a request for intervention on the part of a member of the public. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Nuclear facility operation results in significant offsite radiological contamination that is ignored under the current definition. For example, one known pathway occurs over the course of reactor operation as the direct result of fuel rod degradation giving way to pin-hole leaks, cracks and loss of rod integrity with radioactive contamination to the reactor coolant system. Primary and secondary coolant piping leakage results in radioactive contamination releases being deposited and accumulated as sediment on river and lakebeds and coastal receiving waters from deteriorated reactor coolant discharge systems. This is of particularly more concern for utilities that operated once-through cooling systems and/or boiling water reactor technology though not exclusively so. Some of our organizations are aware that reactor operators, as in one case of the Big Rock Point nuclear generating station, have argued that offsite radioactive sediment areas should not be disturbed by removal/decontamination efforts and are better left alone than decontaminated. The decommissioning definition does not require the utility to analyze the scope of this offsite contamination, consider its cleanup nor effectively regulate the enforcement of decontamination of residual radioactivity that has

migrated from the reactor site and accumulated off site in affected communities resources such as fresh water supplies. These advertent releases of radioactivity as the result of station operation need be covered within the scope and disclosure as environmental impacts within the decommissioning process.

NRC in its evaluation of the environmental impacts acknowledges "Levels of radionuclide emissions from facilities undergoing decommissioning decreased, because the major sources generating emissions in gaseous and liquid effluents are absent in facilities that have been shut down." Consequently, the NRC currently only considers radiological effluent impacts as a result of decommissioning operations while ignoring the potential need for mitigation of cumulative and persistent toxic radioactive materials deposited downstream over the decades of operation of a reactor. (**CL-48/13**)

Comment: This agency's definition of "decommissioning" is fundamentally flawed in limiting its scope of "property" to the site boundaries. The NRC scope needs to be broadened to encompass the decontamination or mitigation of "property" in addition to structures, systems, and components of the nuclear power station that exist beyond the fence line that have been contaminated nonetheless, as a direct result of station operation. (**CL-48/12**)

Response: *Routine releases from power plants do not result in offsite contamination that warrants offsite remediation. There are regulations in place concerning the release of any material from a nuclear power facility. The plants were licensed with the expectation that there would be routine releases to the air and water due to normal operations. The releases are limited to ensure public health and safety. Licensees are required to conservatively estimate offsite dose annually. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: This Supplement to the Final GEIS fails to address decommissioning of nuclear facilities other than commercial reactors. It therefore fails to take into account the subject of NUREG-0586: the environmental impacts of decommissioning nuclear facilities—all nuclear facilities. (**CL-52/2**)

Response: *NUREG-0586 is still valid for all facilities except nuclear power facilities. As stated in Section 1.1 (and unlike the 1988 GEIS), this Supplement covers only reactor facilities licensed by the NRC for commercial power production. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Moreover, in order to assess the full environmental impacts of each facility's decommissioning, it is necessary to take into account its impacts in concert with the impacts of all other nuclear facilities that contribute additive radiological and other contamination to the biologic system. (**CL-52/3**)

Response: *The environmental monitoring program and the licensee's Offsite Dose Calculation Manual would adequately characterize the cumulative radiological impacts associated with nearby facilities that are also light water reactors or that emit or release similar radioisotopes to those occurring in a light water reactor. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: For purposes of this GEIS, the NRC is only focusing on the environmental impact of the actual decommissioning activities between the cessation of operations and license termination. This approach completely and inappropriately ignores the environmental impact associated with any radioactive material remaining following license termination. (**CL-17/2**)

Response: *Any potential radiological impacts following license termination that are related to activities performed during decommissioning are not considered in this Supplement. Such impacts are covered by the "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," NUREG-1496. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The NRC in this Draft says p. D-2 that the temporary storage or future permanent disposal of spent fuel at a site other than the reactor site is not within the scope of this Supplement. Why the hell not? It MUST BE, OTHERWISE THIS DRAFT IS EVEN MORE MEANINGLESS. (**CL-20/83**)

Response: *The Commission has independently, in a separate proceeding called the "Waste Confidence Proceeding," made a finding that there is "reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised license) of that reactor at its spent fuel storage basin, or at either onsite or offsite independent spent fuel storage installations" (54 FR 39767). The Commission has committed to review this finding at least every 10 years. In its most recent review, the Commission concluded that experience and developments since 1990 were not such that a comprehensive review of the Waste Confidence Decision was necessary at that time (64 FR 68005). Accordingly, the Commission reaffirmed its finding of insignificant environmental impacts, cited above. This finding is codified in the Commission's regulations at 10 CFR 51.23(a). The*

operation of a spent fuel pool or an ISFSI is not uniquely linked to decommissioning. All operating nuclear power facilities have spent fuel pools and some (with the number anticipated to increase) have ISFSIs generally located adjacent or near to the power reactor facility. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Our organizations have a fundamental dispute with the Commission's definition of decommissioning. Decommissioning should not permit the release of radioactive contamination from regulatory control and the control of some identified responsible party. At public meetings (in 1993 and in 2001) across the country on the issue of "clean-up," the public consistently called for continued regulatory control over any and all wastes, materials, properties and sites with contamination from nuclear power and weapons fuel chain activities. Rather than requiring the identification, capture and isolation of the remains of nuclear power operations, NRC is legalizing the release of contaminated sites, properties, materials and natural resources. By segmenting the portions of the decommissioning process into separate Environmental Impact Statements and supplements, the public is prevented from addressing the amount and method of identifying residual contamination of the environment, natural resources, the community and downstream and downwind ecosystems. The public is prevented from addressing and preventing the concept of allowable doses to the public from nuclear power operation, wastes and decommissioning activities. We protest the designation of issues related to allowable contamination levels and doses being deemed "out of the scope" of this document. (**CL-48/11**)

Response: *Various activities that are performed during decommissioning may seem intuitively to be part of the decommissioning process. However, they are not considered within the scope of this Supplement because these activities have already received a thorough environmental review during the promulgation of the NRC regulations governing such activities. They are reviewed and regulated by the NRC under other regulations. The public has had the opportunity to comment on the regulations and the environmental assessment during the rulemaking process. The radiological criteria for license termination are given in 10 CFR Part 20, Subpart E, and further addressed in NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities." For a site to be released as unrestricted, the total effective dose equivalent to an average member of the critical group is 0.25 mSv/yr (25 mrem/yr). The NRC staff believes that these criteria are adequate to protect public health and safety. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: CAN believes it is essential for NRC to continue to define decommissioning as a major federal action. As the Appellate Court opined"....., it is undisputed that decommissioning is an action which, even under the Commission's new policy, requires NEPA compliance 10 CFR 51.95(b.)" (**CL-50/4**)

Response: *Decommissioning of power reactors was never considered a major Federal action. The staff agrees with the commenter that NEPA compliance is required. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Exclusion of licensee decisions and actions prior to certification that plant operations have permanently ceased means that the Supplement fails to consider factors that may have negative impacts on the quality of the decommissioning activities and on minimization of the quantity and condition of the wastes resultant from the handling and removal of radioactive materials from plant structures, systems, and components. (**CL-52/9**)

Response: *10 CFR 50.75(g)(1) requires that reactor licensees maintain records of spills or other unusual occurrences involving the spread of contamination in or around the facility, equipment, or site during operations. The staff chose to consider the environmental effect of those actions or decisions made prior to certification of permanent cessation of operations because those activities would be covered by the environmental assessment made at the time the facility was licensed to operate. Additionally, these records are available and referred to during decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Exclusion from consideration of the fate of contaminants post-license termination also renders this Supplement insufficient and not acceptable to account for the environmental impacts of decommissioning. (**CL-52/10**)

Response: *Any potential radiological impacts following license termination that are related to activities performed during decommissioning are not considered in this Supplement. Such impacts are covered by the "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," NUREG-1496. However, any potential non-radiological impacts resulting from decommissioning and occurring after termination of the license are considered within the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.5.5 Definition and Discussion of SMALL, MODERATE and LARGE Impacts

Comment: As I understand your slides, they're not saying that all--that all sites, the water--the water use and quality and air quality and ecology are small. You're just saying the sites--those issues that are dealt with in the generic sense–are small issues. And then, there can be site-specific issues that could be SMALL, MEDIUM or LARGE? (**BO-A/6**)

Response: *Section 4.1.2 of this GEIS Supplement provides a definition of generic and site-specific. For each issue, a generic conclusion can be made if the potential impacts of all sites or subsets of sites are SMALL, MODERATE, or LARGE. Site-specific issues can be SMALL, MODERATE, or LARGE. The comment did not provide new information relevant to the GEIS Supplement and will not be evaluated further. This comment did not result in a change to the Supplement.*

Comment: Executive Summary, page xiv, line 20 - references 10 CFR 50.82(a)(6)(ii) which states that the licensee must not perform any decommissioning activity that causes any significant environmental impact not previously reviewed. The supplement at page 1-8 beginning on line 23 defines three levels of significance SMALL, MODERATE, and LARGE. At which of these significance levels does the requirement of 10 CFR 50.82 (a)(6)(ii) come into affect. This needs to be defined as several Environmental Issues, e.g. threatened and endangered species are listed as site-specific. (**CL-05/3**)

Response: *The definition of "significance" in 10 CFR 50.82(a)(6)(ii) is not related to the SMALL, MODERATE, and LARGE levels of significance used to evaluate impacts in the Supplement. The determination of significance for 10 CFR(a)(6)(ii) is based on comparison of the potential environmental impact of a specific activity with the bounds of impacts previously reviewed. If the impact of the activity is within the bounds of previously reviewed impacts, the activity may proceed as long as the other criteria of 10 CFR 50.82(a)(6) are met. If the impact is not within the bounds, then the licensee may not undertake the activity without a license amendment and environmental review. The SMALL, MODERATE, and LARGE significance levels refer to whether an impact is noticeable or not and whether the impact will destabilize the impacted resource. The Executive Summary was revised.*

Comment: After the explanation by the NRC staff at the public meeting in Atlanta, we further disagree with the process of using the significance levels of SMALL, MODERATE, and LARGE for a variety of issues at a variety of locations to come up with a generic, one-word answer. The classifications are generic in form, hard to understand, and it is difficult to figure out how the NRC came to those characterizations even after NRC staff attempted to explain it at the public meeting in Atlanta. If the NRC unwisely chooses to continue using this classification system, Georgians for Clean Energy urges that, at a minimum, layman's terms be used to define the levels and the methods used to categorize the issues. (**CL-08/5**)

Comment: The Supplement should distinguish better among certain of the small, moderate and large impact levels and better explain certain assumptions used in setting these levels. (**CL-16/3**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC sets arbitrary and unsubstantiated (low, medium and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now and to prevent their inclusion in site-specific analysis. (**CL-26/12**)

Comment: ...the vague and arbitrary use of Small, Moderate, and Large significance levels and the intent for use of these designations, which echoes previous attempted bogus designations such as below regulatory concern; (**CL-38/4**)

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC sets arbitrary and unsubstantiated (low, medium, and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now and to prevent their inclusion in site-specific analysis. (**CL-43/10**)

Comment: NRC's "Levels of Significance and Accountability of Environmental Impacts" assign values of risk to affected communities as "small," "moderate" and "large" as determinants for the denial or approval of a public site-specific review and, potentially, a public adjudication for environmental mitigation. Public Citizen maintains that these categories are excessively arbitrary and broad, and largely groundless for the following reasons: 1. The biological effects of ionizing radiation are destructive. No safe "threshold level" for exposure to ionizing radiation exists for the general population (including the fetus). 2. There is a long history of unresolved regulatory conflict over radiation protection standards that are utilized to determine NRC risk assessments. Federal regulators, including the NRC and the Environmental Protection Agency, have not reached a consensus on residual radiation criteria for decommissioning, with EPA standards being significantly lower (more protective) than NRC criteria. To our knowledge, this conflict has not been resolved and, therefore, it appears that the NRC has unilaterally and arbitrarily concluded what standards would apply in determining whether a risk is "small," "moderate" or "large." 3. The NRC risk assessment inappropriately ignores the population of children in its "critical group" evaluation as the population most vulnerable to residual radioactivity exposure from decommissioning operations. This runs counter to NRC's Organizational Value to a "Commitment ... to protecting the public health and safety." 4. The NRC has a documented history of significant lapses in effective oversight of decommissioning operations as reported by the General Accounting Office in a May 1989 report, "NRC's Decommissioning Procedures and Criteria Need to be Strengthened" (GAO/RCED-89-119). The GAO not only found that complete information does not exist for all licensed activities or buried wastes, but that NRC was found to have terminated a license with radioactive contamination in excess of its own guidelines. Further, the report noted that NRC regulations

lacked a time requirement for document retention. NRC's questionable past performance does not support the agency's move toward generic treatment of decommissioning nuclear facilities where affected communities are denied public review and full disclosure of contamination, the decommissioning plan and license termination plan. (**CL-47/13**)

Comment: NRCs "Levels of Significance and Accountability of Environmental Impacts" assign values of risk to affected communities as "small," "moderate" and "large" as thresholds for denying or conducting a public site-specific review and potentially a public adjudication for environmental mitigation. Our organizations argue that these broad categories established by NRC are largely baseless for the following reasons: 1. The biological effects of radiation are deleterious. No safe threshold for radiation exposure for the general population (including the developing fetus) has been established. 2. There is a long history of unresolved regulatory conflict over radiation protection standards assumed to determine NRC risk assessments. Both federal and state agencies have sought to provide greater protection than NRC requires. 3. The NRC risk assessment inappropriately ignores the population of children in its "critical group" evaluation as the population most vulnerable to residual radioactivity exposure from decommissioning operations. 4. There is a documented history of significant lapses in effective NRC oversight of decommissioning operations as reported by The General Accounting Office in May 1989 "NRC's Decommissioning Procedures and Criteria Need to Be Strengthened" (GAO/RCED-89-119). The GAO not only found that complete information does not exist for all licensed activities or buried wastes, but additionally that NRC was found to have terminated a license with contamination in excess of its guidelines and NRC regulations lacked a time requirement for document retention. NRC's checkered history does not provide justification for the agency to move forward with generic treatment of decommissioning nuclear facilities where affected communities are denied public review and full disclosure of contamination. (**CL-48/26**)

Comment: NRC sets arbitrary and unsubstantiated (low, medium and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now and to prevent their inclusion in site-specific analysis. (**CL-48/45**)

Comment: I would like to have you expand somewhat on your definition of "small," "moderate," and "large" at this moment. (**SF-C/1**)

Comment: It seems a bit strange to me that the majority of the things are defined as "small." With my experience with radiation I would not think that most of them would end up being small, but that often comes down to a matter of scientific debate and opinions. (**SF-C/2**)

Comment: We disagree with the process—and it happened during the Hatch relicensing, too—the process of using the significance levels of small, moderate and large for a variety of issues at a variety of locations, to come up with a generic one-word answer. The classifications

are generic in form, hard to understand and even though it's small, moderate and large which sounds easy, I fundamentally have a hard time explaining that. (**AT-A/18**)

Comment: I also utterly oppose setting "low, medium, and high" environmental impact categories for each of the steps in decommissioning, to give the appearance that some things have negligible effects that don't warrant further consideration. (**CL-33/16**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow NRC to set arbitrary and unsubstantiated (low, medium and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now, and to prevent their inclusion in site-specific analysis. This use of this piecemealing approach in unacceptable. (**CL-44/10**)

Response: *The SMALL, MODERATE, and LARGE significance levels provide a method of describing the severity of impacts. These impact levels were established using the Council on Environmental Quality (CEQ) terminology for determining significance (40 CFR 1508.27), which requires consideration of both "context" and "intensity." Impacts that are of SMALL significance are either not detectable or are so minor that they neither destabilize nor noticeably alter any important aspect of a resource. MODERATE impacts may noticeably alter an important aspect of a resource, but do not destabilize the resource. And LARGE impacts are clearly noticeable and destabilize important aspects of the resource. The discussion of decommissioning impacts in Chapter 4 was changed to more clearly relate the impacts in terms of detectability and effect on resource stability.*

Comment: Page 1-8, Section 1.4. EPA encourages NRC wherever possible to make the Levels of Significance (small, moderate and large) used in the Supplement more definitive by including risk ranges, referencing the appropriate NRC regulations or providing examples of impacts. We note that in several cases the qualitative analysis is given in units of person-rem with no regulatory limit provided. (**CL-16/15**)

Response: *The discussion of decommissioning impacts in Chapter 4 was changed where needed to more clearly relate the impacts in terms of detectability and effect on resource stability.*

Comment: NRC has absolutely no basis to say whether impacts will be small etc. based on that sort of garbage. (**CL-20/6**)

Response: *Use of the levels of significance of SMALL, MODERATE, or LARGE is recognized as an acceptable and commonly used approach to ascribe a measure of significance to*

decommissioning impacts. These levels of significance are based on CEQ guidelines. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: (4.1.1) Terms of Significance of Impacts The Nuclear Regulatory Commission employed a "standard of significance" developed by the Council of Environmental Quality (CEQ). Context means that the significance of an action must be analyzed in several contexts, such as a society as a whole (human, national), the affected region, the affected interests, and the locality. However, no "electric utility" constructs, operates, or decommissions a nuclear station without economics being the paramount consideration. Yet, the NRC and CEQ have created a nuclear Potamkin [sic] Village where economic imperatives are subordinated to the behavioral science flavor-of-the-day. In the NRC's world, an "electric utility" can apply for a loan using NEPA as collateral. I hope that at the end of the GEIS process, the Commission, can provide me with an address so that I can relocate my family to a neighborhood-without-economic considerations. (**CL-02/44**)

Response: *The comment can not be evaluated because it does not provide specific information. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.5.6 Time Frame for Assessing Environmental Impacts

Comment: It is not acceptable to give the option of using recent environmental assessments. What is the definition of recent?...So I would like a definition of what is recent and if we're talking about endangered and threatened species, that list is going to change when a lot of these power plants actually go through decommissioning because species are being put on and taken off those lists all the time. So what is recent? I would request—our organization requests that they always have a recent—a new, like that year that they decide to decommission—an environmental assessment. (**AT-A/23**)

Comment: Georgians for Clean Energy requests that the NRC require licensees undergoing or planning decommissioning to submit a new environmental assessment. We do not find it acceptable to give licensees the option of using "recent environmental assessments." (**CL-08/6**)

Comment: Page xv, Lines 37-38. The document identifies certain issues that are "site-specific for activities occurring outside the disturbed areas in which there is no recent environmental assessment." "Recent" should be defined by, for example, specifying a time frame or "shelf life"

for environmental assessments, so that licensees have clear notice of when they must prepare or update such a document for the disturbed area(s) in question. This same problem arises in Table ES-1, which refers to “current” and “recent” ecological assessments. (**CL-16/11**)

Response: *The text was revised throughout the Supplement to provide clarification and the phrase “recent environmental assessments” is no longer applicable or used.*

Comment: The time frame for assessing the magnitude of the environmental impacts is not clearly discussed. In some instances (terrestrial ecology page 4-20, lines 39-41), the draft acknowledges that some impacts will be temporary but once decommissioning is completed, not significant. The discussion of other issues is silent with regards to when the impact is assessed. For example, dewatering for a relatively short period while sub-surface foundations are removed would be performed in accordance with a National Pollutant Discharge Elimination System (NPDES) permit (section 4.3.2). However the impact on the water table during this period of decommissioning would probably be noticeable. Once dewatering has ceased the water table would most likely return to its pre-decommissioning level. The licensee would reasonably conclude that dewatering during decommissioning is a SMALL (not noticeable, does not de-stabilize any important attribute of the resource) impact once decommissioning has been completed and is addressed in this GEIS Supplement. The NRC should revise the GEIS Supplement to clarify that the magnitude of the impact should be assessed once decommissioning activities have ceased and the license is terminated. (**CL-01/2**)

Response: *The commentor proposes that the NRC assess the magnitude of impacts only after the decommissioning activities have been concluded and the license terminated. NEPA requires a Federal agency to consider in advance every significant aspect of the environmental impact of the proposed action and to take a hard look at the environmental consequences. Such consideration should occur even if the impact is temporary and minor. Additionally, the Federal agency is to evaluate the potential for mitigation of the impact. The staff believes that the consequences of an activity needs to be evaluated at or close to the time that it occurs, thereby complying with the intent of NEPA to provide full disclosure and also to allow for mitigation. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.5.7 Reactors Included in the GEIS Analysis

Comment: You said you had visited a number of facilities. I wondered if you’d visited any in New England, in particular, the Maine Yankee facility? So, you talked with some of the folks up there (Maine Yankee facility) and got a sense of what was--what were the issues and so on? (**BO-A/4**)

Response: *Maine Yankee was one of the reactors visited during the scoping and data collection process. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In Table J-2, the location of Peach Bottom is incorrect. Peach Bottom resides in Delta, and is located less than a mile from Lancaster County and the State of Maryland.

In Table J-2, the location of Three Mile Island by county is incorrect. Three Mile Island resides in Londonderry Township, Dauphin County. "Northampton" County is located in Northeastern Pennsylvania. In addition, there are four counties located within five miles from Three Mile Island, i.e. Cumberland, Lancaster, Lebanon, and York. (**CL-02/67**)

Response: *Table J-2 was revised and Dauphin County is given as the county in which Three Mile Island is located.*

O.5.8 Application of NEPA Process to Decommissioning

Comment: I am opposed to the following change to NUREG-0586: In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning: NRC prevents the National Environmental Policy Act from applying to most of the decommissioning process. (The claim appears to be that this proposed Supplement 1 satisfied the Environmental Policy Act for most of the decommissioning issues.) (**CL-43/7**)

Comment: The National Environmental Policy Act was written for a purpose, your proposed rules side step that purpose. (**CL-25/9**)

Comment: I am opposed to the following proposal(s) in the EIS: NRC prevents the National Environmental Policy Act from applying to most of the decommissioning process. (**CL-26/10**)

Comment: I also utterly oppose preventing the National Environmental Policy Act from applying to most of the decommissioning process. (**CL-33/13**)

Comment: NRC prevents the National Environmental Policy Act from applying to most of the decommissioning process. (The claim appears to be that this proposed Supplement 1 satisfies the Environmental Policy Act for most of the decommissioning issues.) (**CL-48/42**)

Comment: But to the people in the affected communities, it is a problem and that problem is one that they're going to have to live with after the NRC has washed its hands of the site. So we do have some real problems with the fragmentation of the decision making process and the public participation opportunities, and believe that indeed that there are NEPA violations. (**AT-B/7**)

Response: *NRC does not exclude the decommissioning process from the environmental analysis expected under NEPA or the NRC's environmental protection regulations (10 CFR Part 51). The NEPA process allows for the development of programmatic and generic EISs where a "hard look" can be made for programs and issues that have common themes. Power reactor licensees cannot perform decommissioning activities that could result in a significant impact to the human environment that was not previously reviewed. Those activities are reviewed in the Final Environmental Statement (FES) or Final Environmental Impact Statement (FEIS) for construction and operation, Supplements to the FES or FEIS, the GEIS for license renewal, site-specific supplements for license renewal, and the GEIS for decommissioning. If any decommissioning activity might result in significant environmental impacts and that activity is not reviewed in one of these aforementioned documents, then the licensee must submit a request for a license amendment. A license amendment requires that the licensee must submit a Supplement to their environmental report and the staff conducts an environmental review on the request. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: It is important to address NEPA and "psychological stress." The reality is that "psychological stress" exists, and will continue to exist. In fact, if the NRC had revisited the issue of "psychological stress" and the TMI community, it would have found the following:...The D.C. Circuit Court decided psychological (psych) stress does not need to be covered during the restart hearings. However, the Court ruled, that under the National Environmental Policy Act (NEPA), psych stress must be addressed. The Court ordered an injunction on restart until a study on psych stress was conducted. However, on April 19, 1983, The U.S. Supreme Court reversed the D.C. Circuit Court's opinion on psych stress and ruled an environmental study is not necessary. Two months later, on May 5, 1983, GPU revealed for the first time to the NRC that management audits, including psychological evaluations, concluded by BETA and RHR, completed in February and March, 1983, were critical of plant operations and management. The NRC can hide behind NEPA or any other convenient acronym, but "psychological stress" is a verifiable fact of life for people who live and work, in and around, nuclear power plants. (**CL-02/43**)

Response: *No activity has been initiated to vacate the U.S. Supreme Court decision on this matter. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Appellate Court justices opined that your agency was in violation of its own regulations and Rulemaking process in approving the experimental decommissioning at the Rowe reactor without a decommissioning plan and an environmental assessment. In addition, the court has ruled that decommissioning is a major federal action and requires NEPA compliance. "An agency can not skirt NEPA or other statutory commands by exempting a licensee from compulsory compliance, and then simply labeling its decision "mere oversight"

rather than a major federal action. To do so is manifestly arbitrary and capricious." We believe NEPA compliance is mandatory for decommissioning. A Generic Environmental Impact Statement can not substitute for an individual EIS, as computer modeling can not substitute for actual testing. (**CL-50/3**)

Response: *As stated in Chapter 1 of the Supplement, one reason the 1988 GEIS was updated was to further the purposes of NEPA. The Appellate court did not rule that decommissioning was a major Federal action. Rather, the court ruled that the NRC had not followed its own regulations in allowing the licensee of Yankee Rowe to remove major components prior to the completion of the review of the Decommissioning Plan. The NRC revisited this issue as part of a rulemaking involving the public, and has determined that decommissioning is not a major Federal action. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.5.9 Opposition to Use of Generic Impacts

Comment: Existing nuclear power plants are not generically designed and, therefore, a generic program for decommissioning is completely inadequate to protect public health and safety. New and site-specific Environmental Impact Statements must be required to address how different power plants should be decommissioned (from the standpoint of historical operations, age-related degradation, salt water intrusion) in the safest manner possible for each location. In the case of Diablo Canyon, new seismic information should be sought to assure the public that the process would not increase the dangers of an already dangerously sited nuclear plant. (**CL-53/3**)

Response: *NRC staff recognizes that there is wide variability among nuclear power plants. However, based on the results of our analysis, the impacts resulting from decommissioning are similar regardless of plant characteristics. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Generic things sound good, but each plant is different. I was originally thinking well, they are all kind of the same system, so it wouldn't matter, they are on the same principle, but they're not. I mean, there are differences. (**AT-D/3**)

Response: *The generic approach is used (1) when impacts of environmental issues apply to all plants or a specific characteristic of that plant, (2) when a single significance level has been assigned to the impacts, and (3) when mitigation of adverse impacts associated with the issue have been considered in the analysis, and it has been determined that additional site-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation. If an*

environmental issue does not meet all three requirements, additional site-specific review is required. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Georgians for Clean Energy does not believe that a Generic Environmental Impact Statement regarding decommissioning of nuclear facilities is a sufficient tool for evaluating impacts borne to specific environments from decommissioning a nuclear power plant. (**AT-A/17**)

Comment: Again, we feel that a site-specific analysis must be done for each individual nuclear plant. This includes the area of the site itself, along with downstream and downwind regions and all areas within the ingestion radius of the facility. (**AT-A/32**)

Comment: Georgians for Clean Energy does not believe that a generic environmental impact statement (EIS) regarding decommissioning of nuclear facilities is a sufficient tool for evaluating impacts borne to specific environments from decommissioning a nuclear power plant. (**CL-08/4**)

Comment: I do not support any attempt of your agency to narrow the scope of site-specific issues by declaring them to be generic. (**CL-27/1**)

Comment: Some of my concerns about NUREG-0586 include:—the use of generic proceedings to eliminate site-specific evaluation of concerns; (**CL-38/2**)

Comment: Issues common to the process of decommissioning nuclear reactors should be raised with every reactor being decommissioned, not excluded from every specific reactor being decommissioned. These common issues have not been resolved. (**CL-28/1**)

Response: *The NRC has an obligation to implement effective regulatory practices that involve public participation. In this Supplement, the NRC established an envelope of environmental impacts resulting from decommissioning activities, identified those activities that can be bounded by a generic evaluation, and identified those that require a site-specific analysis. The NRC concentrated the environmental analysis on those activities with the greatest likelihood of having an environmental impact. Even for those impacts that have been determined to be generic, a licensee is required to perform an assessment of environmental impacts from each decommissioning activity to determine whether the impacts fall within the generic envelope described in the Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: We disagree with the NRC conclusion that most of the environmental issues they addressed are deemed as quote, generic and small for all plants, regardless of the activities and identified variables, end quote. (**AT-A/19**)

Response: *The commenter did not provide a specific example or basis to demonstrate that the conclusions were not characterized correctly. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: And again, we feel that site-specific studies should be conducted. The economy of rural Georgia is much different from that of urban New York. (**AT-A/41**)

Comment: Therefore, the safest alternative would be, first, to consider each reactor site individually rather than making a blanket policy to cover every site. (**CL-10/6**)

Comment: We again stress system need for site-specific EIS studies on decommissioning for nuclear power reactors. Our communities, from the people to the waterways, are unique and entitled to nothing less. (**AT-A/45**)

Comment: Georgians for Clean Energy firmly believes that a site-specific analysis must be done for each individual nuclear plant. This includes the area of the site itself along with downstream and downwind regions and all areas within the ingestion radius of the facility. As we mentioned at the public meeting in Atlanta, there are already elevated levels of some radioactive contaminants nearly 100 miles downstream of Georgia's Plant Hatch and Plant Vogtle. (**CL-08/17**)

Comment: We again stress the need for site-specific Environmental Impact Statements on decommissioning for nuclear power reactors. Our communities—from the people to the waterways—are unique and are entitled to nothing less. (**CL-08/35**)

Comment: Furthermore, a "generic" EIS cannot provide adequate assurance that the unique situation and condition of each nuclear facility have been fully analyzed and accounted for. Each plant is unique; each plant's impacts must be examined in relationship with all other nuclear facilities that affect the condition of the environment. In the real world environment, radioactive and hazardous materials are not necessarily static; they move; they interact with other materials; they accumulate; they may have their adverse impacts at or near their site of origin or far away from it. The totality of those impacts, upon both human and non-human inhabitants of the biosphere must be incorporated into an environmental analysis and accounted for fully also for adversely affected individuals in any cost-benefit analysis. All issues should be examined at each plant. (**CL-52/8**)

Response: *Site-specific analysis is required for those situations where an environmental review has not been conducted or where the impacts may be different from those previously analyzed. NRC staff recognizes that there is wide variability among nuclear power plants. However, based on the results of the analyses presented in the Supplement, many of the impacts resulting from decommissioning are similar regardless of plant characteristics. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: I oppose the use of "Generic" listing of issues. I support "Site Specific" listing so that local communities can still raise issues they have. (**CL-24/2**)

Comment: Many key issues that local communities face as reactors close and owners leave (liability-free) will be unchallengeable, because they are being listed as "generic" issues. (**CL-25/5**)

Comment: It is my understanding that the purpose, and certainly the effect, of the proposed supplement to NUREG-0586 is to reclassify many decommissioning issues as "generic" in order to avoid a community's right of challenge and to allow owners to depart without liability. I understand that the NRC supplement seriously limits a community's ability to challenge even those issues that are considered "site-specific." (**CL-36/3**)

Comment: If the changes pass, many key issues that local communities face as reactors close and owners leave (liability-free) will be unchallengeable, because they are being listed as "generic" issues. "Generic" decommissioning issues are ones that NRC determines apply to numerous reactors and which are supposedly being resolved with this Supplement to the Generic Environmental Impact Statement. "Site specific" issues are ones than can still be raised in local communities, but the opportunities to address even site-specific issues is being curtailed dramatically. I support the designation of environmental justice and endangered species issues as site-specific (not generic). I oppose Rubblization but support its designation as site-specific. (**CL-43/15**)

Comment: I am opposed to NRC regulations pertaining to Decommissioning which would allow NRC to make most aspects of decommissioning "generic" rather than site-specific so NRC cannot be legally reviewed or challenged at individual sites. (**CL-44/8**)

Comment: In establishing 80% (24 of 30) of the environmental impacts of decommissioning as being "generic" the NRC is doing the industry's bidding to restrict or eliminate the affected public's opportunities to comment on, guide, monitor and review the decommissioning of nuclear power reactors in their communities. (**CL-47/10**)

Comment: Regardless of any uniformity that may or may not exist as issues to consider at decommissioning reactors - and our position is that any concerns of the relevant communities are site-specific - the NRC's move to make most considerations within the decommissioning process "generic" is a thinly veiled project to eliminate public review and full disclosure through public hearings. (**CL-47/11**)

Comment: NRC cleverly makes most aspects of decommissioning "generic" rather than site-specific, so they cannot be legally reviewed or challenged at individual sites. (**CL-48/43**)

Comment: These events do not warrant nor should they instill public confidence in staff conclusions that the agency and the industry can reasonably make the leap to the generic treatment of environmental impact statements for decommissioning nuclear facilities and effectively take away a community's review and the full disclosure of the extent and location of radioactive contamination both on and off site. (**CL-48/6**)

Comment: We have a fundamental dispute with the NRC effort to eliminate public review and full disclosure through public hearings on decommissioning practices and mitigating environmental impacts based on arbitrary and capricious categories for determining "generic" and "site-specific" proceedings for nuclear power station decommissioning. (**CL-48/25**)

Comment: I think my concern is always to what extent a generic statement like this takes particular issues that are local out of the local decision-making process, out of the public hearing that has to be had for—or we were originally led to believe has to be had for each of these. (**AT-C/1**)

Response: *The NRC established an envelope of environmental impacts resulting from decommissioning activities, identified those activities that can be bounded by a generic evaluation, and identified those that require a site-specific analysis. The NRC concentrated the environmental analysis on those activities with the greatest likelihood of having an environmental impact. Even for those impacts that have been determined to be generic, a licensee is required to perform an assessment of environmental impacts from each decommissioning activity to determine whether the impacts fall within the generic envelope. The description of impacts as site-specific or generic does not preclude local communities from participating. The commenters are referred to the Executive Summary for a description of "generic" and "site-specific."*

The public can raise issues using any of several methods. If the licensee has requested an action requiring a license amendment, then the process for intervening in this action is by requesting or participating in a hearing. The process is set forth in NRC's regulations in 10 CFR Part 2, "Rules of Practice of Domestic Licensing Proceedings and Issuance of Orders." If the action of concern does not involve a license amendment, then any member of the public may

raise potential health and safety issues in a petition to the NRC to take specific enforcement action against a licensed facility. This provision is contained in the NRC's regulations and is often referred to as a "2.206 petition" in reference to its location in the regulations (Chapter 2, Section 206 or 10 CFR). The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.

Comment: The above reasons illustrate the lack of a sound basis for staff conclusions that the decommissioning alternatives of entombment and rubblization are a"minor" environment impact and can be treated generically to avoid public review and full disclosure in formal public hearings. We therefore adamantly oppose such generic treatment. **(CL-48/35)**

Response: *Entombment is the focus of a current NRC rulemaking that would provide further guidance on this method of decommissioning a nuclear power facility. If a licensee pursues the ENTOMBMENT option, there will be activities necessary to ready the facility for the entombment. The impacts from the activities to prepare the facility for Entombment are considered generic. A site-specific assessment required by a proposed restricted release would naturally focus on radiological issues.*

Rubblization is not considered an option for decommissioning, but a potential activity of decommissioning. The Supplement states that the radiological aspects of rubbilization on onsite disposal of slightly contaminated material would be addressed in a site-specific manner at the time that the LTP is submitted. The site-specific LTP will provide a mechanism for the NRC staff's evaluation of the licensee's plans to dispose of rubblized concrete on site. The radioactive material that remains at the site after the license has been terminated must meet the dose criteria for license termination given in 10 CFR Part 20.

The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement

O.6 General

O.6.1 Clarifications and Recommendations Related Specifically to Supplement 1

Comment: Second, we would like to see a place in the document where you're comparing the risks, environmental risks associated with dismantling the facility immediately, versus storing the material and keep putting the facility in safe store. It's referenced in the document that there are higher risks, sometimes, of dismantling immediately because the material is more radioactive. But it doesn't show a comparison of the risks associated with storing it versus dismantling it in the short-term. (**CH-A/13**)

Response: *The Supplement provides general advantages and disadvantages for the various options for decommissioning. Both long-term storage followed by decontamination and dismantlement and immediate decontamination and dismantlement were found to be acceptable approaches to decommissioning. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: There are some aspects of the regulations that are specific to light water reactors and I just think the document needs to reflect those rather than all reactors. (**CH-D/5**)

Response: *Section 4.3.11.1, "Regulations," has been revised to reflect that the minimum amounts required to demonstrate reasonable assurance of funds for decommissioning found in 10 CFR 50.75(c) apply only to light water reactors.*

Comment: Activities that require state or local permits or approval should be considered to have a SMALL impact under the GEIS. Licensees will be required to obtain approval from state and/or local agencies for several activities performed as a part of decommissioning and cite restoration. These activities may include routine discharge or non-radiological liquids, dewatering, removal or modification of circulating water conduits, and use of portable combustion engines. Typically, the regulations governing approval for these activities require that the regulatory agency perform an assessment of the environmental impact(s) and, as appropriate, establish mitigating measures as permit conditions. In the case of water quality issues, the NRC relies on the licensee's compliance with the NPDES permit to conclude that the magnitude of the impact(s) is SMALL. The NRC should revise the GEIS Supplement to clarify that the NRC will consider the impact of an activity to be SMALL and rely on the licensee's compliance with a state or local permit, including any mitigating conditions. (**CL-01/3**)

Response: *The determination of level of significance is specific to the evaluation of environmental impacts from decommissioning, regardless of State permits and approvals. The staff does not agree that just because the licensee has a State or local permit that impact of the activity will always be SMALL. NEPA requires an evaluation based on postulated impacts. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The potential impacts of removing circulating water conduits on water quality or aquatic ecology are not consistently discussed or are considered an exception from the staff's conclusions. The Executive Summary states that the "removal of uncontaminated SSCs (such as the intake structure or cooling towers) that were required for the operation of the reactor are included in the scope of the GEIS. However, chapter 4 does not discuss the potential impacts of removing circulating water conduits on water quality (section 4.3.3) and the staff considers

removal of these structures to be an exception to the generic evaluation for aquatic ecology (section 4.3.5). Similarly, the tables in Appendix H do not address this issue. Realistically, the licensee will have to comply with state and/or local regulations to remove the circulating water conduits or cooling towers. The state and/or local agency would perform an environmental assessment and, as appropriate, establish conditions in the permit to mitigate any environmental impact(s). As in the case of water quality issues, the NRC relies on the licensee's compliance with the NPDES permit to conclude that the magnitude of the impact(s) is SMALL. The NRC should revise the GEIS Supplement to clarify that the NRC will rely on the environmental assessment performed for and any mitigating conditions included as part of the state or local permit for removal of circulating water conduits. (**CL-01/5**)

Response: *The consistency of the discussion and the tables in Section 4.3, "Environmental Impacts from Nuclear Power Facility Decommissioning," of this Supplement have been addressed. The staff recognizes that removal of circulation water conduits or cooling towers will be conducted in accordance with State and local requirements. However, the NRC staff cannot reach a conclusion on the level of impact based solely on the presumed compliance with these requirements. Circulating water conduits and other SSCs that will be removed after operation, however, are not expected to detectably change or destabilize the aquatic environment. The staff conclude that the impact to the aquatic environment for these decommissioning activities is SMALL and no further mitigation would be required. The staff conclusion is based on the short duration of most deconstruction activities, the fact that the impact is to a previously disturbed ecosystem, and the potential use of mitigative actions, such as scheduling in-water activities during periods in which impacts to aquatic resources would be minimal, as well as provided oversight from State and local agencies. The staff's conclusions in this Supplement do not provide relief or exception from other laws and regulations related to any of the activities discussed in the Supplement. The staff relies on the licensee's compliance with other agency regulations, such as the NPDES, as an indicator of potentially causing detectable or destabilizing changes in the aquatic environment. Section 4.3, "Environmental Impacts from Nuclear Power Facility Decommissioning," was revised to be consistent with the above response.*

Comment: The GEIS's glossary superficially glosses over "Greenfield" and equates it with an end state of decommissioning ..."According to NRC Regulations, Greenfield is achieved when a nuclear generating station is returned to "original status" prior to licensing, construction, and generation of nuclear power. The NRC would then clear the site for ''free release" and allow a "school or playground" to be constructed at the former nuclear power plant. (**CL-02/40**)

Response: *The definition of Greenfield in Appendix M, "Glossary," was revised to describe Greenfield as one possible end state of decommissioning and that NRC regulations do not require a greenfield end state.*

Comment: Appendix F Summary Table of Permanently Shutdown and Currently Operating Commercial Nuclear Reactors, PG. F-1, Table F-1 Permanently Shutdown Commercial Nuclear Plants {Total Site Area (ac.) For Maine Yankee: 741 (should be 820)}. (**CL-04/11**)

Response: *The revised area was included in Table F-1.*

Comment: 3.3.3 Decommissioning Process pg. 3-29, 2nd full para. This paragraph is redundant to the preceding and seceding paragraphs and can be deleted in its entirety. (**CL-04/17**)

Response: *Section 3.3.3, "Summary of Plants that Have Permanently Ceased Operations," was revised to remove redundancy.*

Comment: Appendix A Draft Generic Environmental Impact Statement Scoping Summary Report: Comments in Scope pg. A-2, Written Comment Letters: George A. Zinke is listed as the "Director, Nuclear Safety & Regulatory Affairs, U.S. Environmental Protection Agency." This reference should be revised to indicate; "Director, Nuclear Safety & Regulatory Affairs, Maine Yankee Atomic Power Co." (**CL-04/19**)

Response: *Appendix A was renamed Appendix N and Mr. Zinke's correct title included.*

Comment: Section 3.1.3, p 3-8 - add "The systems described are typical and may differ at specific facilities." to end of the 1st paragraph. (**CL-05/4**)

Response: *Section 3.1.3, "Description of Systems," was revised and the above phrase added to the end of the first paragraph.*

Comment: Section 3.1.3, p 3-10, 1st paragraph - add "or similar document" following "(ODCM)", since limits may be in Technical Specifications rather than an ODCM. Also, the description of effluent systems should include mention of an evaporator, since some facilities use evaporation to convert liquid waste to gaseous and monitor their discharge. (**CL-05/5**)

Response: *Section 3.1.3, "Description of Systems," was revised and the above phrase was added.*

Comment: Section 3.1.4, p 3-13, last paragraph - shipment of contaminated apparatus or hardware may also occur to support specific activities. (**CL-05/6**)

Comment: Section 3.1.3, p 3-13, last paragraph – Shipment of contaminated apparatus or hardware may also occur to support specific activities. (**CL-09/11**)

Response: *Typically, contaminated apparatus or hardware are considered routinely generated low-level waste (LLW) even if they were operated to support specific decommissioning activities. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Section 3.1.3, p 3-14, 1st paragraph - shipment may also occur on barges or other ships. (**CL-05/7**)

Response: *Section 3.1.3, "Description of Systems," was revised to include barges and other ships.*

Comment: Section 3.2, p 3-16 - the definition of SAFSTOR should more clearly define that it includes the final decontamination of the facility. This would be more consistent with definitions used elsewhere. (**CL-05/9**)

Comment: Section 3.2, p 3-16, lines 18-24 – The definition of SAFSTOR should more clearly define that it includes the final decontamination of the facility. This would be more consistent with definitions used elsewhere, such as in the original GEIS. (**CL-09/13**)

Response: *Section 3.2, "Decommissioning Options," was revised to clearly state that final decontamination of the facility is part SAFSTOR.*

Comment: Section 4.3.4.4, page 4-16, 1st paragraph - add the following sentence to the end of the paragraph: "Particulates produced by decommissioning activities within buildings will be filtered as needed so that air quality impacts will be small." (**CL-05/12**)

Response: *The staff has chosen not to include the comment in section 4.3.4.4, "Conclusions". Section 4.3.4.3, "Evaluation," does however address filtration systems to control the release of particulate material to the environment. The comment did not provide new information relevant to this supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 4.3.7, p 4-25, last paragraph - This conclusion indicates that the NRC will meet its responsibilities on a site-specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees. (**CL-05/16**)

Response: *The responsibilities under the Endangered Species Act (ESA) will be met through appropriate interactions among the licensee, the NRC, and the jurisdictional regulatory agency, either the U.S. Fish and Wildlife Service (FWS) or the U.S. National Marine Fisheries Service (NMFS), or both. Information required of the licensee will depend on the planned*

decommissioning activities and the species potentially present. The NRC staff will seek informal consultation with NMFS and the FWS shortly after the licensee announces permanent cessation of operation. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Section 4.3.14, pg. 4-61, last paragraph - This conclusion indicates that the NRC will meet its responsibilities on a site-specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees. (**CL-05/18**)

Response: *Section 4.3.14, "Cultural, Historical and Archeological Resources," was revised and identifies what activities can be generically evaluated and which require a site specific review. See section 4.3.14.1 for a discussion of the requirements and section 106 of the National Historic Preservation Act .*

Comment: Abstract, p iii, lines 16-17 – add "explicitly" before "consider" in the 5th sentence. The original GEIS did not explicitly cover reactors except boiling water reactors (BWRs) and pressurized water reactors (PWRs). However, other reactors were not explicitly listed in what was not covered by the GEIS. Also, other reactors were listed in the table of decommissioning reactors in the original GEIS. They have been considered covered for activities described in the GEIS. (**CL-09/2**)

Response: *The Abstract was revised and the above change made.*

Comment: Executive Summary, p xi, 3rd paragraph, 4th sentence, lines 31-32 – change to "It does not include research and test reactors or the decommissioning of reactors that were permanently shutdown as a result of an accident." This change provides consistency with the report and does not imply exclusion of all reactors that have been involved in an accident at some time during their operating history. (**CL-09/3**)

Response: *The Executive Summary was revised incorporating the phrase "it does not include research and test reactors."*

Comment: Section 3.1, p 3-2, line 21 – the LaCrosse Boiling Water Reactor site is smaller than San Onofre. McGuire Nuclear Station has two operating reactors rather than three. (**CL-09/4**)

Response: *The Lacrosse reactor is on approximately 1.2 ha (3 ac) with the total utility owned site of 66 ha (163 ac). The total site area for San Onofre is 34 ha (84 ac). The staff chose the total site area to contrast the various decommissioning facilities. The comment on the McGuire plant was correct and the staff chose to use the Turkey Point plant instead.*

Comment: Section 3.1.1, p 3-2, line 39 and 3-3, line 1 – Fermi 1 is in the final phase (decontamination and dismantling) of SAFSTOR. (**CL-09/5**)

Response: *Section 3.1.1, "Types of Nuclear Power Reactor Facilities," was revised and the above phrase incorporated in the text.*

Comment: Section 3.1.1.3, p 3-4, lines 10-14 – delete 2nd sentence and modify 3rd sentence. The Fermi 1 FBR used uranium as its fuel. The information on uranium capturing neutrons to produce plutonium is correct. Breeding rates are dependent on the FBR's specific design. (**CL-09/6**)

Response: *Section 3.1.1.3, "Fast Breeder Reactors," was revised and the above changes incorporated in the text.*

Comment: Section 3.1.1.3, p 3-5, line 1– add "commercial" before "FBR." The final decision on whether to permanently shutdown the FFTF, a DOE FBR, has not yet been announced. (**CL-09/7**)

Response: *Section 3.1.1.3, "Fast Breeder Reactors," was revised and the word "commercial" inserted before "FBR". On December 19, 2001 DOE announced the deactivation of the FFTF.*

Comment: Section 3.1.2, p 3-6, lines 18-19 – The Fermi 1 Reactor Building is a steel domed structure. Below ground, there is considerable concrete shielding, but the building is not reinforced concrete. (**CL-09/8**)

Response: *Section 3.1.2, "Types of Structures Located at a Nuclear Power Facility," was revised and the above changes incorporated in the text.*

Comment: Section 3.1.3, p 3-8, line 32 – Add "The systems described are typical and may differ at specific facilities." to end of the 1st paragraph. (**CL-09/9**)

Response: *Section 3.1.3, "Description of Systems," was revised and the above sentence added to the text.*

Comment: Section 3.1.3, p 3-10, line 7 – Add "or similar document" following "(ODCM)", since limits may be in Technical Specifications rather than an ODCM. Also, the description of effluent systems should include mention of an evaporator, since some facilities use evaporation to convert liquid waste to gaseous and monitor their discharge. (**CL-09/10**)

Response: *Section 3.1.3, "Description of Systems," was revised and "or similar document" added to the text after "ODCM".*

Comment: Section 3.1.3, p 3-14, lines 5-6 – Shipment may also occur on barges or other ships. (**CL-09/12**)

Response: *Section 3.1.3, "Description of Systems," was revised and the reference to barges or ships was included in the text.*

Comment: Table 3-2, p 3-27 – Add footnote "c" to Fermi 1. Detroit Edison informed the NRC in late 2001 per the requirements of 10 CFR 50.82, that the final decontamination and dismantling phase of SAFSTOR would be started for Fermi 1. (**CL-09/14**)

Response: *Table 3-2 was revised and footnote "c" added.*

Comment: Section 3.3.3, p 3-29 – Sentences are duplicated between the three full paragraphs on p 3-29. (**CL-09/15**)

Response: *Section 3.3.3, "Summary of Plants that Have Permanently Ceased Operations," was revised to remove redundant text.*

Comment: Section 4.3.3.3, p 4-12, line 16 – There appears to be a discontinuity between the previous paragraph and the paragraph starting on line 16. Is something missing? (**CL-09/16**)

Response: *Section 4.3.3.3, "Results of Evaluation," was revised to include the missing information.*

Comment: Section 4.3.3.3, p 4-12, lines 28-30 – Add "The processing of residual sodium products from an FBR is no more likely to result in water quality impact than decommissioning activities at a LWR." (**CL-09/18**)

Response: *The suggested wording does not add anything to or change the staff's conclusion. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 4.3.10.2, p 4-40, lines 12-14 – in the paragraph on FBR decommissioning activities, add that decommissioning a FBR involves removal of sodium and NaK, but that these decommissioning activities can be performed safely with the proper engineering controls. (**CL-09/27**)

Response: *The suggested wording does not add anything to or change the staff's conclusion. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Section 4.3.11.1, p 4-41, line 7 – add "LWR" before "licensee" in the third sentence. The formula for the specified minimum amount of decommissioning funds applies to LWR's. The other regulations on decommissioning funds and evaluation of adequacy do apply to all reactors, so there is no adverse impact of the formula applying only to LWR's. (**CL-09/28**)

Response: *Section 4.3.11.1, "Regulations," was revised and "LWR" was added before "licensee".*

Comment: Section 4.3.11.3, p 4-45, lines 4-5 – delete or reword "and is either undergoing decommissioning or is in safe storage awaiting decommissioning" from the second sentence. SAFSTOR or safe storage is a form of decommissioning. (**CL-09/29**)

Response: *Section 4.3.11.3, "Evaluation," was reworded eliminating the misperception that safe storage is not decommissioning*.

Comment: Tables 4-6 and 4-7, p 4-71 – footnote "d" is not used in the tables, but probably belongs next to the 960 value for the number of shipments from a PWR using SAFSTOR. (**CL-09/30**)

Response: *Tables 4-6 and 4-7 were extensively revised and footnote "d" referring to truck and rail shipments is no longer used.*

Comment: Section 4.3.18.2, p 4-72, lines 38-41 – other irretrievable resources include gases and tools, but these resources are also minor. (**CL-09/31**)

Response: *Section 4.3.18.3, "Evaluation," was revised and "gases" and "tools" were added to the text*.

Comment: Section 6.1, p 6-1 – for plants shutdown before existing decommissioning rules were adopted, the environmental reviews may not be in the PSDAR as discussed in this section. In such cases environmental aspects not previously addressed that need to be addressed will be covered in the LTP. (**CL-09/32**)

Response: *For plants that permanently ceased operation before the 1996 rule, the Decommissioning Plan and the Environmental Report become the PSDAR. Decommissioning activities at all permanently shutdown facilities are substantially underway. The major impacts, if any, that may not have been covered by the Decommissioning Plan and the environmental report (such as impacts to minority and low-income populations surrounding the facility) have already occurred. In addition, the staff has been sensitive to protected species at existing decommissioning sites with several informal consultations occurring over the past several years. The comment did not provide new information relevant to this Supplement and will not be* evaluated further. The comment did not result in a change to the Supplement.

Comment: Table F-1The site area for Fermi 1 is listed as 1,120 acres. That is the size of the Fermi 2 site; Fermi 1# is on a portion of that site. The original Fermi 1 site was 900 acres. Currently, the portion of the site considered to be the Fermi 1 nuclear facility on the Fermi 2 site is less than 4 acres. (**CL-09/34**)

Response: *The revised area values were incorporated in Table F-1.*

Comment: Fermi 1's cooling water source was Lake Erie. Saxton's area is listed as 1.1 acres, however, the text reported San Onofre as having the smallest site. Also, footnote "b" should be applied to the "Cooling System" header, rather than "Cooling Water Source." (**CL-09/35**)

Response: *Table F-1 was corrected to include Lake Erie as the Fermi 1's cooling water source. The staff chose to list the area of the original licensed site for Saxton. Footnote "b" was changed to "cooling system".*

Comment: Table F-2, p F-4 – Fermi is in Michigan, not Ohio. (**CL-09/36**)

Response: *Ohio was changed to Michigan for Fermi in Table F-2.*

Comment: Section G.2.1, p G-13 & G-19 – the conclusion reached that the doses for SAFSTOR and DECON are not substantially different is partly due to which decommissioning plants were selected to be evaluated. (**CL-09/43**)

Response: *In some cases, data for different categories of facilities were limited, and the data presented represents the best information currently available. All data received from decommissioning facilities was included in the estimates. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Tables E-3, E-5, H-1 and H-2 – some additional activities, for example, system dismantlement and large component removal, could potentially impact air quality. Provisions are needed for portions of these activities to prevent adverse impacts. (**CL-09/49**)

Response: *Typically, such activities are conducted inside enclosed structures with monitored release points and are considered under the category "Maintain Effluent and Environmental Monitoring Program." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Table H-2, p H-17 – in the "Impact and Summary of Findings" section, "water use" should be changed to "air quality." (**CL-09/50**)

Response: *"Water use" was changed to "air quality" in Table H-2.*

Comment: Section J.1.1, p J-1 – add, "selected" before "facilities" in the first sentence of the first paragraph. Identify the time period used for the comparison in the second paragraph. (**CL-09/56**)

Response: *The recommended revision has been made in part. The word "selected" has been added in the text. The time period considered in the analysis is from the shutdown of the plant. Section J.1.1 was revised.*

Comment: Table J-1 – add footnote "c" to Fermi 1. (**CL-09/57**)

Response: *Footnote "c" was added under Fermi 1 in Table J-1.*

Comment: Section 4.3.9.1, page 4-33, refers to the licensee's FSAR. Suggest adding the words "or equivalent" after "FSAR" since some licensees have a defueled safety analysis report (DSAR) instead of a FSAR. (**CL-15/2**)

Response: *The phrase "or equivalent" was added after "FSAR" in Section 4.3.9.1, "Regulations".*

Comment: Section 4.3.12.1, page 4-47, second line – Add a period after the word "effects" and begin the next sentence with the word "Socioeconomic." (**CL-15/3**)

Response: *The text was revised in Section 4.3.12.1, "Regulations," consistent with the above comment.*

Comment: The following Conclusions sections discuss environmental impacts that may have

small, moderate or large impacts: 4.3.1.4 (Onsite/Offsite Land Use), 4.3.5.4 (Aquatic Ecology), 4.3.6.4 (Terrestrial Ecology), 4.3.9.4 (Radiological Accidents), 4.3.10.3 (Occupational Issues), 4.3.12.4 (Socioeconomics). The FGEIS is not clear what, if any, actions a licensee should take depending on if the impacts are small, moderate or large. (**CL-15/4**)

Response: *The Supplement was revised to explain those issues that are considered generic and have more than one level of significance. Section 4.3 was changed for clarification.*

Comment: It is not always clear when a particular decommissioning activity or site/operating condition falls within the envelope of environmental impacts described in Section 4.0 and when that activity or condition would require further analysis. (**CL-16/2**)

Response: *Chapter 4 was extensively revised to more clearly define the envelope of generic impacts. However, the comment is too general to provide a specific answer. The comment did not provide new information relevant to this supplement and will not be evaluated further. The comment did not result in a specific change to the Supplement.*

Comment: The Supplement should address how the environmental analysis of decommissioning activities takes into account changes in the environmental parameters of the site during plant operation. (**CL-16/4**)

Response: *The Supplement has taken into account the changes in the site environment during the plant's operation. A generic environmental impact statement is a method of evaluating the impacts of similar activities at similar facilities resulting in similar impacts. Changes in the site environment during the plant operational period are not so significant as to cause the impacts of similar activities at similar facilities to be significantly different. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The Supplement should provide more specific guidance to licensees regarding the level of a particular decommissioning activity, or the site conditions in which an activity is occurring, which would trigger a site-specific NEPA analysis of the activity by the licensee. For example, with regard to levels of activity that would require a site-specific analysis, the Supplement should more specifically define what constitutes a major transportation upgrade. With regard to site conditions, it should define how much time may pass after the previous disturbance of an aquatic or terrestrial ecosystem before a site-specific analysis is necessary, or how recent the ecological assessment of that ecosystem must be to rely on the Supplement instead of a site-specific analysis. This will facilitate both licensees' evaluation of environmental impacts in required submissions such as the Post Shutdown Decommissioning Activities Report (PSDAR) and the License Termination Plan (LTP), and NRC's development of site-specific NEPA documents. (**CL-16/6**)

Response: *Chapter 4 was extensively revised to more clearly define when a site specific analysis is required.*

Comment: Response to Comment No. 6-C, page A-13, indicates that impacts from potentially contaminated sediment are addressed in the Supplement, but we did not find this information. (**CL-16/8**)

Response: *The staff response in the scoping summary report (see comment 6-C, page A-13) referred to evaluation of the impacts of potentially contaminated sediment within the site boundary. Onsite contaminated sediments are normally addressed in detail during the license termination plan review and is not addressed in any detail in this Supplement. The NRC staff does not normally require remediation of offsite sediments unless they pose a threat to public health and safety. The plants were licensed with the expectation that there would be routine releases to the air and water due to normal operation. These releases are limited to ensure the public health and safety. Offsite contamination is monitored and remediation is not warranted. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 2-5, Section 2.2, Line 10. This section should note that state or local requirements may be more restrictive than NRC's. (**CL-16/16**)

Response: *The text in Section 2.2, "Summary of Current Regulations," was revised to recognize that state or local requirements may be more restrictive than NRC's requirements .*

Comment: Page 3-17, Section 3.2.1, Lines 32-33. Please revise the document to clarify that while the evaluation of ISFSIs is outside the scope of the GEIS, it should be noted that the DECON alternative does not necessarily completely eliminate the need for long-term security and surveillance of a facility; an ISFSI at a decommissioned facility will require long-term security and surveillance. (**CL-16/21**)

Response: *It is stated (Table 1-1) that ISFSI maintenance is an activity that may be separately licensed under 10 CFR Part 72 and is out of scope. It is further discussed in Section 1.3, "Scope of This Supplement." The statement in Section 3.2.1, "DECON," is correct. The facility being referred to is the reactor facility and not the ISFSI, which is considered as a separate facility. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 3-29. Lines 29-39 repeat lines 11-21. (**CL-16/22**)

Response: *The redundancy in the lines has been eliminated.*

Comment: Page 4-57, Section 4.3.13.4, Lines 36-38. The environmental sections of some PSDARs submitted to date have not provided detailed information. The Supplement should elaborate on the "appropriate information" that licensees should provide relating to environmental justice in the environmental section of their PSDARs to enable NRC to obtain sufficient information on potential environmental justice issues at decommissioning facilities. (**CL-16/68**)

Response: *The requirements for submitting the PSDAR can be found in 10 CFR 50.82(a)(4)(I). Guidance on what should be in the PSDAR can be found in Regulatory Guide 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report," dated August 2000. The staff plans to update Regulatory Guide 1.185 subsequent to publishing Supplement 1 to NUREG-0586, with guidance on including environmental justice considerations in the PSDAR. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 4-69, Section 4.3.17.2, Line 5. What is meant by "not large enough to destabilize the important attributes of the system?" (**CL-16/71**)

Response: *In terms of transportation impacts, MODERATE impacts are those that would result in noticeable changes such as increased traffic or increased road maintenance requirements, but would not result in the need for major transportation system modifications, cause substantial changes in local traffic flow, or cause a significant increase in traffic fatalities or public radiological dose. Section 4.3.17.2 was consistent with the above explanation.*

Comment: Pages 4-72 to 4-73, Section 4.3.18. The discussion of irretrievable resources more properly belongs in a section that summarizes environmental consequences. The Supplement could benefit from having such a section as was done with the recently issued draft NMSS guidance document on NRC preparation of NEPA documents. (**CL-16/72**)

Response: *This section summarizes irreversible environmental consequences for impacted areas. The reader is referred to Table ES-1 for a summary of the environmental impacts of decommissioning. NRC has not determined that combining the discussion of irretrievable resources with a summary of environmental consequences would substantially improve the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Page 4-72, Section 4.3.18, Line 9. It seems inappropriate to include concrete as an irretrievable resource. (**CL-16/73**)

Response: *Section 4.3.18, "Irretrievable Resources," was revised and concrete was eliminated as an irretrievable resource.*

Comment: Page 4-72, Section 4.3.18.1, Line 14. The Supplement states that there "are no regulations that deal specifically with the concept of irretrievable resources." It is unclear what is meant by this statement. The following statutory and regulatory provisions pertain to irreversible and irretrievable resources in the NEPA context: —NEPA ' 102(2)(C)(v), 42 U.S.C. ' 4332(2)(C)(v);—40 CFR 1502.16 (CEQ regulations); and,—10 CFR, Part 51, Subpart A, Appendix A (NRC regulations). (**CL-16/74**)

Response: *Section 4.3.18.1, "Regulations," was revised. The first sentence was removed and the pertinent references were added to the section.*

Comment: We would like to comment on the draft NUREG to correct an error in Table 4-3, line 21 regarding the Cost Impacts of Decommissioning for Rancho Seco. Line 21 should read:

Rancho Seco 913MWe PWR DECON $394.

Please refer to our letter submitted to the NRC Document Control Desk dated 3/26/01 entitled Rancho Seco Report on Decommissioning Funding Status. On page 2 of the letter we stated:

"...Their [TLG] estimate was $495.4 million in 2000 dollars. The portion of this total that is non NRC-defined decommissioning activities related to non-radiological dismantlement and management and storage of spent fuel is $101 million, most of which is related to fuel storage costs..."

SMUD, when it first established its decommissioning fund, included radiological dismantlement costs and costs related to storing spent fuel. Therefore, $495m -$101m leaves $394 million for equivalent cost discussed in Table 4-3 of the NUREG. (**CL-18/1**)

Response: *Table 4-3 was revised to reflect the new estimate for decommissioning.*

Comment: The Figure 1-1, "Decommissioning Timeline" should also reflect the 60 year window, mentioned in 10CFR50.82(a)(3), that starts from the permanent cessation of operation. (**CL-30/2**)

Response: *Figure 1-1 was revised to reflect the sixty year period for decommissioning.*

Comment: Revise the first part of the last sentence on page 1-5 to read: If a licensee chose to operate the ISFSI under a Part 50 license, they could choose to continue under the Part 50 license, or by way of license amendment request. (**CL-30/3**)

Response: *Chapter 1, "Introduction," was revised to accurately reflect the requirements in 10 CFR Part 50 and Part 72.*

Comment: Under the description of the Turbine building (on page 3-6) revise the last two sentences to read: Primary coolant is not circulated through the turbine building systems in PWRs. However, it is not unusual for the turbine building to become mildly contaminated during power generation at PWRs. (**CL-30/5**)

Response: *Section 3.1.2, "Types of Structures Located in a Nuclear Power Facility," was revised and the last two sentences in the description of the "Turbine building" were changed as proposed above.*

Comment: Add the following sentence to the first paragraph in section 3.1.4: Most of the contamination in the reactor coolant system is from the activation of corrosion products and not fuel. (**CL-30/6**)

Response: *Section 3.1.4, "Formation and Location of Radioactive Contamination and Activation in an Operating Plant," was revised and the above sentence was added to the text.*

Comment: Revise the second to last sentence on page 3-15 to read: The entire structure (or portions) must be removed…….. (**CL-30/7**)

Response: *Section 3.1.4, "Formation and Location of Radioactive Contamination and Activation in an Operating Plant," was revised consistent with the above comment.*

Comment: The last sentence on page 3-15 is only true if corrosion products are included. The sentence should be revised to read: If corrosion products are included, the radioactive decay…….. (**CL-30/8**)

Response: *Radioactive corrosion products are the result of activation and can be considered activation products, therefore the staff chose not to make a change to the text of the Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The last two paragraphs on page 3-15 need to be rewritten. The discussion of contamination and activation needs to be clarified. If requested, CYAPCO will work with the Commission to rewrite this text. (**CL-30/9**)

Response: *The staff has determined that for the purpose of this Supplement the explanation of contamination and activation is adequate. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Yankee Rowe should be added to the list of plants mentioned in the second to last paragraph of page 3-26. The Yankee Nuclear Power Station was one of the plants in the AEC's Demonstration's Program. Yankee Rowe's license number is DPR-3. (**CL-30/10**)

Response: *Section 3.3.1, "Plant Sites," was revised and Yankee Rowe was added to the list.*

Comment: The second to last paragraph on page 3-32 discusses the creation of nuclear islands. Nuclear islands are not primarily created because of security reasons. The real benefit in creating nuclear islands is to not interfere with spent fuel storage. The purpose for creating a nuclear island is to provide a facility for the safe long-term storage of spent fuel, which is independent of the remainder or the rest of the facility. The purpose of the modifications is to divorce the spent fuel cooling function from dependence on systems which must be dismantled as part of the overall decommissioning process. (**CL-30/11**)

Response: *Section 3.3.3, "Decommissioning Process," was revised to more accurately describe the reasons for establishing a nuclear island.*

Comment: Expand the discussion about Stage 4 of the decommissioning process. This discussion should contain as much description as the descriptions under stages 1 through 3. (**CL-30/12**)

Response: *The staff chose not to expand the discussion of Stage 4 of the decommissioning process. Activities during Stage 4 result in minimal environmental impact and focus on demonstrating that the previous decommissioning activities have resulted in site radiological conditions that allow termination of the license. The comment did not provide new information relevant to this supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Delete "groundwater" from the first sentence in section 4.3.3.4. Releases are not made to groundwater under NPDES permits. NPDES discharge points discharge to surface water locations. (**CL-30/13**)

Response: *Section 4.3.3.4, "Conclusions," was revised and the term "releases" was removed from the first sentence. Section 4.3.3 does consider impacts to groundwater due to decommissioning; therefore, it is appropriate that the "Conclusions," Section 4.3.3, include groundwater.*

Comment: On Pg 3-17 there is a discussion of the advantages of the DECON alternative for decommissioning. One advantage of DECON is not discussed and should be. Generally speaking the shorted lived nuclides are easier to detect because of their beta/gamma emissions, versus the alpha emissions of longer lived nuclides. The difficulty of detecting the alpha emitters will increase analysis costs and increase the difficulty of performing surveys. Ultimately the cost of providing RP coverage and of performing the Site Characterization and Final Status Survey will also be increased. (**CL-31/6**)

Response: *Section 3.2, "Decommissioning Options," provides a very general comparison of the various options for decommissioning, including the advantages and disadvantages of each option; therefore, the staff has determined that the suggested change provides detailed advantages not consistent with the other options.*

Comment: Table F-1 lists the total site area for Peach Bottom Unit 1 to be 620 acres. 620 acres is the total site area reported in the Peach Bottom Unit 2 and 3 Updated Final Safety Analysis Report. However, Table F-2 reports the total site area for Peach Bottom Units 2 and 3 to be 618 acres. Table F-2 should be changed to reflect the total site area for Peach Bottom Units 2 and 3 to be 620 acres. (**CL-31/14)**

Response: *Table F-2 was revised and the value 620 acres was used.*

Comment: On page L-6 of Appendix L, line 4 refers to criticality accident monitoring requirements described in 10 CFR 7.24. Criticality accident monitoring requirements are described in 10 CFR 70.24. This typographical error should be corrected. (**CL-31/16**)

Response: *The reference was corrected to 10 CFR 70.24.*

Comment: On page L-6 of Appendix L, line 17 refers to 10 CFR 50.73 as requiring a licensee event report within 30 days. 10 CFR 50.73 was recently revised to require a licensee event report within 60 days. This change should be made to Appendix L. (**CL-31/17**)

Response: *Appendix L was revised to reflect the 60 day limit.*

Comment: All spent fuel at Dresden Unit 1 will be moved to dry storage on site by the end of the first quarter of 2002. This change needs to be reflected in Table 3-2. (**CL-31/19**)

Response: *Table 3-2 was revised to indicate that all the Dresden Unit 1 fuel is in dry storage.*

Comment: And speaking of Appendix F, by the way: please note in Table F-2 that the Callaway plant is located in Missouri, not in Montana. (**CL-51/6**)

Response: *Appendix F was revised and Montana was changed to Missouri.*

O.6.2 Clarification Questions

Comment: I had a question on the difference between the 1988—or one of the differences between the 1988 version and this supplement. The scope of facilities that are being addressed is much smaller, it's mainly just nuclear power reactors and I wanted to know for all the other facilities that were referenced in the '88 document and some of those included like the MOX facilities. How will those be addressed? Are they going to be addressed in a different type of document down the road or—I'm just asking along those lines. (**AT-A/1**)

Response: *This Supplement only addresses permanently shutdown commercial nuclear power reactors. The environmental analysis for the other facilities in the 1988 GEIS is still valid. As deemed necessary and appropriate, NRC will update the environmental impact assessments for the decommissioning of other facilities evaluated in the 1988 GEIS but not included in this Supplement. MOX fabrication and utilization facilities will have a separate environmental assessment prepared by the NRC staff. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The last paragraph in the Conclusions section of the Executive Summary, and page 2-3 of Section 2.2.1, state that a licensee would have to submit a license amendment request if environmental assessments are outside the bounds of the GEIS or if the environmental impacts of a decommissioning activity have not been previously reviewed. What is the licensing document that should be modified in the license amendment request? Section 2.2.1 states the Environmental Report should be revised, but the PSDAR may be a more appropriate document. (**CL-15/1**)

Response: *The Environmental Report is the appropriate document that needs to be updated. The PSDAR requires a discussion of the reasons for concluding that the environmental impacts associated with site-specific DECON activities will be bounded by previously issued environmental impact assessments. It does not require the analysis of specific impacts related to specific activities. However, based on the results of the licensee's environmental review, the PSDAR may also require updating. The license amendment would request the incorporation of*

a license condition in the license that would allow the activity to proceed. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: Will this Supplement replace entirely the previous NUREG-0586? (**SF-A/1**)

Response: *No. This Supplement will entirely replace the evaluation of environmental impacts from decommissioning activities of nuclear power facilities. The Supplement will be a stand-alone document and supercedes the environmental impacts to power reactors described in the 1988 GEIS. This Supplement goes beyond the 1988 GEIS and considers the permanently shutdown high-temperature gas-cooled reactors and the fast breeder reactors. This Supplement does not cover research and test reactors or power reactor facilities that have shut down due to major accidents (i.e., Three Mile Island). It also does not cover other types of fuel-cycle facilities. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I'm a little confused because if a licensee is outside the bounds or in an area that is beyond what has been previously reviewed, we're required to submit a licensee amendment request. Now I'm confused, since you've got, for these different criteria, a small impact, and a moderate impact, and a large impact, what is the bounds? (**SF-A/2**)

Response: *If the evaluation of any activity indicates that it could potentially result in an environmental impact that is greater than that predicted by the Supplement, then the licensee needs to submit a license-amendment request. For example, if the change to the facility would result in a moderate impact to the environment and the Supplement predicts a small impact, then the licensee needs to submit an amendment request. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: In reaching your findings about these impacts, these environmental impacts, the generic issues and impacts, I'm wondering what the baseline you were using was to measure those impacts against. In other words, were you comparing the impacts to the site before the nuclear facility was built or during its peak period? And in that case were the impacts considered cumulative or stand alone? (**SF-B/1**)

Response: *The impacts were compared against those that existed at the time the facility permanently ceased operation. The impacts identified at the time that the facility permanently ceased operation are cumulative impacts from plant construction through operation. Therefore, comparing decommissioning impacts to impacts at the time the plant ceased operation would*

include cumulative impacts. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.

Comment: My question concerns the last comment that you just made about that no activities can be performed during decommissioning that would result in significant environmental impacts not previously reviewed. Would you determine this from the submission of the PSDAR? Is that how you would determine if anyone was going to do anything that wasn't previously reviewed? (**CH-A/1**)

Response: *When the licensee prepares the PSDAR, they will identify the major activities that they plan to perform during decommissioning. They must evaluate the environmental impacts from decommissioning activities and compare those impacts to the results of the GEIS on decommissioning and other site-specific environmental impact statements. The licensee is required to evaluate any planned decommissioning activity against any previous environmental assessments prior to undertaking that activity [10 CFR 50.82(a)(b)(ii)]. the requirement for the evaluation is contained in the facility's written procedures. Documentation that such an evaluation has been conducted is available for NRC review during a site visit or inspection. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Once the work is performed, is there monitoring to make sure they're in compliance with the PSDAR? If they're actually acting, doing what they said they were going to do? (**CH-A/2**)

Response: *During the decommissioning process, NRC inspectors will periodically conduct special inspections of specific activities at the site. Site visits and inspection will be more frequent for plants that are undergoing decontamination and dismantlement and less frequent for plants that are in storage mode. Since the PSDAR is primarily an information document prepared to inform the public and NRC of the licensee's plans and schedule, it is not normally utilized by the NRC to determine compliance with regulations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: You said that a licensee could go ahead and dismantle without formal approval and I thought that the licensee based on the document, the licensee had to submit the PSDAR and then there was a 30-day public process. Were you not counting that because that didn't directly relate to the question? (**CH-A/16**)

Response: *Initial decommissioning activities such as draining systems, removal of some components, pumps, tanks, disposal of resins, and surface contamination removal can occur at any time, including immediately after permanent cessation of operations. However, no major decommissioning activities may take place until 90 days after the PSDAR has been submitted. Major decommissioning activities are defined as "any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components for shipment containing greater that Class C waste." A description of the decommissioning process is given in Section 3.2. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: What I was asking you was then cumulative impacts in terms of the plant during its operating period with the decommissioning activities added onto it, or do you mean something else? (**SF-B/2**)

Response: *For discussions of cumulative impacts, the NRC considered the terminology defined in 40 CFR 1508.7: "Cumulative impact is the impact on the environment which results from the incremental impact of the action [in the case of this Supplement, that is decommissioning activities] when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Using this definition, the staff examined the impacts of decommissioning activity at NRC-licensed nuclear power facilities and made a cumulative assessment of decommissioning activities and other past, present, and reasonably foreseeable future activities at the sites. Section 4.0 of the Supplement has been changed for clarification.*

O.6.3 Statements for or Against Nuclear Power

Comment: Georgians for Clean Energy promotes the shutdown of our unsafe nuclear power plants here in Georgia and the phase out of nuclear power nationwide. (**AT-A/8**)

Response: *Shutting down operating facilities is outside the scope of this Supplement, which deals with facilities that have permanently ceased operations. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: I'm now concerned about the costs, about all the broken promises, because these all sound—all these systems sound so good. But I can remember—I'm old enough to remember when this was going to be clean, safe and cheap. Electricity was going to be too

cheap to meter. That sticks with me. And we know that it's as expensive as anything possibly could be when you consider the whole—the whole cycle from the mining of the uranium to what happens afterwards. There's a huge process. (**AT-D/10**)

Comment: The nuclear issue is the most important issue facing humanity and has been since the atom was first split. The nuclear issue is the Sword of Damocles over the planet and all future generations should we survive the next decade. (**CL-20/2**)

Comment: Furthermore, no new nuclear plants should be allowed or built as they will just add to the existing contamination, and all operating plants should be shutdown to stop further "waste" - such as plutonium-generation. (**CL-20/115**)

Comment: The nuclear power industry was a colossal mistake to begin with, as we all know. (**CL-33/2**)

Comment: The NRC must resist the pressure of the nuclear industry. If their profits are waning, they have had their turn. The citizens of the U.S., who pay everyone's way, have a right to expect a healthy environment, and a right to fight for it within the United States legal system. (But what a shame that a fight is ever needed.) (**CL-36/8**)

Comment: It ought to be equally obvious that without public subsidy (via Price-Anderson) nuclear power is economically untenable. (**CL-42/4**)

Comment: It ought to be equally obvious given these factors the complete phase-out of nuclear power should be a high priority. Alternative power sources such as wind, solar, hydrogen fuel cell [and conservation] should be vigorously pursued in its stead. (**CL-42/5**)

Comment: The enterprise of electricity generation using nuclear fission requires public subsidy. Without Price-Anderson protection, nuclear power would be economically untenable. (**CL-46/5**)

Comment: Consideration of these factors must be fully and publicly discussed before exposing our citizens to additional exposures through development of new nuclear generation facilities. The complete phase-out of nuclear power should be considered based on objective analysis of health and economic effects including probability evaluation of all possible accidents and incidents, and comparison of all potential energy sources such as wind, solar, hydrogen fuel cell and including conservation. (**CL-46/6**)

Comment: As we have stated earlier, the methods used to decommission a nuclear plant will affect not only the communities of today but also the livelihood of future generations. The nuclear industry is leaving humankind a legacy of devastation—epitomized by its long-lived and

highly dangerous nuclear waste. They are unable to solve their waste problem and now, when faced with the eventual shutdown of their plants, are unwilling to take measures to ensure that the public is protected. (**CL-08/32**)

Response: *The comments relate to nuclear energy in general and are outside the scope of this Supplement. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: Bush is stripping us all of those safeguards we all need to protect citizens--and this includes you. He has only corporate interests--the nuclear power industry being one. (**CL-34/3**)

Response: *The missions of the NRC include the protection of public health and safety and protection of the environment. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

O.6.4 Comments in Support of Decommissioning

Comment: I certainly heard Eva loud and clear, that the amount of exposure for decommissioning is less than for operating reactors. So our organization is certainly in favor of decommissioning. Let's just do it right. (**AT-B/18**)

Comment: We'd like to see the decommissioning of nuclear plants go forward, and we want it to go forward in the safest, most environmentally sound manner. (**CH-A/4**)

Comment: As a preliminary matter, we support the prompt decommissioning of nuclear power plants and urge the U.S. Nuclear Regulatory Commission ("NRC") to ensure that decommissioning goes forward in the safest, most environmentally sound manner. (**CL-11/1**)

Comment: We would like to make it abundantly clear that we see decommissioning to be the most appropriate and responsible action to take with all nuclear reactors. (**CL-47/3**)

Comment: Certainly, every reactor shut down is another step away from further creation of radioactive waste, the ever-present possibility of nuclear terror (be it a reactor accident or terrorist attack) and the continuing irradiation of our everyday lives. (**CL-47/5**)

Comment: Our organizations are fully supportive of the permanent closure of nuclear power reactors. (**CL-48/7**)

Comment: Our goal is to require that nuclear facility owners and operators, to the best of their ability, function as the good neighbors and responsible corporate citizens they claim to be. That would include fully encapsulating and isolating all of the wastes and radioactively and chemically contaminated materials resulting from their operations and decommissioning. It includes doing everything possible to: 1)Prevent public exposures in the current and future generations to radiation and chemicals from nuclear power production, waste management, transportation, "cleanup" and decommissioning; 2)Prevent additional environmental contamination both onsite and offsite and to remediate and minimize that which has already occurred. (**CL-48/8**)

Response: *The comments are in support of safe, efficient, and timely decommissioning of permanently shutdown power reactors. The comments did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

O.6.5 General Comments

Comment: I think this is a good beneficial effort to have this generic supplement. I think it's going to help do evaluations of the environmental consequences of what we're doing. It's going to make sure in some cases that we look at the right things and don't skip anything. I do agree with the overall conclusions of the document. And also, I agree on what should be considered generically and what is site-specific because there are some site-specific issues. (**CH-D/1**)

Comment: For the next comment, for older plants, in some cases, there are some differences in the physical configuration from what was described and assumed. An example is like there may not be active ventilation systems. We are just going to have to install those systems as needed to properly protect the air quality and so forth. (**CH-D/9**)

Comment: Also, in the licensing arena, our documents may not include what has already been assumed to be in the documents for plants that recently shutdown. And in those cases, like for the environment hazards, if we don't have it already covered in the document, we're going to have to cover it in the license termination plan. So, I think what will be covered is just, it may not already be covered in the document. (**CH-D/10**)

Comment: Overall, Maine Yankee (MY) believes that the Supplement provides a fair update of the sections of the 1988 NUREG versions relating to pressurized water reactor, boiling water reactors, and multiple reactor stations. (**CL-04/1**)

Comment: Draft supplement 1 represents a useful update of the environmental impacts of decommissioning based upon over 200 facility-years' worth of actual decommissioning experience accumulated by nuclear facilities since the NRC published the initial GEIS in 1988.

NEI concurs with the GEIS conclusions, which found that for the "…environmental issues assessed, most of the impacts are generic and SMALL for all plants regardless of the activities and identified variables…" (**CL-05/1**)

Comment: Overall, Detroit Edison agrees with the conclusions in the draft NUREG-0586, Sup 1. The supplement will be helpful and updates the previous Generic Environmental Impact (GEIS) on Decommissioning to accommodate changes in regulations and experience gained in recent decommissioning activities. (**CL-09/1**)

Comment: In conclusion, Detroit Edison thinks the draft supplement to the GEIS on decommissioning of nuclear facilities is a good effort and agrees with the overall conclusions. Some details should be revised to improve accuracy and to ensure planned decommissioning activities, intended to be covered by this supplement, are fully addressed. This will avoid future questions on whether activities are covered and/or bounded by this GEIS supplement. (**CL-09/58**)

Comment: EPA supports the approach NRC has taken in the Supplement of establishing an envelope of environmental impacts resulting from decommissioning activities and identifying those activities which can be bounded by a generic evaluation and those which require a site-specific analysis. This approach concentrates the environmental analysis on those activities with the greatest likelihood of having an environmental impact. EPA also commends NRC for drafting a Supplement which facilitates public understanding in its use of plain English and explanation of technical terms. (**CL-16/1**)

Comment: Also, based on information presented in various industry forums, several numbers quoted for some of the other plants may be inaccurate. Each plant should verify the numbers for accuracy. (**CL-18/3**)

Comment: Just as anyone with common sense can tell this Draft Supplement 1 to NUREG-0586 will have dire consequences if implemented in its current form. (**CL-20/3**)

Comment: Exelon continues to maintain that providing guidance, which addresses environmental issues generically, provides the highest standard the public at large can use effectively to challenge industry to return power plant sites to beneficial use upon facility retirement. (**CL-31/2**)

Comment: Excelon believes the proposed Draft Supplement correctly concludes that most of the environmental issues assessed result in impacts that are generic and SMALL for all plants. We reach this conclusion based upon our experience decommissioning one BWR (Dresden 1),

two PWR's (Zion Station), one HTGR (Peach Bottom 1), and our observation of other industry decommissioning projects. We have not seen to date - and currently do not expect to find - environmental impacts different from those addressed and bounded by this Supplement to the GEIS. (**CL-31/1**)

Comment: In general the draft supplement meets the goal of updating the GEIS to current decommissioning practices and dismantlement options. (**CL-30/1**)

Comment: There is still time to correct all the serious problems in the Draft, still time for the NRC to turn from the path of wickedness and ruin the Draft Supplement and GEIS will lead to if passed as is. (**CL-20/118**)

Comment: I would point out that on pages C-1 and C-2 are the names of those responsible for this abomination for reference in case of future lawsuits, so the public should make a note of that (this is, after all public record, what I have written). (**CL-20/117**)

Comment: It appears that the nuclear industry has written its own ticket, as usual, on the issues in the Draft. P. E-5 notes the help from the Nuclear Energy Institute in gathering information. (**CL-20/64**)

Comment: The NRC is charged to protect the quality of the human environment and we ask that they can—that they do all they can to uphold that charge. The current draft GEIS is not protective and needs major improvement. (**AT-A/44**)

Comment: [In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including:] Planned Operating Life of a Nuclear Generating Stations. (**CL-02/4**)

Comment: [In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including:] Plant Valuation. (**CL-02/8**)

Comment: Did the Nuclear Regulatory Commission "encourage" its economists, accounts, and actuaries to ignore the impact of deregulation and plant devaluations on local communities? Is it unreasonable to ask the NRC to view decommissioning through a global lens that accounts for economic reality, objective science, and fiduciary accountability? Or is the Commission intent on viewing radiological decommissioning through surrealistic prescription monocles prescribed by the Nuclear Energy Institute, the Edison Electric Institute, Electric Power Research Institute, and the Institute for Nuclear Power Operations? (**CL-02/14**)

Comment: At some point, the NRC will have to create a decommissioning vessel the incorporates reality as its guide. Frankly, the GEIS resembles a script for "Abbott and Costello" prepared by Norman C. Rasmussen, Bernie Snyder and Ken Lay. (**CL-02/16**)

Comment: The document can be condensed in to three words, namely: "DUMP AND COVER." (**CL-20/1**)

Comment: Deregulation has already had serious negative impact on local municipalities this will be just another blow. (**CL-25/12**)

Comment: To even think that decommissioning nuclear power plants' regulations via presidential fiat is acceptable is beyond logic and reason. (**CL-34/1**)

Comment: I find the proposals in Supplement 1 to the Generic Environmental Impact Statement on Decommissioning unrealistic when it comes to the health of United States citizens at the time of decommissioning and to those living years later. (**CL-39/1**)

Comment: I guess one of the reasons I wanted to comment on this "Draft Supplement" is because it so dramatically reflects the backward world of Alice in Wonderland and of commercial nuclear power: "Sentence first --- verdict afterwards." Make a permanent mess first --- try to figure it out afterwards. (**CL-51/27**)

Comment: We concur with and adopt by reference the comments of the Nuclear Information and Resource Service, submitted by Paul Gunter. (**CL-52/1**)

Comment: I don't really know why I am bothering to write all this, as the NRC will ignore it anyway, but hope springs eternal as they say. If we don't have comparisons, we can't have at least some idea of what constitutes the start of a return to a more unpolluted site, and we can't establish what needs bulldozing and taken to a radioactive waste national sacrifice area. (**CL-20/11**)

Comment: Additionally, Public Citizen is concerned that the provisions outlined in the Supplement might allow owners and operators of nuclear power reactors to reduce or completely evade their civic, environmental, economic and legal responsibilities. (**CL-47/2**)

Comment: (The Western Shoshone Nation, AKA the Nevada Nuclear Test Site) that blew radioactive fallout across the nation causing serious illness, birth defects and cancers, besides doing the same to some nearer the site in Nevada. The only thing Las Vegas worried about, was if the tests shook their gambling tables according to press reports. When the wind blew towards Las Vegas they tried not to test. For Nevada to now whine that they don't see why they should get the spent nuclear fuel as they have no reactors-power reactors-is obscene,

considering that a huge Curie quantity of the spent fuel was generated making/creating the plutonium and the tritium for the nuclear weapons most of them supported and didn't care that the fallout dumped on their fellow planetary citizens. The fact that there were, and are, some small groups who were, and are against the weapons and the testing and the horrors of nuclear power does not alter the fact that the state didn't protest. The states current protests, even if valid for other reasons, ring hollow against that history of nuclear collaboration, when they use the "no power reactor" excuse to keep the waste out. It is time history was set straight. (**CL-20/82**)

Comment: Have you all no shame? (**CL-20/108**)

Comment: This is ridiculous! (**CL-22/1**)

Comment: You do not need to further endanger our lives while the polluters go scott free. (**CL-34/5**)

Comment: These admonitions have been presented to the NRC repeatedly in many Commission and staff meetings, agency panels and workshops, public meetings, legal proceedings. Until they are heard, adopted, and adhered to, this Supplement, the Final GEIS on Decommissioning of Nuclear Facilities and the Decommissioning Rule and NRC's radiation protection standards will continue to be inadequate and in violation of the applicable laws, including but not limited to the AEA, NEPA, and APA, cited above. All four should be withdrawn and entirely rewritten to provide true protection from radiological contaminations. (**CL-52/25**)

Response: *The comments are general in nature and did not provide new information relevant to this Supplement and will not be evaluated further. The comments did not result in a change to the Supplement.*

Comment: We support the NRC's current efforts to update the GEIS for nuclear power plants to reflect the industry's experience in decommissioning and to more fully consider issues like partial site release and re-use of concrete rubble as fill. (**CL-01/1**)

Response: *Rubblization and partial site release are evaluated and discussed in the scope of the document in Section 1.3 and further addressed in Chapter 4, as appropriate. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: As the NRC evaluates the comments received on the GEIS, it should look beyond the actual decommissioning process and focus on what condition the site would be in following license termination. (**CL-17/10**)

Response: *Regulations regarding license termination are in 10 CFR 20, Subpart E. These regulations and ultimate goal of decommissioning is to ensure that the site will be in a condition suitable for future use in either a restricted or unrestricted capacity. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: If the possibility exists that radioactive material will remain onsite under an unrestricted or restricted use condition the GEIS should consider the associated long-term environmental impacts. (**CL-17/11**)

Response: *Regulations regarding license termination are found in 10 CFR 20, Subpart E. For sites that have been released for unrestricted use, there would be no mechanism for future contamination or radiological releases. Therefore, long-term environmental impacts would be negligible. In the event that the site is released for restricted use, the site would continue to be monitored until the levels have been reduced below 10 CFR 20, Subpart E limits. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: Public Citizen is very concerned about several aspects of this supplement to NUREG-0586, specifically those that could pose risks to public health, the public's right to participate in decisions that affect them, and environmental quality. (**CL-47/1**)

Response: *The description of impacts as site-specific or generic does not preclude local communities from participating. The commenter is referred to the Executive Summary for a description of "generic" and "site-specific." The public can raise issues using any of several methods. If the licensee has requested an action requiring a license amendment, then the process for intervening in this action is by requesting or participating in a hearing. The process is set forth in NRC's regulations in 10 CFR Part 2, "Rules of Practice of Domestic Licensing Proceedings and Issuance of Orders." If the action of concern does not involve a license amendment, then any member of the public may raise potential health and safety issues in a petition to the NRC to take specific enforcement action against a licensed facility. This provision is contained in the NRC's regulations and is often referred to as a "2.206 petition" in reference to its location in the regulations (Chapter 2, Section 206 or 10 CFR). The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: The potential use of plutonium fuel at the McGuire and Catawba reactors is not adequately addressed in decommissioning—in this decommission document. In fact, the costs of decommissioning are nowhere to be found. So we would request that there be a supplement right away before mistakes are made in licensing the use of plutonium fuel at the McGuire and

Catawba reactors because the decommissioning impacts, including costs, and also including the additional radioactivity, the additional waste, those are real impacts that are basically left unaddressed in the generic environmental impact statement for decommissioning. (**AT-B/9**)

Response: *If a MOX Fuel program is adopted in this country then it may be considered in the next Supplement to the GEIS. However, at the present time the use of MOX fuel is speculative at best. The comment did not provide new information relevant to this Supplement and will not be evaluated furthers. The comment did not result in a change to the Supplement.*

Comment: The Oconee plant, which I'm near, which we've gone to visit, it scares me. I mean the reactors look like they're really solid. One thing they're going to do is cut into the wall to take—to change the steam generator. They're only going to put it back and somehow—is it going to be as strong as it was before? (**AT-D/8**)

Response: *The replacement of a steam generator at an operating facility is outside the scope of this Supplement. The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Comment: It has come to my attention that the Nuclear Regulatory Commission is possibly compromising the security of our nation's future by making way for further build up of nuclear waste that will theoretically be safe in so many thousands of years. (**CL-41/1**)

Response: *Spent fuel maintenance and storage are outside the scope of this Supplement as discussed in Section 1.3, "Scope of this Supplement." The comment did not provide new information relevant to this Supplement and will not be evaluated further. The comment did not result in a change to the Supplement.*

Appendix P

Public Meeting Transcript Excerpts and Written Comments

Contents

1. Transcript of the Public Meeting on December 4, 2001, in San Francisco, California P-1

2. Transcript of the Public Meeting on December 6, 2001, in Chicago, Illinois P-14

3. Transcript of the Public Meeting on December 10, 2001, in Boston, Massachusetts P-31

4. Transcript of the Public Meeting on December 12, 2001, in Atlanta, Georgia P-38

5. Comment Letters P-75

1. Transcript of the Public Meeting on December 4, 2001, in San Francisco, California

[Introduction, Mr. Cameron]
[Presentation by Mr. Scaletti]
[Presentation by Ms. Hickey]
[Questions answered by Mr. Sackschewsky]
[Questions answered by Mr. Masnik]
[Questions answered by Mr. Zalcman]

SF-A Mr. Sokolsky: David Sokolsky with Humboldt Bay Power Plant.

SF-A-1 Will this Supplement replace entirely the previous NUREG-0586?

Mr. Scaletti: It will replace in entirety -- or it's a standalone document for nuclear power reactors, yes.

Mr. Sokolsky: Okay.

Mr. Scaletti: The other facilities within -- NUREG-0586 is still applicable to those facilities.

Mr. Sokolsky: All right. That was my understanding in looking at this Draft Supplement, that anything from the previous NUREG is included in the Supplement that's applicable.

Mr. Scaletti: That's correct.

Mr. Sokolsky: So when we respond we no longer have to look at the previous issue, just this Supplement.

Mr. Scaletti: That is correct.

Mr. Sokolsky: Okay. Thank you.

SF-B Ms. Cabasso: My name is Jackie Cabasso. I'm the Executive Director of the Western States Legal Foundation.

SF-B-1 And I have a question for Eva which is that in reaching your findings about these impacts, these environmental impacts, the generic issues and impacts, I'm wondering what the baseline you were using was to measure those impacts against.

In other words, were you comparing the impacts to the site before the nuclear facility was built or during its peak operating period? And in that case were the impacts considered cumulative or standalone?

Ms. Hickey: Okay. Let me make sure I understand your question. You want to know what the baseline was that we were evaluating against --

Ms. Cabasso: Um-hum.

Ms. Hickey: -- and then whether we looked at the impacts cumulatively.

Ms. Cabasso: Um-hum.

Ms. Hickey: What we were comparing against was, we would look at the impacts that were identified in any previously-written environmental impact statements, final environmental statements that the licensee had published, and any other environmental assessment that had been conducted during the operation.

So we were weren't necessarily looking at the impact; we were looking at the way the impacts might change from during operation, not necessarily from the way the plant was prior to operation. So we were comparing those impacts with other environmental impact statements that had previously been written.

And, yes, we did look at cumulative impacts.

SF-B-2 Ms. Cabasso: Now just could you elaborate on that a little bit? Because what I was asking you was then cumulative impacts in terms of the plant during its operating period with the decommissioning activities added onto it, or do you mean something else?

Ms. Hickey: Well, we looked at it in a variety of ways. We would look at whether the impacts from all of the activities -- well, okay. The radiological was kind of an easy one to establish. The impacts from all of the activities individually and then how cumulatively the radiological impact to the environment would end up.

We also looked at them across the issues, so we would look at activities -- at an activity and see -- I'm sorry. I'm having a hard time describing this. But we would look at them from -- at an activity and then look at water quality and how water quality might impact potentially air quality or any of the other issues. So from that perspective we looked at it cumulatively across all the issues.

And then, like I said, we looked at the impacts from the environmental statements that had previously been written and how the environment might change from that point in time.

Do you have any other -- okay.

Ms. Cabasso: Could I? While I have the microphone, this is just an out-of-left-field question, but there's one -- on the handout for the viewgraphs, there's one sort of orphan at the end which --

Ms. Hickey: Oh, yes. Thank you for bringing that up.

Ms. Cabasso: -- and I wondered if somebody was going to talk about that.

Ms. Hickey: Yeah, I appreciate you bringing that up.

When we had our scoping meetings we talked a lot about the different options of decommissioning that are used. And I just felt like that -- even though I didn't want to go into that, I wanted to give that information and have it handy in case anybody brought up questions that related specifically to the option, SAFSTOR, DECON, or ENTOMB. And so that's -- yeah, that's an orphan. Thank you.

Ms. Cabasso: Well, I would appreciate it if you would just -- I was at the scoping meetings when those came up -- or the scoping meeting when that came up, but I'd appreciate a little review.

Ms. Hickey: Oh, okay.

Ms. Cabasso: Yes, my colleague would.

Ms. Hickey: Let's do that then.

Okay. There are three options for decommissioning that NRC has described. And one of the things I'd like to point out -- well, let me discuss them separately.

DECON is an option where the plant would shut down and immediately start the decommissioning activities and would complete decommissioning in, say, five to ten years.

SAFSTOR is an option where the plant would shut down and then wait some period of time before it completes the decontamination and decommissioning activities in order -- well, there's

a number of reasons, but it's typically to let radioactive decay occur. But there can be other issues, too.

And then ENTOMB is an option where the plant would shut down, go through some level of decontamination, and then be put in a long-term -- a stable environment, but -- and then it would have restricted access.

Now the way the decommissioning experience has gone is most plants have not -- and there's no plants currently, no power reactors currently doing ENTOMB. But most of the plants have not used just DECON or SAFSTOR.

So what we've found is that a plant may shut down and wait three to five years for either decay or some other reason, and then -- and that would be a short SAFSTOR period -- and then they'll go back and do their final decontamination and decommissioning activities.

So what we're seeing is that most plants are combining the two DECON and SAFSTOR options.

SF-C Mr. Nesbitt: Sure. I am Dale Nesbitt. I am on the Board of Western States Legal Foundation, also active with Peace Action, and a retired staff engineer from Lawrence Berkeley Laboratory.

SF-C-1 I would like to have you expand somewhat on your definition of "small," "moderate," and "large" at this moment. I know it's in Chapter 4, which I haven't read yet. Maybe it's all there. But why don't you take the opportunity to expand on that?

That to me is a very untechnical term.

Ms. Hickey: Yes. I agree. And that's why we tried to give some definition in the document.

In Chapter 1, on page 1-8, we give the Council on Environmental Quality's definitions for "small," "moderate," and "large." And this is what we based our analysis on.

"Small" pretty much means that there's no detectable, observable changes to the environment from the activity in the issue that we evaluated.

"Moderate" would mean that impacts are sufficient to alter noticeably but not destablize the attributes of the resource.

And then "large" would be that there would be a noticeable change to the resource.

I know that doesn't sound very specific, but back in Chapter 4, for every issue that we evaluated, we tried to characterize that.

I know the Socioeconomics is pretty well defined because those are areas where we look at the same sorts of issues for other environmental analyses that we've done. So if you take a look there, you may see the specific criteria that we used.
And, Mike, maybe if you could talk a little bit about the Terrestrial and the criteria, how you did your analysis for the Terrestrial Ecology.

Mr. Cameron: And Mike give us your full name and affiliation, please.

Mr. Sackschewsky: Mike Sackschewsky, PNNL.

I prepared the Terrestrial Ecology sections. In that case and for every case for each issue, we would define what we mean by "small," "medium," and "large" impacts.

In the case of Terrestrial Ecology, a small impact is one basically that you would not be able to detect any changes in the local plant, or animal populations, or community structure, or ecological functioning in the vicinity of the facility.

A moderate impact would be one that has some detectable changes in one of those factors, but not enough to drastically alter the functioning of it. You could see it, but they're still functioning normally.

And then a large impact would be one that's causing a dramatic change in the function of the plant, plant/animal populations or ecological functions.

Mr. Cameron: Dale, do you have a follow up on that or... Let me get you.

Mr. Nesbitt: Well, I understand what he said. That's helpful. I'd have to go into more detail.
SF-C-2 But it seems a bit strange to me that the majority of the things are defined as "small."

With my experience with radiation I would not think that most of them would end up being small, but that often comes down to a matter of scientific debate and opinions.

Mr. Cameron: To just follow up on that, perhaps it might be useful for people to actually get an idea of what the implications of this Generic Environmental Impact Statement are.

If you took an impact that was labeled as "generic," can you give us an example of how would a licensee who was preparing an environmental report for decommissioning, how would one of those generic impacts be considered in their environmental report?

I just want to make sure that people know what the implications of labeling an impact as generic is in terms of the decommissioning process.

Is that clear, Eva?

Ms. Hickey: Well, I guess, let me give an example that I think help defines it. And the radiological examples to me are the easiest ones.

When a plant determines their activities and how they're going to decommission the plant, they do an assessment of the dose to the workers from all the activities.

One plant in particular that we looked at determined that they could not meet the guidelines in the original GEIS, the 1988 NUREG-0586, using the methods that they were going to use. So they did a chemical decontamination of their facility in order to bring the doses down so they could be within the GEIS, within the envelope of the GEIS.

Now they didn't necessarily have to do that, but what they would have had to do is then a separate analysis in order to explain why their doses were outside of those bounds.

So I hope that kind of characterizes. If the licensee looks at an activity and they fall within the boundary in that activity, they don't have to do any additional analysis. If they are outside the boundary, outside the envelope on that particular activity, then they'll have to do a site-specific analysis.

Mr. Cameron: So that they definitely have to take a look at each particular type of impact to see whether they're within the generic bounds that this is establishing.

Ms. Hickey: Right. Right.

Mr. Sokolsky: David Sokolsky again with the Humboldt Bay Power Plant. And I don't have more information, but I have more questions.

SF-A-2 I'm a little confused because if a licensee is outside the bounds or in an area that is beyond what has been previously reviewed, we're required to submit a licensee amendment request.

Ms. Hickey: That's --

Mr. Sokolsky: Now I'm confused, since you've got, for these different criteria, a small impact, and a moderate impact, and a large impact, what is the bounds?

Ms. Hickey: Okay. If we've defined something, an activity as generic, and the significance is moderate, that's our generic assessment of it. It doesn't mean that you need to make the impact small. Is that answering your question?

What we're saying is we expect that impact to be moderate.

Mr. Sokolsky: Well, for example, with staffing and its impact on population, you give percentages that would result in either a small, a moderate, or a large impact --

Ms. Hickey: Right.

Mr. Sokolsky: -- on the area's population. So if in our situation we have a large impact or a moderate impact, do we need to submit a license amendment request? Do we need prior NRC approval on this?

Ms. Hickey: If, for that particular issue, that particular aspect of the socioeconomic issue, if it states that the impact is moderate and you're small or moderate, then it's fine. If you're large, we've determined that that's not generic.

So you need to -- yes.

Mr. Sokolsky: That makes sense, but I didn't --

Ms. Hickey: Okay.

Mr. Sokolsky: -- and I haven't read this thoroughly. Is that criteria described in here or defined in here?

Ms. Hickey: You know, I think that's a good -- okay, Mike.

Mr. Cameron: Let's get this on the record. I think that some of these questions are raising what are actually comments. And I just want to assure people that these will be treated as

comments. But I think what we're trying to do here is to figure out what's the implications of a generic finding, particularly when those generic findings might be stated in terms of "small" or "moderate."

Ms. Hickey: And one of the things that I'm really interested in comments from the public is -- we've tried to make this clear. And if we haven't presented it clearly, that's what we want to know, so we can go back and try to redefine it.

Mr. Cameron: Okay, Mike.

Mr. Sackschewsky: Mike Sackschewsky, PNNL.

In partial answer to your question, the definition of a "generic" impact also includes -- well, it has the three aspects

One, it's applicable to a number of sites.

Two, it has the same level of impact at each site. And then,

Three, after looking at it, it was determined that available mitigation measures were either technically infeasible or economically infeasible. And so therefore they're not warranted to mitigate the effects of those impacts.

So even if the impact is large, then it's determined that there's nothing that can be really done about that, and you're decommissioning the plant anyway. So that's partially what's answering your question.

And there are just a couple of issues where there are actually more then one level of impact, but that's for specific cases. And in that case you just have to determine which situation meets your case, you know, the population percentage, or whatever.

SF-D Ms. Olson: Great. My name is Patricia Olson, and I'm with TriValley CAREs in Livermore, California. We appreciate the opportunity to provide input at the hearing, but we do support holding the hearings in reactor communities in California.

SF-D-1 We're concerned that the use of the proceeding may be used to eliminate site-specific evaluation of local concerns. And our concern is the right of local residents will be preempted from raising concerns during the license termination plan review.

SF-D-2 Now I've talked earlier with people about the scope of this hearing and to what extent the

radioactive contamination levels that are permitted to be released from regulatory control for decommissioning are being used to release radioactive materials routinely.

SF-D-3 From what I understand, this is not the case. But if that were in fact true, we would oppose any release of contaminated materials during decommissioning or other times.

I think the questions about the small, moderate, and large significant levels have already been discussed. So that's all. Thank you.

Mr. Cameron: Thank you very much, Patricia.

Dale.

Mr. Nesbitt: Okay. I had not prepared anything beforehand, so this will be ad lib. Just to add to the little background, yes, I am a mechanical engineer retired from Lawrence Berkeley Laboratory, where I had a great deal of contacts with various radioactive concerns.

In addition to that, it just happens that my oldest brother, who's 15, 16 years older than I am, is retired from the Atomic Energy Commission, where he was in charge of the radioactive waste facility at Hanford.

I have another brother who spent a good share of his career designing nuclear power plants.

Now when I finished the university I was certainly one of those that was convinced -- this was back in the '50s, early '50s -- that nuclear power was the wave of the future and indeed that would produce power so cheap we wouldn't have to meter it, and all that stuff.

Well, slowly over the years, and part of it from what I've learned from my oldest brother, I've started to learn more and more about some of the bad sides of nuclear power; and over the years became concerned of course about the nuclear weapons.

But what I want to address here, and it's a question, I don't have any doubt that on a technical level the work that's represented in this is very thorough and very conscientious. I have been responsible for similar things; I know how hard it is.

SF-C-3 But I think that there is an overall concern, which I know that this doesn't address, and that is the vulnerability of nuclear power plants to various acts of terrorists. And I don't think it should be ignored, and I think that we should be very concerned about it.

SF-C-4 Now I would be -- just as background, before September 11th, I probably felt that the SAFSTOR approach was one of the best things, to let them sit for 10, 20 years, and let the radioactive level decrease significantly before you try to disperse it.

I no longer think that. And yet I just heard, well, the licensees have 60 years to decide, and they can do anything they want. And I don't think that that's a danger that the public should put up with.

And I also feel over the years, and one of my brothers also spent a great deal -- he's retired from your facility at Hanford, and he worked on the vitrification process. And so I also know quite a bit about that.

SF-C-5 But my concern here is I don't think there's any good way to treat the long-term storage of radioactive waste. I don't think Yucca Mountain is the answer, for darn sure, for various reasons.

Also at Lawrence Berkeley Lab the group that's the Earth science group has done the study on groundwater transportation. And I know from some of my associates there that they think it is not a satisfactory location for long-term storage.

SF-C-6 But now the point I want to make, that the danger to the public from a terrorist act is a function of the total level of radiation that exists on one given site. We cannot do anything about the total level of radiation in a global sense, but through government regulations we could do something about the amount of radioactive material that is stored at any one location.

And I believe that that's where the very concerted effort of the Nuclear Regulatory Commission should be in the immediate future. And I'm not so much concerned about this document as it stands, but I am concerned about the overall global effects.

Thank you.

Mr. Nesbitt: As a response to that, and whether or not it applies to this document at all, I realize
SF-C-7 it was outside of what was scoped for this particular document, I do not think it's outside of the scope of this particular document to have some regulations about the speed, let's say, of how the total amount of radiation on a given site was reduced. I think that would be perfectly within the scope of this document.

SF-B-4 Ms. Cabasso: Yeah. This is not a formal comment, but just I understand that spent fuel is dealt with in a different GEIS. And I haven't read anything except the Executive Summary of this one so far, so I am partly speaking out of ignorance.

But I think I raised this concern during the scoping. The 60-year period presumes a lot of things.

SF-B-5 And one of the things it presumes is that there's going to be a viable option for removing the spent fuel from the site. And I'm just wondering if anybody could talk a little bit about the relationship there, because I am one of many people who believe that Yucca Mountain is not a foregone conclusion, although probably that is not your view here, but there is significant opposition to it from some rather more powerful actors than us in the state of Nevada.

And, you know, I'm just wondering like what -- you know, if you can talk about that relationship, then what kinds of long-term planning is going on with the NRC in case that 60-year window doesn't work out.

Mr. Cameron: Again I guess is there something -- Mike, can you also address, I think Jackie was asking maybe some information about how this document does consider spent fuel storage, either pools or otherwise. But you heard Jackie's question to you.

Dr. Masnik: The document actually talks about long-term storage of fuel on the site. It was included in the document, even though technically it is outside the scope. And we did that because we know that there is a lot of interest in that area, obviously.

The history of this is quite interesting. When the Commission first started thinking about decommissioning, it was in the '70s. And the 1988 GEIS and the regulations that were passed in 1988 presumed at that time that spent fuel wasn't going to be a problem, and it never even addressed it.

And the presumption was there because we assumed that there would be a high-level waste repository and the high-level waste would be removed from the site actually during decommission.

Well, we all know that didn't happen. And we don't have a high-level waste repository. So what the Agency did was enact some regulations that allowed for interim storage of that spent fuel on the site.

Now the regulations allow for wet storage of the fuel in the spent fuel pool. And the Commission has come to the conclusion that that fuel can be safely stored onsite in wet storage for, I believe, 20 years additionally. Is it 30? Well, 30 years additionally. Thirty. Thirty? Okay.

Mr. Cameron: Forty plus 30.

Dr. Masnik: Yes. Additionally, the Commission enacted some regulations that allowed for dry storage of the fuel onsite. And, in fact, a number of licensees have built these dry-storage facilities, they're called ISFSIs -- it's an acronym -- but basically the fuel is placed in a canister and then placed inside of a concrete overpack and kept onsite.

It remains to be seen what will happen with Yucca Mountain. There are some other options that are being explored. There may be some interim surface storage of the fuel as well. I think you probably know about it, but it is a problem and we're wrestling with it.

Mr. Cameron: And I believe that the document does talk about the Commission's Waste Confidence Decision. And indeed if Yucca Mountain was not -- if there was no license application for it or if the license was denied, then I think the Commission would have to go back and revisit that Waste Confidence Decision.

And let's go to Steve Lewis.

Mr. Lewis: Mr. Nesbitt, let me offer an additional --

Mr. Cameron: Give us your name and --

Mr. Lewis: Steve Lewis, Office of General Counsel.

Mr. Nesbitt, let me try another sort of perspective, to try to respond to your question and maybe the questions of others, too, I think.

(Sounds of cheers from neighboring ballroom.)

Mr. Lewis: I'm sure that's not for me.

Nothing that the Commission is doing nowadays post September 11th of this year is being done in isolation. It's extremely important that we have heard your comment today.

And although it's going to fall under the framework of what we have to do with or what we decide to do with respect to this document, other people in the Agency are going to be looking at what we say in this document. And they're going to be thinking about the comments that we received on this document.

And those other people are doing a very disciplined review that Barry Zalcman referred to previously, about this top-to-bottom review of our whole regulatory regime in light of what appear to be very changed circumstances, regarding terrorist threats.

And what I would encourage you to think of is that your comment is extremely important. It's important for this document. It's also important for the Commission in general because we are embarked on a really serious and intensive attempt to try to figure out what we need to do in light of the September 11th events.

And the last thing I will say is that the direction from the Commission includes that we look at the entirety of what might need to be done, including whether or not we need to propose any legislation; whether or not we need to change our regulations in any way.

So it's conceivable that although this particular document is dealing with 5082 as it currently exists, it may well be that the kinds of comments that you have offered today and that many other people are offering to us in other forums may cause us to change our regulations in a number of respects, including possibly 5082.

Ms. Cabasso: Just a general comment which is that I want to thank the NRC and encourage the NRC to push for more openness right now with the public, as your last comment suggested, rather than less, which is what's happening with some of the other agencies.

I was on a conference call today with some people who are -- other people working on Department of Energy facilities, where we've had a real problem with a shutdown of information.

And it was pointed out that, in a number of specific cases that we can document, public input was critical in actually significantly improving public health and safety because of discrepancies that were found in documents or perspectives that were not being recognized by the agency.

So I was very encouraged by what I heard tonight here. And I just want to really encourage the NRC to fight that trend and to talk to us and solicit ideas from the public.

And maybe some of the things that we've been saying, like there shouldn't be anymore nuclear power because we don't know what to do with the waste, is becoming a more salient point now that needs to be really looked at from a fresh perspective. So thank you.

2. Transcript of the Public Meeting on December 6, 2001, in Chicago, Illinois

[Introduction, Mr. Cameron]
[Presentation by Mr. Scaletti]
[Presentation by Ms. Hickey]
[Questions answered by Mr. Masnik]
[Questions answered by Mr. Zalcman]

CH-A
CH-A-1 MS. MUSIKER: Sure. I'm Debbie Musiker with the Lake Michigan Federation. My question concerns the last comment that you just made about that no activities can be performed during decommissioning that would result in significant environmental impacts not previously reviewed. Would you determine this from the submission of the PSDAR? Is that how you would determine if anyone was going to do anything that wasn't previously reviewed?

Mr. Scaletti: Well, the licensee has to take a hard look at his decommissioning process as required by 5082. In there, he must look at the activities, look at the environmental impacts that had previously been established and reviewed and determine whether or not the activities are covered by those previously issued environmental impact statements. And we will, we go out following the submission of the PSDAR and do a fairly robust look-see at their records to determine whether or not we agree.

CH-A-2 Ms. Musiker: And then, once the work is performed, is there monitoring to make sure they're in compliance with the PSDAR? If they're actually acting, doing what they said they were going to do?

Mr. Masnik: Let me go back to your first question, too. I just, I want to make it clear that what happens is, oh, I'm sorry. Mike Masnik. Licensees in decommissioning actually take the plant apart. And our regulations require that if you make any changes to the plant, you have to do certain reviews. And one of those reviews, of course, we look at it, we require the licensees to look at any changes to the facilities from the standpoint of safety because that's a big concern. If they make a change in the plant, will it affect the safe operation in the facility?

But in that process, they look at a whole host of other activities. Will it change the fire protection program? Will it change, you know, quality assurance issues? It is one of those things that they look at every time they make a change in the plant, and what they have is a procedure.

And that procedure says, is this activity going to result in any impacts outside the bounds of these particular documents. So, the licensee does that check before the actual change to the facility is made.

We, the NRC, receive annually a list of those changes to the facility, and we do inspect that process by which they do this screening as we call it. So, just to amplify that it's done at that point, and then, as Dino said, when the PSDAR is submitted, we typically look behind the licensee's assertion that the plan that is proposed by the PSDAR will not result in any impacts outside the bounds of any previous evaluation. We actually send an inspector out and he looks at the materials that the licensee relied on to come to that conclusion.

Now, as far as any monitoring to determine whether or not in fact there was any impact, well, certainly from a radiological point of view, there's a lot of monitoring that goes on and that if they had missed the mark, you know, it would be determined or discovered by them. We don't require, for example, monitoring of aquatic systems, let's say. That's under state control. And what we have found is that typically, there are no offsite impacts associated with decommissioning that would affect, that would have a non-radiological effect, let's say, on fish or wildlife in the area.

That's one of the things that Eva will talk about actually. Does that answer your question? Okay.

CH-B
CH-B-1 Mr. Gaynor: Hi, I'm Paul Gaynor from the Environmental Law and Policy Center of the Midwest. My question is with regard to the site-specific issues. One of the site-specific issues is threatened, I'm sorry, aquatic and terrestrial ecology. And it says, the rationale, activities occurring beyond previously disturbed areas. And I'm wondering what the definition of a previously disturbed area is. Is there a time frame or how that is defined?

Ms. Hickey: By previously disturbed, we mean an area that's already been used on the site during operations. So, they've already plowed it, dug it up, built something on it, made a parking lot, had a building placed on it as opposed to an area that's still forested or a meadow. Does that clarify it?

Mr. Gaynor: So, it's at any time during the operation? So, if they –

Ms. Hickey: Right.

Mr. Gaynor: Had the initial 40-year license period and then a 20-year extension --

Ms. Hickey: Right.

Mr. Gaynor: Any previously disturbed area within that time frame?

Ms. Hickey: Right.

CH-A-3 Ms. Musiker: I have a follow up question. So, could you explain to me what that would mean for an intake for water for cooling at the facility. Would that, does anything happen to that intake position during decommissioning?

Ms. Hickey: That's a good question. I can't recall exactly, go ahead, Mike. You obviously –

Mr. Cameron: Okay, Mike. I'll bring this over to you.

Mr. Masnik: Michael Masnik, NRC. What we have found at most facilities is the intake and discharge structure, first of all, are structures that are not typically taken out of service for some time. They're usually kept in place for the majority of the decommissioning. The ultimate goal of the licensee will depend, will determine what will happen to that intake and discharge structure.

For example, typically, these plants become valuable industrial locations, and having an intake and discharge structure might be of value to some future use of the facility. And since it is a permanent structure, licensees probably would like to keep them if they can. As was mentioned earlier though, there are some States that require them to dispose of all structures on the property, in which case, the intake and discharge structure would be removed.

To answer your question, and that is that would be considered previously disturbed areas. Now, those kinds of activities, in-river activities of course are normally very closely watched by the coastguard and also by the state. So, there would be some oversight on those activities as well.

Ms. Hickey: Yes, there's another issue there. Sometimes the structures are not on the site. And that was one of the issues that we discussed in determining scope, is that we were looking at decommissioning the activities that actually occur on the site. And so, if those structures are outside of the site, then they're not considered in this document.

Mr. Cameron: Eva, you mentioned the term, you used the term envelope and I guess that gives me an opportunity to see if everybody understands how, if this GEIS were finalized the way it is, how a NRC licensee would use the document, particularly would use the generic impacts, how that envelope would apply to the analysis that they did. Can you give people an idea of how that works?

Ms. Hickey: Yes. Yes, if you're looking, when the licensee is beginning or before they conduct an activity, they would look at the GEIS and do an evaluation. And if all of their impacts for all of the environmental issues fall within our statement, what we state as our envelope, then they will not have to do a further analysis. They can conduct that activity. On the other hand, if they are outside of the bounds that we've identified in the document, and those are all expressed in detail in Chapter 4, that's where the detail is, then they would have to do a site-specific analysis.

Now, another point would be is if they perform an activity or if a new technology comes along that's not evaluated in this document, then they would have to do a site-specific analysis because it would be outside of the envelope that we've identified in the supplement.

CH-C Mr. Klebe: Well, first of all, on behalf of the Department of Nuclear Safety, first of all, my name is Michael Klebe. I'm with the Illinois Department of Nuclear Safety.

First of all, on behalf of the department, I'd like to welcome the Nuclear Regulatory Commission to Chicago and hope that your stay here is pleasant. And oh, by the way, since we're having a little bit of financial problems in the state, spend as much as you can so we can maximize the tax revenue that we can gain from you folks.

I will try to be brief, but for those of you that know me, that's not a strong suit. So, I will try to keep my remarks to five to ten minutes per comment.

Mr. Cameron: We're going to send out for coffee. All right.
Go ahead, Mike.

Mr. Klebe: All right. One thing really jumped out when I was reading this voluminous document that almost destroyed my printer. Under Chapter 4, Environmental Impacts, Section 4.3.8, and it's located on page 4-26, and that's of the version that I downloaded out of the Adams website rather than the one that you have. If you do it a chapter at a time, it works out much better. If you try to do it in the two block one, it just freezes up.

CH-C-1 The thing that really jumped up and disturbed me was about middle of the paragraph. It says, "All decommissioning activities were assumed to determine their potential for radiation exposures that may result in health effects to workers and the public.

This section considers the impacts to workers and the public during decommissioning activities performed up to the time of the termination of the license. And potential radiological impacts following license termination are not considered in this supplement. Such impacts are covered by the generic environmental impact statement in support of rulemaking on radiological criteria for license termination of NRC licensed nuclear facilities." NUREG-1496, NRC document dated 1997.

I don't think that you can remove the long-term radiological impacts of using entombment as a decommissioning method from this environmental impact. I understand that this document pretty much worries about, you know, what sort of problems are you going to have while you're tearing down the structures, while you're -- parking lots, buildings, whatever.

But if you're going to pursue entombment as a disposal option which according to your slide in the 1988 draft or '88 GEIS was assumed not to be a viable alternative, you really need to look beyond license termination into the long-term radiological impacts because that stuff is going to be there forever until it decays away.

CH-C-2 And depending upon what system structures and components you put into the containment building, that time period of potential radiological hazard may be relatively short, it could be really long. And so, I think this, the scope, the basic premise of these radiological impacts are understated.

CH-C-3 The scope is just inadequate.

CH-C-4 And the other, well, and also talking about that, if you take a look at the date of this NUREG-1496 being 1997, that was also in a time frame when entombment really wasn't being talked about. NRC held their first meeting on entombment as a viable reactor decommissioning option in December of 1999. So, I doubt that those long-term radiological impacts are assessed in this EIS, referenced in NUREG-1496.

CH-C-5 So, I don't think that anyone has answered that question as to what it is. So, what I see happening here is you're setting yourself up with entombment, whether it be entombment 1, entombment 2, entombment 3, 12, whatever, is you're not looking at the long-term radiological impacts to the residents of the state of Illinois or the residents of Connecticut or whatever state it may be.

Mr. Cameron: I'm going to make a suggestion. Before you guys jump in, we're going to let Michael finish his comments, so he can entirely set out his statement on the record -- If there are clarifications that the NRC has to offer, and I'm saying clarifications rather than debate, then I would appreciate it if you could provide that later. But let's let Michael finish.

CH-C-6 Mr. Klebe: So, in that regard, I don't think the long-term radiological impacts are being addressed and the scope of this document is inadequate as it relates to radiological impacts. And I realize that that could be site-specific or just generic, but I think in generic terms, that should be addressed. I mean, you have some general idea of entombment 1, what sort of nuclei inventory you may have or entombment 2, what sort of nuclei inventory you would have. And then you would be able to give some idea as to what are those impacts.

CH-C-7 Now, the other place where, and I admit that some of my comments are maybe not germane to this specific EIS, but they do relate to entombment as a decommissioning option. One of the things that your GEIS did not consider is termination of a license under entombment.

CH-C-8 Entombment is basically the isolation of contaminated reactor stuff from the environment. Now, if you, and that's just a rough estimate on a definition. But if you look at definitions of disposal, it's going to be pretty similar.

CH-C-9 Disposal is defined as isolating radioactive material or radioactive waste from the biosphere from the environment in a facility suitably designed. Now, the one thing that this did not, this GEIS did not consider is regulatory authority as to whether or not the NRC can license the disposal or in essence allow entombment as a reactor decommissioning option in agreement states because in agreement states, it's those states such as Illinois that has licensing authority over the disposal of low-level radioactive waste in the state.

CH-C-10 So, your GEIS does not consider the give and take between the federal government and the agreement states as to who really has the authority to say that yes, you can entomb a reactor. And from the state of Illinois' perspective, it's not you folks, it's us. Because what you are proposing in this GEIS as an allowable decommissioning option is the disposal of low-level radioactive waste.

It's not residual contamination as identified under Sub-part E of Part 20 because let's face it, if it was a residual contamination, it would be low activity, probably high volume there because of accident, and it would not be something that you would, some system structure or component that you'd be deliberately picking up and putting in a containment building and then grounding it in place or somehow, you know, preventing intrusion into it. So, in that regard, it's just a basic fundamental philosophy that you folks don't have the regulatory basis to allow that in agreement states, while you may in non-agreement states. You don't, at least from my perspective, our department's perspective, have that authority in Illinois.

CH-C-11 In addition, entombment could potentially, in the state of Illinois, create seven disposal facilities. And your GEIS does not address the potential conflict with other state or other federal statutes as it relates to authority of disposal of low-level radioactive waste. That being the federal low-level radioactive waste policy act of 1980 as amended in 1985 which specifically gave states the responsibility for providing for the disposal of low-level radioactive waste generator within their states.

And the kicker, the great benny that the federal government, the Congress gave to the states to do this is the ability to form regional compacts specifically to limit the number of radioactive waste disposal facilities in the country instead of every, you know, 15 states having one. The idea is there would be a couple. And what this GEIS is proposing to allow to happen, not necessarily requiring to happen but allowing to happen, is the potential to do bunches of these. Seven in the state of Illinois, if you look at the reactor stations that we have in the state.

CH-C-12 And I realize that this only relates to the nuclear power stations, but in previous NRC federal register notice, they specifically asked whether or not entombment should be allowed for non-reactors as well. So, I can see this really running far afield or far counter to the federal act. And I think, in terms of authority as it relates to those federal acts, you know, there's no talk here in this GEIS about consultation with regional compacts.

The Central Midwest Compact Commission, having a meeting here in Chicago on Saturday on how specifically, the specific authority to say where low-level radioactive waste generated within the state of Illinois will be disposed of. It can either allow it to be exported from the region to go to an out-of-state facility or it could require it to remain in-state. So, I see your GEIS as not addressing those issues in terms of, again, authority as to who can really say something can happen.

So, those are just the general ones on top of my head. I would refer you back to correspondence that we have sent you regarding entombment and the wisdom of it and how it relates to state's authority and to 10 CFR Part 20, license termination. We've, you know, sent you guys correspondence on this before. I don't think any of our comments have ever been addressed in those regards because we seem to keep asking the same questions.
But anyway, I would love to have a dialogue with you folks from the NRC and from PNNL and I would like to hear what sort of comments you have back. And let's start the discussion.

Ms. Musiker: Thank you. I'm Debbie Musiker with the Lake Michigan Federation. The Lake Michigan Federation is an environmental organization with offices in Illinois and Michigan. And our mission is to work to restore fish and wildlife habitat, conserve land and water and eliminate toxic pollution in the watershed of America's largest lake.

Mr. Gaynor: I'm Paul Gaynor from the Environmental Law and Policy Center for the Midwest, also known as ELPC. ELPC is a Midwest regional public interest environmental advocacy organization working among other things to achieve cleaner energy resources and implement sustainable energy strategies.

CH-A-4 Ms. Musiker: We want to make clear that we'd like to see the decommissioning of nuclear plants go forward and we want it to go forward in the safest, most environmentally sound manner. Because our 18 nuclear reactors on the United States side of the Great Lakes which represents almost 20 percent of the world's freshwater supply, we have taken a preliminary look at this document and we want to provide a voice for the lakes. As decommissioning plants go forward, we will be monitoring them and commenting on them as appropriate.

Today, we wanted, I have three points to make on behalf of both organizations and then we had
CH-A-5 several questions as well. First, we don't believe you should allow nuclear reactor owners under safe store to store waste for 60 more years after operations cease. We think the document should narrow the parameters.

Why? Because we have many concerns, some of which relate to institutional memory. In the document, it mentions that one advantage of going forward with decontaminating and decommissioning the facility right away is that you have people on the site that know about the facility. They know how it was put together. They know how it was operated and they can better advise operations for decommissioning.

CH-A-6 Second, we're concerned about the financial viability of the companies that own these sites. During a 60-year period, the companies may go bankrupt and that may leave the sites unaccounted for. We're also worried about the uncertainty associated with the cost of disposing radioactive material later. We understand that safe store is preferred because of lower costs later, but because of Yucca Mountain and other uncertainties about disposal, we're concerned about those hanging costs. Excuse me.

CH-A-7 We're also concerned about safety. With reduced staffing as mentioned in the document, there's an increased risk of accident or the threat of attack on these sites with huge environmental and human consequences.

CH-A-8 With regard to the threat of attack, I think this relates to our second point. This document was prepared after September 11th. It doesn't, thank you so much.

The document was prepared after September 11th, but it doesn't seem to respond to September 11th. We think the document should be responsive to the events of September 11th. What is NRC going to do to make sure that facilities are protected and secure during decommissioning? Has that changed in response to the threat of terror attack? We think it should.

CH-A-9 My understanding is that releases are, if there is the possibility of release during decommissioning, then that should be something that should be accounted for especially in light of concerns of attack.

CH-A-10 Finally, considering the importance of the Great Lakes to the world and to this region, we think that the impact should be addressed specifically. It is not appropriate to lump them under a generic impact analysis.

CH-A-11 I also have a fourth issue that I have after hearing the opening talk by Dino Scaletti. The new issues that he raised as the basis for this document, the list of three, "rubblization", et cetera, to me reflect a sense that NRC is looking for ways to make it easier to finish the decommissioning process rather than thinking about ways to make it safer or more environmentally sound. And that concerns me. It seems to be driven by how we can facilitate the process, making it happen more quickly or with less cost as opposed to considering the safety issues. All of those issues relate to doing it more quickly and less costly.

CH-A-12 Those are my comments. We do have a couple of questions to you that we wanted to put on the record. And I hope, when we have an opportunity to have a conversation, they can be answered. On page 1-6 of the document, it references that, there's literature saying that materials can be stored safely for 30 years, yet safe store can go on for 60 years. And I don't understand how you can reconcile that. There may be a way but I just don't understand it from the document. There maybe a way that you can make that more clear in the document.

CH-A-13 Second, we would like to see a place in the document where you're comparing the risks, environmental risks associated with dismantling the facility immediately versus storing the material and keep putting the facility in safe store. It's referenced in the document that there are higher risks sometimes of dismantling immediately because the material is more radioactive. But it doesn't show a comparison of the risks associated with storing it versus dismantling it in the short term.

CH-A-14 That relates to our last question about safe store and that number, 60 years, and our question is what was the technical basis for establishing a 60-year period? And is it still appropriate?

Mr. Gaynor: And then, I just wanted to add one other question that I thought of while listening to Eva Hickey's presentation which is, I understand that in determining the generic EIS, you analyzed the variables at particular sites and this relates to a point that Deb made which is, a
CH-B-3 question I have is what consideration was given to the location of the facility as a variable in determining?

CH-B-4 I saw on PowerPoint, there was one of the, it was Other, and I don't know if the site location was included in as an Other in the variable. And I'd be interested in what kind of depth of analysis went into that if it was a variable that was considered.

CH-D Ms. Goodman: Hello, I'm Lynne Goodman. I'm responsible for decommissioning Detroit Edison's Fermi I facility. I am going to submit detailed comments. These comments here will be at the summary level. They'll give you a flavor of what kind of comments I have. And hopefully, that can at least give you an idea and provide some benefit.

CH-D-1 I'd like to start by saying I think this is a good beneficial effort to have this generic supplement. I think it's going to help do evaluations of the environmental consequences of what we're doing. It's going to make sure in some cases that we look at the right things and don't skip anything. I do agree with the overall conclusions of the document. And also, I agree on what should be considered generically and what is site-specific because there are some site-specific issues.

CH-D-2 My detailed comments, I'm going to have some comments on the details of my facility, Fermi I, ranging from the status of our decommissioning since we are inactive, the final act of decommissioning, what kind of fuel the plant used, the type of containment, some of our systems. We are cleaning up sodium residues. While that's not real different than other decommissioning activities, I'd like that stated in the report. It is one of the type of chemical activities and chemical hazards that are being done as part of decommissioning.

CH-D-4 And also, I'll talk about, I'll have comments on the site's size.

CH-D-5 So, other areas, oh, and one other item is there are some aspects of the regulations that are specific to light water reactors and I just think the document needs to reflect those rather than all reactors.

CH-D-6 For example, the specific formula for the decommissioning cost. Not that we don't have to have plant's decommissioning fund and have to look to the adequacy because the regulations do require that and we do that. But the formula doesn't apply to non-light water reactors.

CH-D-7 Okay, now, to take another area, I think there are some additional hazards that have to be addressed in the discussion of the hazards. Some of these are addressed, but I think there are additional hazards. I don't think these would affect the overall conclusions of the document. But I think there is more detail, and to some extent, some hazards that are not fully addressed in the document. And some of these are in the areas of occupational hazards.

There's a lot of decommissioning work that you have to be very careful about. In my position, industrial safety is actually the thing I spend the most time on. And it can be done safely, but most aspects of decommissioning involve an occupational safety issue.

CH-D-8 I think the document needs to address fires, chemical hazards, particulates, spills. And I'll provide more detailed comments in writing on how I think this needs to be addressed. But again, I don't think that affects any conclusions. I just think there are more issues that need to be addressed in the document.

CH-D-9 For the next comment, for older plants, in some cases, there are some differences in the physical configuration from what was described and assumed. An example is like there may not be active ventilation systems. That doesn't mean we aren't going to be monitoring our releases and filtering them as needed. We are just going to have to install those systems as needed to properly protect the air quality and so forth. But we may not have those systems still in process.

CH-D-10 Also, in the licensing arena, our documents may not include what has already been assumed to be in the documents for plants that recently shutdown. And in those cases, like for the environment hazards, if we don't have it already covered in the document, we're going to have to cover it in the license termination plan. So, I think what will be covered is just, it may not already be covered in the document.

CH-D-11 I have one very specific comment. And this is something in Appendix G that I wanted to put on the record. And I was very surprised to read of excess malignancies that have been experienced at doses of 10 REM. This is contrary to the health physics and radiological health handbook and other material that I've read over the more than 25 years I've spent in this industry. And I think that needs to be addressed and reevaluated.

CH-D-12 One last comment I want to make is that I recommend highly that in future efforts of this sort, the communications to get information about specific plants be with those specific plants or otherwise actions be taken to ensure that all plants are covered. I know in this case that some plants were not contacted, and other plants were contacted with very little time to respond. And I think you'd have a better document if you get everybody's input up front.

So, I do plan to submit detailed comments on the document. I really think it is a good effort. And I think it will help those of us that are decommissioning or during environmental reviews, ensure that what we are doing is covered or know that we need to cover it specifically.

Mr. Cameron: Okay. Thank you very much, Lynne, for those comments. Because I think we're probably, when we go to what I would call clarification in terms of some of the points that Michael raised might lead us into a wide-ranging discussion, why don't we see if we can provide information on the two questions that we had, that is, the 60 years? What's the technical basis for the 60 years? And if we need to go back to Debbie to clarify what the question is, we'll do that. And then, to Paul's question about how location was considered.

I'm assuming that the NRC was taking note of those questions. Can we have someone who can address the basis for the 60 years? Michael, all right.

Mr. Masnik: I can honestly say that I can't, and I don't think there is a really good explanation of how the agency arrived at 60 years. As we were talking for a few minutes before the meeting, I have heard, and I don't know if this is really the way it happened. They assumed that cesium had a half life of 40 years, and they figured a half life and a half would be a significant reduction in the facility and would make a significant difference in the occupational exposure as you dismantled it. But, you know, I've looked into this before and I really can't find a good explanation. None of the other NRC personnel here have an opinion on this.

There was one other question that you had, one other issue raised and that was on the bankruptcies. I don't know how familiar you are with our regulations, but we do have a requirement that the money be collected and placed in a secured trust. And that money is basically unreachable by the licensee. There are very strict limits as to when, for example, the licensee can access that money.

We've had a number of license transfers where the ownership of the plant has changed. That, it's been pretty clear that that fund transfers with the facility and that the losing entity no longer has any claim over that money. Yes?

Mr. Cameron: And if you could just give us your name again for the transcript?

Ms. Musiker: Sure. Sure. Debbie Musiker, Lake Michigan Federation. That makes sense to me if a facility has a full life or the expected life. But what happens to a facility that shuts down prematurely and they haven't actually collected sufficient funds for what's necessary for decommissioning and then, they go bankrupt? And that situation still poses a risk.

CH-A-15

Mr. Masnik: That is a very good question. The requirement to put aside money for decommissioning trust fund was part of regulations that were put into place in 1988. Very shortly after that, we had a series of plants that shutdown that had essentially insufficient money in their decommissioning trust fund. And it was a significant concern to the Commission.

What has happened is, in some cases, the licensee has placed, we believe, we don't know for certain, but we believe that the licensee had chosen safe store for several years or a number of years to accumulate funds in their trust fund. Fortunately, the PUC's, the state PUC's allow the collection of that money, and as a result, those funds have solidly been built up even in the plants that have permanently ceased operation shortly after 1988.

You know, as we enter the second millennium now, we've had roughly 13 years. Those funds of the remaining plants that are still operating now are, I wouldn't say fully funded, but significantly funded. And it appears that they will be funded to a level where we won't have to worry about whether or not there is sufficient money.

You know, if the money is not available, there are other remedies. We discussed this back when Three Mile Island had an accident. And ultimately, the responsibility falls on the federal government although we've never had to exercise that, so, at least not in power reactors.

Mr. Cameron: And Mike, do you want to try to answer Paul's question about location or should we turn to someone else on that? And do we need Paul to address that again, to just repeat what his question is?

Ms. Hickey: Okay. I think the question was did we use the location of the plants as one of the variables. And in fact, we did do that. We looked at location from the perspective of does it sit on a lake, on an ocean, and also from a perspective of population. So, we did in fact include location, and I guess the variabilities that location would have on the decommissioning activities. Is that adequate? Okay.

Ms. Hickey: Yes. I want to make one clarification point on one of your initial comments on entombment. And if you look at what we say is in scope in the document, we are only looking at activities that lead to termination of a license for unrestricted use. And entombment would not end up there. You would have a restricted use when you get to the point of license termination.

So, what we did is we evaluated the impacts for preparing a facility for entombment. And in fact, a site-specific analysis would need to be done at the time of license termination for entombment. So, I'd like to just make that as a clarification. I know you had a number of other issues.

Mr. Cameron: And Michael, do you want to either give us an additional comment or find out what exactly Eva meant by that?

Mr. Klebe: Mike Klebe, IDNS. I have no problem just starting up this dialogue because what you just said really perplexes the bejeebers out of me. And I'm not, for the court report, I'm not quite certain how you spell bejeebers. So, what you're saying is you're going to set something in motion, i.e., entombment in motion, you're going to allow a nuclear plant operator to take all the contaminated system structures and components, put them in a containment building as part of this GEIS and you're not concerned at what's going to happen at license termination? Because that's in essence what you just said.

CH-C-14

Mr. Masnik: Let me back up a little bit. First of all, the 1988 GEIS didn't come to the conclusion that entombment was probably not a viable option at that time. Since that time, since 1988, there has been some interest on the part of industry and there's been some interest on the part of the staff to explore the possibility of entombment. The staff was directed by the Commission to take a look at this.

There is an additional parallel effort within the agency, and I know you're, I'm sure you're familiar with the fact that we just put out an advanced notice of proposed rulemaking on entombment, which is inviting the public to assist the staff in coming up with a possible regulation that addresses this. Now, to be honest with you, we were put in a position of looking at environmental impacts on an activity in which the Commission has really not decided what direction to go, that it should go in.

And what we decided to do was look at the environmental impacts associated with the activities related to preparing the facility for entombment, knowing full well that there would likely be future rule making that dealt with the issue of entombment and the issues of, the other issues that you raised during your presentation. So, I think what Eva was trying to say was that restricted release, which is allowed by 10 CFR Part 20 Appendix E, would require a site-specific analysis. And therefore, it could not be considered generically by this document. And therefore, we're not evaluating it. Okay.

Now, the rule making that would potentially allow for some sort of entombment would also require some environmental assessment and could likely result in an environmental impact statement that would deal with the issues that you raised, the long-term effects and the issue of whether or not the states would be involved in the process, which I assume they would be but I'm not sure how that would occur.

Mr. Klebe: Okay. Mike Klebe, IDNS. Just so I understand, so you've got, you just said that because this is going to lead to a restricted use license or release under restricted use limitations –

Mr. Masnik: Let me, we, the staff, made the assumption that it would be restricted release. You have to understand we're --

CH-C-15 Mr. Klebe: Okay. That's fine. That's fine. And you said that for that restricted release use is going to need analysis on a site by site basis. Then why are you dealing with entombment in a generic EIS? Because just by your statements, entombment is not a generic activity. It is a completely site-specific activity. Maybe I'm just not seeing the picture right but –

Mr. Cameron: Let's try to answer that.

Mr. Masnik: Again, a very good question. The way the regulations are set up, when a plant shuts down, they can begin to decommission the facility. They can do that without any specific authority by the NRC. In other words, we don't have to grant them approval to begin to dismantle the plant.

The licensee essentially can perform the majority of the decommissioning without any formal environmental review and approval which would involve an environmental assessment. Towards the end of the decommissioning, when you get close to the end of decommissioning, the licensee has to submit a license termination plan. And that license termination plan is an amendment to the license and it contains the requirement to do an environmental assessment at that point.

However, from the period of time that they permanently cease operation until the license termination plan which would be typically a couple of years before they plan to terminate the license, and that could be a seven to ten to 50-year period, there is no environmental assessment required. So, what this generic environment impact statement does, if the licensee so chooses to entomb and if the NRC has regulations in place that would allow for the entombment, it covers the period of time that the plant permanently ceases operation until the site-specific analysis is done under the license termination phase.

CH-C-16 Mr. Klebe: Mike Klebe, IDNS. Doesn't that set the utility up for a great risk exposure to go down the path of entombment and find out that 40, 50 years, whatever time frame they elect when they try to terminate their license of someone saying, no, you can't do that? I mean, because of the radiological impacts?

CH-A-16 Ms. Musiker: Because you said, Debbie Musiker, Lake Michigan Federation. You said that a licensee could go ahead and dismantle without formal approval and I thought that the licensee based on the document, the licensee had to submit the PSDAR and then there was a 30-day public process. Were you not counting that because that didn't directly relate to the question?

Mr. Cameron: And I think you were just doing some shorthand there. And besides the PSDAR, you may want to revisit the statement that Dino had on the slides about there are certain things that they have to be within a framework. Okay, if you could just give us a summary of that, Mike?

Mr. Masnik: Yes. The regulations, I'll give the summary first and then I'll answer your question on PSDAR. The regulations are very specific and they say that you cannot perform any

activities outside the scope of any previously issued environmental assessments. And that forces the licensee, as I mentioned earlier, to do this review each time they make a change to the plan.

However, the 1996 change to the regulations established the post-PSDAR as the vehicle for telling the NRC and the public what they planned to do with the facility. There is a requirement to submit a document. This document is typically 15 to 20 pages long. It talks about schedule. It talks about what they plan to do. There's some discussion on funding and there is some discussion on environmental impacts.

But that document is submitted to the NRC and it is not submitted as a licensing action. We do not review and approve it. It's given to us, and 90 days after the NRC receives that document, they then can begin major decommissioning activities, major decommissioning dismantlement activities. But there is no review and approval of that document.

One other thing I might mention, there is a license, there are things called tech specs. And periodically, during decommissioning, the licensee will change that license. Those changes to the license require licensing documents to be submitted to the NRC and it's a license amendment. And that procedure allows for an opportunity for hearing and it also requires the staff to do an assessment.

But it's only on that particular change to the license. There's no overall assessment of the plan to decommission or how they plan to decommission the plant.

CH-D-13 Ms. Goodman: Lynne Goodman. I just have one additional request, I'll put it. Within the last short period, there's a number of decommissioning related documents that have come out for review. And while I appreciate the NRC has been very busy, in addition to this GEIS supplement, the entombment proposed rule making, there's also I think, I got two documents this week regarding decommissioning cost reports and I think the cost estimate formats.

If there is any way that we could not have to get all the comments in the very short comment period, if it could be extended, I'd really appreciate it because it's going to be a very busy December for me.

3. Transcript of the Public Meeting on December 10, 2001, in Boston, Massachusetts

[Introduction, Mr. Cameron]
[Presentation by Mr. Scaletti]
[Presentation by Ms. Hickey]
[Questions answered by Mr. Masnik]

BO-A Mr. Dierker: Sure. Carl Dierker with the EPA in Boston.

I had a couple of questions on Eva's presentation.

BO-A-1 If the life cycle of the plants has the decommissioning activities out as far as 60 years, what's the scenario that might involve?

Is that a scenario such as Millstone, where you've got this facility in SAFSTOR, while the other facilities are up and running?

Or is there actually a facility that would be not running, nothing's going on at the facility, and there's no decommissioning going on for 60 years?

That seems awfully long.

Ms. Hickey: The regulations require that the decommissioning be completed within 60 years.

So, there could be a SAFSTOR period in there, and then, the final decommissioning would actually have to take place within that 60 years.

But, yeah. There's a number of plants that are shut down and that have associated operating plants with them. And they are waiting until the other units shut down before they go through their decommissioning.

BO-A-2 Mr. Dierker: But, at least, in your experience, have you seen facilities -- You haven't seen facilities where the only facility that's been operating has been shut down, and then they're just sitting there waiting.

Ms. Hickey: Yeah. There's -- There's a number of them that are just in SAFSTOR. Zion, which has just recently shut down is in SAFSTOR.

LaCrosse is in SAFSTOR.

And then, there's a number of facilities that have been shut down. And most of -- There are several that are now going through decon, so they haven't stayed in SAFSTOR up to the 60 years.
But, Rancho Seco and San Onofre were both in SAFSTOR for a period.

BO-A-3 Mr. Dierker: And just -- It seems like it's taking a substantial land mass out of sort of useful life for a long period of time.

Ms. Hickey: Right. And this is–

Mr. Dierker: For someone's generation -- Really a generation of life.

So, that's my only question.

Ms. Hickey: Yeah. There's a discussion in here on -- on some of the benefits and disadvantages of using SAFSTOR or decon.

And one of the disadvantages of SAFSTOR is, yes, that land is in -- not available for other uses.

Mr. Dierker: That makes sense in the Millstone situation, obviously.

BO-A-4 You said you had visited a number of facilities. I wondered if you'd visited any in New England, in particular, the Maine Yankee facility?

Ms. Hickey: Yes. We went to Maine Yankee. That was--

Mr. Dierker: So, you talked with some of the folks up there and got a sense of what was -- what were the issues and so on?

Ms. Hickey: Right.

Mr. Dierker: Okay. That's good.

Ms. Hickey: And we list the plants in the supplement that we visited. There is a listing there.

Mr. Dierker: Great.

Now, on the findings on impacts -- issues and impacts, you have, next to the -- the impacts that
BO-A-6 you expect from these facilities, these aren't -- As I understand your slides, they're not saying

that all -- that all sites, the water -- the water use and quality and air quality and ecology are small. You're just saying the sites -- those issues that are dealt with in the generic sense are small issues.

And then, there can be site specific issues that could be small, medium or large?

Ms. Hickey: If -- Right. If they -- If they fall within the bounds of a small -- If it's generic and we say it's small, and they fall within the criteria of that, then they can be considered generic and they don't have to do any other analysis.

Mr. Dierker: Got ya. That's all the questions I have. Thanks.

BO-B Mr. Williams: Thank you. Carl Williams, I'm from Maine Yankee.

I've got a question in scope.

Clearly, NRC scoped evaluating environmental impacts associated with the radiological aspects of decommissioning.

BO-B-1 And yet, I note in the document that you also include decommissioning -- environmental impacts of decommissioning a non radioactive system such as cooling towers and discharge pipes.

I'd like to understand what criteria NRC will use to determine the acceptability of a licensee's plans in those areas.

Ms. Hickey: Okay. Let me explain. When we looked at those systems, what we did is, we said, if -- if a system was not radiologically contaminated, but was required for reactor operation, then we included those within the scope of our document in -- in assessing environmental impacts.

So, that's -- that's why you'll see some of those -- some of those systems and buildings and what not that would not -- that are not contaminated.

And so, I guess -- I think, then your question is, if NRC -- if there were impacts beyond what we described in our GEIS for those non contaminated or uncontaminated buildings or systems, what would NRC's -- what would they do if they -- if you weren't within the envelope, I guess.

Because, if you're within the envelope that we've defined, then it wouldn't be an issue.

That's a good question, I think, I will--

Mr. Cameron: Tom, do you -- Maybe you want to just elaborate a little bit on the implications of what you're talking about, and then, we can go to someone else to perhaps give us some more information?

Mr. Williams: Clearly, a decommissioning involves a lot of agencies. It involves EPA. Maine Yankee's going through a very large closure process.

It involves historic preservation commissions, Atlantic Salmon Commission. It involves everyone that you can possibly imagine that has a stake in environmental issues.

BO-B-2 The NRC scope is clearly associated with the radiological aspects of decommissioning.

So, an issue such as rubblization, that has a radiological component, this seems clearly it's within the scope of NRC's review regulation.

I do not see the removal of a cooling tower is within NRC's scope.

Mr. Cameron: Let's find out what the rationale was for including that within the scope. Mike?

Mr. Masnik: Mike Masnik, NRC.

We started this project almost three years ago. And for the first two years, this was an issue that we argued a lot, as to where do we draw the line.

Clearly, the regulations say that decommissioning involves the radiological decommissioning or decontamination of the facility.

But, to be honest with you, there was a lot of -- a lot of interest on the part of the public and other federal agencies to go beyond just those systems that are radiologically contaminated.

You know, where do you draw the line? And that's a good question.

We chose to draw the line at -- at those systems necessary for the safe operation of the facility.

But, for example, the training facility, or an administrative facility that's on the site, would -- would -- we decided would be outside the bounds of this analysis.

When a plant is licensed, non radiological issues are -- are evaluated. And it seemed reasonable that at this -- at this point, that those particular impacts also be evaluated.

That's -- That's how we got to that -- that decision.

Now, we have made some predictions on things like noise and -- and dust. And -- And we established an envelope.

Mr. Dierker: Good evening. My name is Carl Dierker. I'm regional counsel at the Boston office of EPA, or New England office of EPA.

I've a brief statement to read today.

I would like to start by thanking the Nuclear Regulatory Commission for coming to New England, a region that is in the forefront of commercial nuclear power plant decommissioning, to give interested stakeholders here an opportunity to comment in person on its Draft Supplement 1 to the generic environmental impact statement on decommissioning in nuclear facilities.

As an aside, I'm a little disappointed we don't have a better turn out for you all here. We certainly have a lot of people interested in this issue.

And I'm disappointed we haven't had more people.

As you know, four nuclear power plants presently are in various stages of decommissioning and dismantling. Maine Yankee, Connecticut Yankee, Yankee Rowe in Massachusetts and Millstone Unit 1 in Connecticut.

EPA New England has been following the decommissioning process at each of these facilities closely in order to ensure that the cleanups at these four sites are comprehensive and integrated to the maximum extent possible in order to leave these sites available for safe -- for safe reuse far into the future.

Congress has given EPA an independent role in reviewing other federal agencies' compliance with the National Environmental Policy Act. And we at EPA's New England Regional Office take this role seriously.

EPA has four primary responsibilities with regard to NEPA. One, providing advice to federal agencies that are developing NEPA documents. Two, advocating for early and substantive opportunities for public involvement in the development of these documents.

Three, evaluating the adequacy of federal agencies' environmental reviews which are the basis of these NEPA documents.

And four, recommending whether projects undergoing environmental review should be modified or mitigated based on projected environmental impacts.

Where EPA finds that a proposed action is unsatisfactory from the standpoint of public health or welfare or environmental quality, the Environmental Protection Agency administrator has the responsibility to refer the matter to the President's Council on Environmental Quality for resolution.

EPA, and a variety of stakeholders agree with the NRC that the GEIS for decommissioning that was published in 1988 needs to be revised and updated.

That was one of our -- one of the primary concerns we raised when we first got involved in the NRC decommissioning process in New England back in January of 1999.

EPA applauds NRC's initiative in preparing Draft Supplement Number 1 and issuing it for public comment.

Moreover, we generally support the approach NRC has taken in this draft document of analyzing environmental impacts and determining which can be reviewed generically for all decommissioned facilities, and which require site specific review.

In conjunction with EPA headquarters in Washington, we are currently reviewing the draft supplement and we'll be providing specific comments on NRC analysis and suggesting where additional discussion or clarification may be needed.

EPA looks forward to working with NRC as it continues to develop this important document.

We believe that early and thorough public participation is critical to reaching the best solution in environmentally complex issues. Solutions that will have credibility with and maintain support from the affected communities.

This meeting, and the opportunity for public -- for the public to submit written comments on the draft supplement by December 31st, are significant parts of the public outreach and participation process that should be ongoing at every decommissioning facility.

Thank you again for coming to New England and providing a forum for comments for our citizens, who will be extensively involved and affected by the decommissioning process in the months and years ahead.

Thank you.

4. Transcript of the Public Meeting on December 12, 2001, in Atlanta, Georgia

[Introduction, Mr. Cameron]
[Presentation by Mr. Scaletti]
[Presentation by Ms. Hickey]
[Questions answered by Mr. Masnik]
[Questions answered by Mr. Zalcman]
[Questions answered by Mr. Lewis]
[Questions answered by Mr. Neitzel]

AT-E Mr. Genoa: Thank you. Paul Genoa with the Nuclear Energy Institute.

At one point, Dino, you mentioned that the scope was to include three new areas. You mentioned rubblization, entombment and partial site release. The entombment is clearly identified as a section in the report. Could you direct us towards the part of the report that would deal with rubblization or partial site release?

Mr. Scaletti: Rubblization in general is considered from the standpoint of disposing of clean material on site and the leachability of that material, et cetera and that's covered in every section of the report.

Mr. Cameron: Mike, do you want to offer something on this?

Mr. Masnik: I can give you a page number for the first one, and that's rubblization.

Name is Mike Masnik.

On page 1-7, lines 20 through 33, it talks about rubblization.

Mr. Masnik: Mike Masnik again.

For partial site release, the Commission just recently issued a draft rule for comment on the proposal to release portions of the site prior to approval of the license termination plan. That's out for comment at this time.

Additionally, recently the Commission also issued an advance notice of proposed rulemaking for entombment and that also is a solicitation for public comment.

Mr. Scaletti: Partial site release is talked about on 2-7.

Ms. Zeller: I'm Janet Zeller, Blue Ridge Environmental Defense League. I'd like to know what issues or areas of concern or specific information the NRC would evaluate in determining additional rulemakings, whether they are needed.

Mr. Scaletti: Well, this document -- right now, the one rulemaking activity we have going on is -- the notice of advance rulemaking is entombment.

Ms. Zeller: Right.

Mr. Scaletti: Now we did evaluate a range of entombment options at both ends of the spectrum. And there's information in there that could be used for the entombment rulemaking. I expect there'll be a lot more done but certainly this would go to support it if it was necessary.

Ms. Zeller: Okay, and are there other possible areas of new information that could be presented in this process by the industry or the public that would result in additional rulemakings, other than those now underway?

Mr. Scaletti: I'm not sure. Would you like to address that, Barry?

Mr. Zalcman: Good evening. My name is Barry Zalcman, I'm also with the Office of Nuclear Reactor Regulation.

I try and characterize our regulations as always being interim regulations in that we try to perfect them all the time. There are experiences that we get through plants and operation as plants go into decommissioning and events that occur and obviously the events of September 11 have a bearing on this as well.

So the agency is always receptive to interest on the part of the public in the way we should shape our rules. There's a mechanism allowing the public to participate that way. But let me at least provide you some insight that certainly in the case of security, the Commission has already directed the staff to do a top down review of security issues, not only in plants that have been permanently shut down but also for operating nuclear power plants as well.

So that's a fertile area, it's likely to be changed in the years to come. The agency has taken additional actions as well in the interim, but certainly we're talking about entombment, there's an initiative underway of the partial site release rule. You can expect that there would be changes in the security arena as well. The key is we can't forecast where all those changes are going to be, but we have an organic set of regulations in that we attempt to improve them as we have more and more experience, engaging the stakeholders, and that's the public and the industry and licensees, throughout that process.

AT-A Ms. Barczak: Sara Barczak with Georgians for Clean Energy.

AT-A-1 I had a question on the difference between the 1988 -- or one of the differences between the 1988 version and this supplement. The scope of facilities that are being addressed is much smaller, it's mainly just nuclear power reactors and I wanted to know for all the other facilities that were referenced in the '88 document and some of those included like the MOX facilities. How will those be addressed, are they going to be addressed in a different type of document down the road or -- I'm just asking along those lines.

Mr. Scaletti: The 1988 EIS is still intact with the exception of nuclear power plants, all of the information in there is still valid. We have excerpted all of the information and we have repeated it if necessary so that the supplement is a standalone supplement.

As far as the timing and the necessity to revise the other portions of NUREG-0586, if someone else can address that, certainly not me.

AT-B Ms. Zeller: Okay. Janet Zeller, Blue Ridge Environmental Defense League.

AT-B-1 Okay, we searched the document to determine what the actual acceptable risk is to the public for the activities addressed in your process. And what we determined is that it's a pretty wide range, from three to 21 person rems.

AT-B-2 Can you explain what the differences are between the actual impacts on a population of say 10,000 for the two options of non-restricted use and restricted use at the end of the decommissioning?

Ms. Hickey: Well, let me see if I can repeat it back so I make sure I understand. You're looking at the variability that we've shown in the dose to the public from the decommissioning activities and so your question is what -- why is there that variability? And then you had a question related to restricted release and unrestricted release.

Ms. Zeller: Okay, yeah. What is the absolute level of acceptable risk -- and I know it ranges in the experiences that the NRC has had at different decommissioned power plants. And so there were different doses identified at different plant locations and I know some of the variables that went into that.

What is the absolute level of acceptable risk that NRC will allow for decommissioning activity in general -- that's number one. And number two is what are the two levels of acceptable risk for the two options of leaving the site -- leaving the site really clean, which is unrestricted use, or leaving the site restricted.

Ms. Hickey: Okay, I think I understand.

The first question is related to the actual time when decommissioning is occurring, and what we did, we looked at the collective dose to the public during the time of decommissioning and we found -- what we did is we compared it with the dose to the public during operation. And we found that for the most part, that dose was lower than during operation. There may be some activities, some times when the releases would be similar to operation, but the plant must meet the regulations for release of effluents the same as an operating plant. And so that's why we compared it to those of the operating plant.

Now, the second question is related to actual license termination and our document only looked at -- we only considered in scope license termination for unrestricted release. If the licensee goes in for a restricted release, then that would require a site-specific evaluation.

For an unrestricted release, the criteria is 25 millirem per year. So for the --

(Inaudible question from Ms. Zeller.)

AT-B-3 Mr. Cameron: The question was 25 millirems where?

Ms. Hickey: Okay. Maybe the best way to do that is to read what it actually says in the requirements and then I can try to explain it, if I need to.

"Unrestricted use means that there are no NRC-imposed restrictions on how the site may be used. The licensee is free to continue to dismantle any" -- okay, let me go down to this --

"The Commission has established a 25 milliservert (ph) per year, which is 25 millirem per year total effective dose equivalent to an average member of the critical group as an acceptable criterion for release of any site for unrestricted use."

And I won't describe exactly what the critical group is, but that's described in here. So that means in one year there is a group, an individual that would be outside of that reactor site and they would have to receive less than 25 millirem per year. That's total effective dose equivalent. So for the entire year, on site -- I'm sorry, on site -- so for the entire year, somebody located on site could not receive more than 25 millirem per year.

AT-B-4 Ms. Zeller: Okay, so who's responsible then for a site that has restricted use? Because I couldn't quite tell. Who would actually protect the public?

Ms. Hickey: -- if I can just tell you that those descriptions are on page 2-5 and 2-6 of the supplement and that's directly out of the regulation, 10 CFR Part 20.

Steve.

Mr. Lewis: Steve Lewis, Office of General Counsel at the NRC.

The major comment I wanted to offer was that the question of who will be responsible for a restricted release, which I think was the most recent question you posed as a question, the answer to which you are not going to find in this document. This document didn't address it. It's really NUREG-1496, a 1997 document, which was the basis for the license termination rule that addresses those types of issues.

As far as the particular numerical requirements that go along with restricted release, I think they are as set forth. Eva pointed to you where in the document those are specifically laid out.

AT-C Mr. Martin: My name is Ed Martin, I'm a lawyer in Atlanta. I have represented or worked with people concerned about facilities for most of the past 30 years, off and on for the past 30 years. And I'm always concerned in these processes about where the public ends up.

The very first question I ever had about NRC operations was in the licensing of the Vogtle Nuclear Plant when the public comment -- or public hearing was scheduled, and of course, that plant is near Augusta, Georgia, the nearest major city. The public hearing was scheduled in Atlanta on the weekend of the Masters golf tournament. We had to get Senator Talmadge's
AT-C-1 office to move that back. And I think my concern is always to what extent a generic statement like this takes particular issues that are local out of the local decision-making process, out of the public hearing that has to be had for -- or we were originally led to believe has to be had for each of these.

AT-C-4 A lot of my work has been based on concern about the cost of these facilities relative to the amount of electricity or other benefits they provide on a life cycle basis, and that seems to be something that's a subtext of this statement.

AT-C-2 I think going back 25-30 years, the notion was well, we're going to build these things, we're going to run them and then we're going to cover them up in concrete and post guards around them and they'll be safe. Well, now we have rubblization. Suddenly entombment was the floor, now it's become the ceiling, we won't see it because it's too expensive. Money moves too fast and, you know, how can we do it cheap, how can we do it quick.

And of course, our concern is, you know, it may be quick and cheap for the licensee, but for people in the immediate area, people downstream, people on the Savannah River, on the Altamaha River, my concern is that they not be unduly saddled with costs that should be taken into account and that those local concerns be maintained in this process.

AT-C-5 Let me just see, I had -- I think the one other question I had was as I recall when the first statement was issued, there was a discrepancy between the NRC radiation exposure floor, threshold level, and the EPA level. Is that still out there? I think yours is 25, theirs is 4 to 15 or something for the same exposure.

Mr. Cameron: Do you have anything else that you want to add before we sort of just close on your formal comment and then we'll see if we can answer that question?

AT-C-6 Mr. Martin: Okay. Yeah, that was just a question I had. No, I think my main issue is just, you know, having the costs on the table and having the costs be understood, because I think for me there's a moment I go back to in the late 1970s in a proceeding before the Georgia Public Service Commission around the Georgia Power rate hike and this is prior to the Vogtle plant or anything else coming on line.

The power company presented a decommissioning report by the Bechtel Corporation, which was a consultant of theirs, that estimated that the cost to decommission a plant was going to be $270 billion in then current dollars. And of course, that was, you know, 30 years, 50 years down the road. So we're talking about dollars that are worth less than dollars in 1978 or whenever that was. And my number was always -- my benchmark number was always that the supply of money in circulation in the United States at that time was $360 billion.

And I think there's got to be some explicit discussion of those sorts of economic issues, and it
AT-C-3 seems like they're not really out there. You know, I think if people thought we're going to be rubblized and have a waste dump out there, they might not have been so welcoming to these facilities.

Thank you.

Mr. Masnik: Yes. It has been a controversy for a number of years now. The EPA has proposed 15 millirem per year and we've proposed 25 -- actually not proposed, but our regulations state 25. We're still working with EPA to try to resolve the differences. We've had a number of facilities that have agreed to clean up to a lower standard and in fact, what we find is that for those plants that are nearing the end of the clean up, they're not really near any of those numbers, they're much lower than even the EPA numbers.

So hopefully in the not too distant future, we'll resolve the disagreement between the two agencies, but meanwhile, the industry is working towards a number that's actually below that.

Can I just quickly address one or two other comments that he had? Or do you want --

Mr. Cameron: Well, since Ed does have to leave, I think the one comment that everybody would probably like to -- I mean Ed's comment was basically how does the locality, how does the community around the facility participate in decommissioning, how do such questions as cost get considered. I don't want to go into a big long thing now, but Mike, if you could just talk about how that happens and just reiterate the fact that this Generic Environmental Impact Statement, although it is important, is only just one piece of the decommissioning process.

Mike.

Mr. Masnik: Our Regulations 50.75 require licensees to put a certain amount of money aside. That trust fund that the money is put into. Licensees are required, on an every two year basis, to notify the NRC the status of that trust fund.

At the time the plant permanently ceases operation, the licensee has two years to prepare a PSDAR, post-shutdown decommissioning activities report, and that requires a certain amount of information. It provides for notification to the public and the NRC of what the licensee plans to do with the decommissioning. It provides a schedule. It also requires a licensee to take a hard look at costs and also environmental impact. So that's another period of time.

Now when a plant ceases operation, what we have done in the past, about two or three months after the plant permanently ceases operation, we do have a public meeting in the area to kind of tell the public what the process is. At the time that the PSDAR is submitted, typically two years after shutdown, we also have another public meeting where we discuss this.

There is a requirement -- in fact, we're just recently publishing or have published some new regulatory guides on cost estimates and what kind of cost data the licensee has to submit to the NRC. So if you're interested, we could get you those. But that would give you some more detailed information on cost.

Your number of $270 billion mystifies me. I think you might have been off by a factor of 1000 on that. What we're finding is the numbers can vary anywhere from $250 to $400 million but we have to be very careful when we talk about cost because we're only concerned about radiological decommissioning costs, okay, what it costs to clean up the radiological hazard.

Very often, licensees lump fuel management costs in there, they lump costs associated with regulations required by the local community or the state. Green field costs to return the site to its pristine condition can add significant amounts of money to that.

So whenever anybody gives you a cost number, be sure you ask what exactly does that entail. But like I said, about $250 to $400 million, and it looks like most of the licensees are going to be, you know, within that range. And I think we even discuss that some in the document as well.

Ms. Barczak: I don't have a Power Point presentation. Can you hear me with this, because I didn't think it was amplifying before. Is this better? Okay.

My name is Sara Barczak and I'm the Safe Energy Director for Georgians for Clean Energy in our Savannah field office. We also have an office here in Atlanta. Georgians for Clean Energy is a non-profit conservation and energy consumer organization. We are statewide with members throughout Georgia and have focused on energy and nuclear concerns for about 18 years.

AT-A-2 I would like to start out by addressing the process and how it limits the ability for the public to effectively participate in this and other nuclear-related issues that impact Georgia communities. The technical nature of the issues and an ongoing resistance by nuclear regulators to share accurate information about nuclear threats has always made it difficult for the public to be involved in decision-making involving nuclear energy issues.

AT-A-3 But after the tragic events of September 11, this problem has escalated to a point where our organization believes it is highly irresponsible of our federal government to go forward with making crucial decisions that will affect generations and generations to come. The NRC's website, as many of you know, was not available for a time and is currently severely scaled back, making public access to important background information very difficult or impossible.

I have spoken with representatives of the U.S. Nuclear Regulatory Commission and they have echoed some of my concerns as they too have difficulty gaining information on nuclear industry activity. If people like myself who have the ability to research these issues on a full time basis along with staff members of the regulatory agencies are having a hard time, imagine the fate of a concerned citizen who has limited time to devote.

And I think all of us in this room know what I'm talking about, and it's a very real concern, it's very valid. And regardless of how much I try to get fishermen to use the ADAMS website down on the Altamaha, they are not going to do it. So this is a real, real problem that we're all dealing with right now.

AT-A-5 Moreover, the NRC's public notice, as an example, that went out on November 2 of this meeting, contained an inaccurate link to the public electronic reading room. I tried to access it and it didn't work, and fortunately I got ahold of Andy Kugler who works on the Hatch relicensing issues, and he gave me a current one.

Well, for a lot of people that got that link, that's all they'll do, they'll go to that link and it doesn't work and they think they don't know how to use their computer and then they just go home. So again, the accuracy of information that's going out right now, we have to be very aware of when there are mistakes made.

For citizens concerned about issues at Plant Hatch in south Georgia, unless they have a hard copy of the relicensing documents, it is difficult for them to look up concerns that would be relevant to today's meeting because those relicensing documents are no longer available on line. We did have a link to it on our website, but you know, we all know it's not working.

So folks that addressed me from the Darien, Brunswick, Baxley area that wanted to come to the meeting wanted to look at those notes. And you know, I can cut and paste what I wrote up and other things, but once again, you know, to keep people interested like that, they're not going to jump through hoops like that and none of us really should expect them to because we know how boring -- some of you are glazing over right now -- these meetings can sometimes be.

AT-A-6 Therefore, we feel it is important to both extend the public comment period until these documents can be made readily available.

AT-A-7 Also, it is essential to provide more meeting locations to gather public comments.

Four locations is not enough, given that we have nuclear reactors that will eventually be decommissioned in many states and the public, as I've said, has had difficulty accessing the information. We don't even have any nuclear reactors in Atlanta and nobody wants to come to Atlanta -- I don't want to come to Atlanta.

I like Savannah. It's a long drive and yet I'm doing this full time and 60 some years from now when Plant Hatch finally gets decommissioned, I'm going to be retired but I'm still going to be hobbling up to these meetings because I'm dedicated and I'm very concerned about it.

But I think we do need to extend the public comment period to address the inability of getting the information easily, and have more meetings. And I know that's a burden on the NRC staff because not a lot of people show up, but there are some very good comments that come out of these meetings and they're important.

AT-A-8 Georgians for Clean Energy promotes the shutdown of our unsafe nuclear power plants here in Georgia and the phase out of nuclear power nationwide.

AT-A-9 We also advocate for sound, systematic policymaking regarding decommissioning.

AT-A-10 Since many nuclear contaminants are extremely long-lived and dangerous to humans and the environment, decommissioning measures need to be handled most carefully, as our future generations literally will depend on how well the job is done today.

AT-A-11 The notion presented by industry and others that decommissioning is inherently safe because the plant is no longer operating is a deceptive argument that confuses the public. Due to the nature of radiation, even after shutdown, parts of the plant, as we know, remain highly contaminated and extremely radioactive. The nuclear waste, such as the spent fuel produced by the plant during operation generates heat and emits radiation for thousands of years after the plant is shut down. Therefore, there is risk to the workers at the plant and to the local communities during decommissioning.

AT-A-12 Getting onto a brief comment on security, as many things are being reviewed in light of September 11, the decommissioning of nuclear reactors should be no exception. From what I've heard today, it sounds like there will be some sort of analysis of security issues and I hope that's directly relating to this decommissioning document. As we know, the draft EIS is grossly deficient in ensuring that security measures are taken to protect our homeland security from threats of sabotage at a nuclear plant. Georgians for Clean Energy request that a thorough amended review of necessary security measures be compiled by the NRC and added to the supplement.

AT-A-13 Again, this highlights the need for an extended comment period and careful analysis of this issue. For instance, I'm sure there are a number of nuclear security organizations worldwide that perhaps this draft and others within the NRC could be opened up to get their comments and maybe their suggestions of what they're doing in other countries or whatever, because we're looking at a global assault now, not just one person down in south Georgia acting like a weirdo.

AT-A-14 It is now abundantly clear that nuclear materials are desired by terrorist organizations. Not only are our operating nuclear power plants terrorist targets but so too is the nuclear waste they generate. Since a decommissioned nuclear power plant would have a greatly reduced security force, the closed plant could provide an easier opportunity for terrorists to obtain nuclear material.

AT-A-15 In the case of plants like Hatch, that have outdoor storage of nuclear waste, the notion of a reduced security force is even more troubling.

AT-A-16 And I probably have a question in there because I wasn't sure, reading through the document itself, where, like the outdoor storage facilities at Plant Hatch and elsewhere -- how they are dealt with after the plant itself is decommissioned and if the license is terminated. I'm not sure how that works and who's responsible and I would like more clarification on that. So maybe I can get some of these cards afterwards.

And then getting to the site-specific concerns, and I didn't ask questions during Ms. Hickey's forum because I can't even formulate them because I'm so confused by that section.

AT-A-17 Georgians for Clean Energy does not believe that a Generic Environmental Impact Statement regarding decommissioning of nuclear facilities is a sufficient tool for evaluating impacts borne to specific environments from decommissioning a nuclear power plant.

AT-A-18 We disagree with the process -- and it happened during the Hatch relicensing too -- the process of using the significance levels of small, moderate and large for a variety of issues at a variety of locations, to come up with a generic one-word answer. The classifications are generic in form, hard to understand and even though it's small, moderate and large which sounds easy, I fundamentally have a hard time explaining that.

Crabbing season is listed, you know, as a small concern because it's a small aquatic problem. I can't even say that clearly because it's just very confusing; therefore, it is difficult to figure out how the NRC came to those characterizations.

AT-A-19 We disagree with the NRC conclusion that most of the environmental issues they addressed are deemed as quote, generic and small for all plants, regardless of the activities and identified variables, end quote.

AT-A-20 I would enjoy hearing the response to that statement from fishermen downstream of Plant Hatch on the Altamaha or Plant Vogtle on the Savannah. Once again, that's where having other meetings outside of the area could gather some useful information that may have been missed and maybe site specific that wasn't addressed earlier.

AT-A-21 As we saw in Eva's presentation, at least two site-specific environmental issues were identified, threatened and endangered species and environmental justice, with four other issues listed as quote, conditionally site specific. That is ludicrous.

AT-A-22 We request that licensees undergoing or planning decommissioning require a new environmental assessment. This will become more clear as I go on.

AT-A-23 It is not acceptable to give the option of using recent environmental assessments. What is the definition of recent? For instance, data from the 1970s on several fish and seafood species was originally used in the EIS for Plant Hatch relicensing.

Though newer data later emerged because of Fish and Wildlife Service and other people raising a bunch of concerns, we finally got new information. I don't have any safeguard that Plant Hatch won't use studies from the 1970s or from the year 2000 on the endangered species such as the shortnose sturgeon when they begin decommissioning decades from now.

So I would like a definition of what is recent and if we're talking about endangered and threatened species, that list is going to change when a lot of these power plants actually go through decommissioning because species are being put on and taken off those lists all the time. So what is recent? I would request, our organization requests, that they always have a recent, a new, like that year that they decide to decommission, an environmental assessment.

AT-A-24 Additionally each nuclear power plant has a different historical performance record that may have impacted the surrounding environment in ways that are unique to the facility. What makes it acceptable to ignore these operating histories when decommissioning?

AT-A-25 Furthermore, some nuclear plants, like Hatch, have overflowing volumes of nuclear waste that are now being stored outdoors which impacts the environment and could affect decommissioning.

AT-A-26 Likewise, there is no experience in decommissioning nuclear reactors that have operated beyond the original 40-year license period. Again, Plant Hatch may pose a unique example if the aging plant is relicensed.

AT-A-27 The degradation that will occur due to the constant bombardment of radiation could affect how the plant is dismantled and how the radiation exposures will be for workers and could easily add new accident scenarios. For instance, Plant Hatch has a cracked core shroud, and I know other plants do, too. But I don't know -- that's question, I guess, have any of those been dismantled? How will that deficiency affect decommissioning?

These factors, among others, must be incorporated in addressing the decommissioning of individual facilities.

Ed Martin touched on economic concerns and we have some similar and a couple different
AT-A-29 from his. Georgians for Clean Energy requests that all decommissioning costs be borne by the parent company of the licensee in perpetuity. The parent company should not be allowed to recoup the cost of decommissioning from the ratepayer or federal government through the taxpayer.

Ratepayers and taxpayers in Georgia have already had to pay far beyond their share of promised cheap nuclear power that has brought one of the largest rate hikes in the history of Georgia. Furthermore, private landowners, whether residential or commercial, farms, federal, state, county, city, community properties or others should not be responsible for the costs of monitoring, containment or clean-up.

AT-A-30 Georgians for Clean Energy is also concerned about economic impacts to the local communities associated with decommissioning. Currently, according to the NRC relicensing documents on Hatch, Appling County, where the plant is located, receives an unhealthy 68 percent of its tax revenue from Southern Nuclear. Provisions for environmental staff and maintenance staff be established in perpetuity and all costs be borne by the parent company of the licensee.

The local community should not have to shoulder these costs. In the case of Appling County, after they lose their tax base, they would not even be able to remotely afford any type of monitoring. Again, it is apparent that communities are left dealing with tremendous problems and little or no resources to address them properly. Quite a reward for being loyal to the company.

AT-A-31 Regarding economics, the NRC needs to pay attention to decommissioning costs proposed by Georgia nuclear utilities during rate cases and other proceedings so there is not a situation created where much needed monitoring and maintenance is ignored simply because there was no regulatory attention to the real cost of decommissioning.

I'm finishing up. My apologies for taking more than five minutes.

On the environmental side, we have several concerns with the environmental impact section of
AT-A-32 the draft. Again, we feel that a site-specific analysis must be done for each individual nuclear plant. This includes the area of the site itself, along with downstream and downwind regions and all areas within the ingestion radius of the facility.

AT-A-33 There are right now already elevated levels of some radioactive contaminants nearly 100 miles downstream of Plant Hatch and Plant Vogtle.

AT-A-34 It is hard to believe that decommissioning activities will have a small impact on water quality or air quality. Construction and demolition sites across Georgia, most of which do not have nuclear contaminants fortunately, contribute to the degradation of our rivers and air. How can an enormous project such as decommissioning an entire nuclear plant, which will involve the handling of nuclear contaminated materials have a small impact?

AT-A-35 We request a copy of the analysis that was done to make this determination.

AT-A-36 Additionally, a thorough analysis of groundwater impacts seems lacking. Given Georgia's current concern over the Floridian aquifer, it is again hard to believe that something fundamental to life , water, is being analyzed generically. Future generations will depend on the resources that we are polluting today.

AT-A-37 We adamantly disagree with the possibility of rubblization as a method of decommissioning. Chopping up a plant and storing it on site not only sounds ridiculous, but also is grossly negligent of the fact that there are facilities designed, built and licensed to handle radioactive materials.

Georgians for Clean Energy does not promote the idea of shipping nuclear waste to other people's backyards, but recognizes that although organizations critical of nuclear power often forewarned local communities of these potential dangers, plant owners never told communities near nuclear plants that they were also accepting a permanent nuclear waste dump. Rubblization is an egregious assault on the public participation process and a devious example of corporations casting aside those communities that supported them over the years.

AT-A-38 Georgians for Clean Energy also opposes any efforts by the nuclear industry or licensee of a decommissioning nuclear plant to "recycle" -- and I use that in quotes -- radioactive materials for release into the marketplace. It is appalling that there may be an option for companies involved in a technology that can cause its own facilities to become radioactive, to financially benefit from selling the hot garbage to unsuspecting citizens in the form of daily household products.

AT-A-39 Under health and safety. The nuclear facility's land, even after decommissioning, must not be allowed to revert to public or private use, even if the NRC believes that the radioactivity on the land is less than 25 millirems per year. Additionally, in no circumstances should future buildings, structures, etc. be built atop the former nuclear site.

The draft GEIS mentions that tourism activities are planned for the Trojan nuclear plant in Oregon after decommissioning. Under no circumstances should that be allowed at any of these sites. Bringing tourists or school groups to nuclear plants that are running now is not

acceptable. It's dangerous. I was just in Oregon for my honeymoon, and I just can't imagine going and touring that site. There are a lot of beautiful things in Oregon but the Trojan plant ain't one of them.

AT-A-40 Ms. Barczak: As we have stated in earlier comments, adequate attention to issues surrounding economic justice and the long-term negative economic implications of decommissioning plans in the community have not been thoroughly studied. Reactor sites are often contaminated and made undesirable and unsafe for future economic development.

AT-A-41 And again, we feel that site-specific studies should be conducted. The economy of rural Georgia is much different from that of urban New York.

AT-A-42 In conclusion, as we have stated earlier, the methods used to decommission a nuclear plant will affect not only the communities of today but also the livelihood of future generations.

AT-A-43 The nuclear industry is leaving humankind a legacy of devastation, epitomized by its long-lived and highly dangerous nuclear waste.

They are unable to solve their waste problem and now, when faced with the eventual shutdown of their plants, are unwilling to take measures to ensure that the public is protected.

AT-A-44 The NRC is charged to protect the quality of the human environment and we ask that they can -- that they do all they can to uphold that charge. The current draft GEIS is not protective and needs major improvement.

AT-A-45 We again stress system need for site-specific EIS studies on decommissioning for nuclear power reactors. Our communities, from the people to the waterways, are unique and entitled to nothing less.

Thank you very much.

AT-D Ms. Kushner: Thank you.

My name is Adele Kushner and I'm with Action for a Clean Environment, which is a group located in northeast Georgia -- very rural northeast Georgia. But all of our members live about 50 miles from the Oconee plant, so we're specifically interested in what's going on.

I'm not really prepared for this. Our group deals with so many issues, air quality problems from asphalt plants and feed mills and anything else that comes up. Also, I haven't even read that big fat supplement. So I'm just speaking in response to what I have learned, and the more I learn, I think the worse it gets. I would love to have a copy of Sara's comments because she hit on a whole lot of stuff that I would like to know more about.

What I do know, I learned from someone who lives and works near the Yankee Rowe plant in Massachusetts and told a group of us what happened when it was decommissioned and cut apart. You know, closed down and cut apart. She said the whole process was just horrendous.
AT-D-1 The cost is one thing. It was awful, very high cost, up in the millions. I don't remember how
AT-D-5 much. But things that shouldn't have been done did happen and things -- you know, when they were washing some of the surfaces to prepare for cutting apart and shipping the washwater -- I've spoken about this to some of the people already. It just went into the ground. It was supposed to be contained and it wasn't. And other things like that that happened that were not supposed to happen, but they do happen.

I don't know if it was the supervision, or the plan, or whatever it was. I understand this was after 1991 when there had been experience with some decommissioning. It was -- it was poorly
AT-D-2 done. There was danger to the workers. The workers were not prepared. They didn't -- whatever the -- the moonsuits they were supposed to wear or something, they often didn't. And it was -- I mean it's dangerous.

AT-D-6 This is a very dangerous material and the danger lasts for such a long time. If you're going to cut apart a plant and pack it and ship it, everybody along the route is exposed to the danger
AT-D-7 and whatever is left is an exposure to the people who still live there. You talk about burying it somewhere, well everybody is in danger when you do this kind of thing. So it doesn't make any
AT-D-9 sense to me to ship things off to someplace else. You need to keep it where it is and somehow seal it off, and then you have to monitor it for years and years and years because none of this goes away. So the whole process just seems like it's fraught with difficulty.

AT-D-3 Generic things sound good, but each plant is different. I was originally thinking well, they are all kind of the same system, so it wouldn't matter, they are on the same principle, but they're not. I mean, there are differences.

AT-D-8 The Oconee plant, which I'm near, which we've gone to visit, it scares me. I mean the reactors look like they're really solid. One thing they're going to do is cut into the wall to take -- to change the steam generator. They're only going to put it back and somehow -- is it going to be
AT-D-4 as strong as it was before? The excess storage -- I mean the storage in pools, but there's a whole lot setting out in dry casks very vulnerable to whatever comes along, whatever happens. I mean the whole thing is just -- I don't know how in the world they're going to deal with it.

AT-D-10 I'm now concerned about the costs, about all the broken promises, because these all sound -- all these systems sound so good. But I can remember -- I'm old enough to remember when this was going to be clean, safe and cheap. Electricity was going to be too cheap to meter. That sticks with me. And we know that it's as expensive as anything possibly could be when you consider the whole -- the whole cycle from the mining of the uranium to what happens
AT-D-11 afterwards. There's a huge process. It affects people's health. Workers especially who are not warned, who are not protected.

I'm not prepared but I'm going to learn some more.

AT-E Mr. Genoa: Yes, thank you, Chip. Paul Genoa with the Nuclear Energy Institute.

AT-E-1 The question goes to the issue of the rubblization and the language in the GEIS that puts part of it out of scope and part of it is discussed as being covered under the generic environmental impact statement supporting the license termination rule. The heart of the comment and question really gets at the issue that from our perspective is not yet covered in that license termination rule and the assumptions embedded in that GEIS. And that has to do with the scenario of what happens and what are the assessments for the radiological materials post license termination.

The rubblization is one angle that begs that question. A similar one is a technical issue we talk about as an embedded pipe. If you can imagine, a large nuclear facility with very thick walls. You know, three or four feet thick with piping that penetrates these walls. In fact, the piping is literally embedded within the concrete walls. The standard approach is to truncate that piping as it breaks into an open room. To clean that piping -- the length of that piping, to survey that piping, then to seal the ends of that piping and fill it with the grout or some other material to fix any residual radioactivity within -- inside of it.

The license termination rule would have you access the potential dose to a occupational worker in what they call the building scenario, or building occupancy scenario. We understand how you might address the potential exposure from this embedded pipe onto an individual who would work in that room. You might sum that direct exposure from the pipe with all other exposures that might occur from materials within the room, put them together, compare it to the standard, 25 millirem, and determine whether you meet the criteria or not.

The question is do you need to assume some refurbishment scenario post-license termination? Do you have to assume that someone determines it would be in their benefit to knock the wall down, to remove this embedded piece of pipe and to do something with it? You know, one could postulate that.

The question the industry asks is how do we address that. Do we come up with some scenario and refurbishment that would account for that? What would that scenario look like? We need that information so that we can do those assessments. Our understanding and reading of that GEIS and the license termination rule is that that refurbishment scenario is not limiting, that, in fact, the building occupancy scenario of someone working 40 hours a week, etc., etc., in that room is limiting if that's the case. That's what we wanted to know.

I draw the parallel because this is similar to the rubblization idea. Again, the idea that when you dismantle these buildings, knock them down, there will be basement structures. You're going to knock them down and you're going to end up with rubble on the side. You need to fill these basement voids. You either need to bring material from off site or you could potentially use some of this fill, this rubble fill as beneficial fill for these facilities. There could be residual radioactivity associated with it and it would be subsurface.

Again, the issue is post-license termination. How do you access a potential risk to a member of the public from that material? It's fairly straight forward to understand that the resident farmer scenario requires you to assume that that residual radioactivity could affect a resident farmer through groundwater pathways, inhalation and ingestion. You know, getting into crops, irrigation, all of that.

The question is, is there some unique pathway that needs to be assessed for this material, such as an intruder pathway? Do we have to assume post-license termination that someone comes in and digs up this material and uses it to build a pier or uses it for rip-rap or for a roadbed or some other material?

Clearly the industry could calculate the results of those scenarios. It was our understanding in reading the original GEIS for decommissioning back in '88, that that was considered and assumed to be non-limiting. That the resident farmer would be, in fact, limiting.

Our understanding was this GEIS would sort of beef that up because of this new idea; however, it appears that that was sort of left out of scope and appropriately maybe so. Perhaps that is in the scope of the license termination rule. But my point in all of this -- and I know it's rather technical and I'll be happy to express in layman terms anything that's not easily understood.

The industry wants to do the right thing. They need to know what the requirements are. This issue of what are these hypothetical potential pathways post-license termination, I believe, one easily addressed. We just need to know what the boundaries are and what the assumptions are that we need to impose, if any. We had hoped for some of that to come out in GEIS. It may still be appropriate to do so, otherwise perhaps other guidance is necessary.

AT-B Ms. Zeller: Okay. My name is Janet Zeller and I'm Executive Director of the Blue Ridge Environmental Defense League. We'll have our birthday -- 18th birthday as an organization in March. We work in North Carolina, South Carolina, Tennessee and Virginia and occasionally in north Georgia. I'm looking forward to coming back to Adele's community in February.

AT-B-5 We have some grave concerns about the process. I would like to just say that we would like to reiterate the comments so beautifully presented by Sara Barczak about the process. There is a real problem I think with public knowledge about the opportunities for input into NRC's decision making. And one of my favorite attorneys describes the NRC decision making processes and
AT-B-6 draft documents as whipsawing the public because it really may matter to you, Ms. Hickey that the license termination document details one level of exposure while the draft EIS on decommissioning details another level of exposure.

AT-B-7 But to the people in the affected communities, it is a problem and that problem is one that they're going to have to live with after the NRC has washed its hands of the site. So we do have some real problems with the fragmentation of the decision making process and the public participation opportunities, and believe that indeed that there are NEPA violations.

We are on record opposing the license extension for -- in fact, we've intervened in the license
AT-B-8 extensions for the Duke reactors, McGuire 1 and 2 and Catawba 1 and 2. We believe that the decommissioning document has definitely underestimated the impacts of the additional license extension period. In fact, the minimization of that impact I think is a major flaw in the document in that there needs to be a reassessment of all of the impacts, including cost, but also including the aging issues, including the waste issues and other off-site environmental impacts for license extension periods.

AT-B-9 The potential use of plutonium fuel at the McGuire and Catawba reactors is not adequately addressed in decommissioning -- in this decommission document. In fact, the costs of decommissioning are nowhere to be found. So we would request that there be a supplement right away before mistakes are made in licensing the use of plutonium fuel at the McGuire and Catawba reactors because the decommissioning impacts, including costs, and also including the additional radioactivity, the additional waste, those are real impacts that are basically left unaddressed in the generic environmental impact statement for decommissioning.

AT-B-10 We're familiar with some of the decommissioning models that the NRC is using. Believe me, Yankee Rowe, Connecticut Yankee and Maine Yankee are not good models for anyone to follow for subsequent decommissioning.

In fact, this is such an important issue that it really is inappropriate, I think, to make it up as you go along. We were able as an organization, with some help from our friends from the Citizens Awareness network in western Massachusetts to track the train carrying decommissioned parts of Yankee Rowe from western Massachusetts all the way to Barnwell.

Now this was supposed to be a dead secret, what route the train was taking through the several states, Pennsylvania, Virginia, et cetera, on its route to the burial ground near our Aiken, South Carolina office. It was very easy for us to, with little man and woman power, to do the train spotting for tracking -- no pun intended -- the route, the progress of this -- of this waste shipment.

So I hear in Rockville, Maryland at the Atomic Safety -- no Atomic Reactor Safety Board meeting and at the recent hearing in Rock Hill, South Carolina and again tonight that there is a top to bottom review of security and terrorism issues, yet the process of decision making continues unabated. We need a cessation in NRC decision making until there is this top down review of security and terrorism issues.

AT-B-11 If an organization like ours can spot a train carrying very dangerous radioactive waste, any terrorist organization can do the same thing. You've got to take that into consideration.

AT-B-12 The whole approach -- the whole probablistic approach to risk is inappropriate. You must assume that whatever can go wrong will go wrong and that should be the level at which your risks are evaluated, not some unrealistic dream-like assessment of probability that isn't real world anymore.

AT-B-13 I'd like to invite you to come to Charlotte. At the last hearing that NRC had in Charlotte, which is in the midst of four nuclear reactors, we had standing room only. Chip was there. One hundred and fifty people I counted before I stopped being able to count. We could, I think, fill up a hearing room so that you could hear from the citizens who are directly affected by your decision making that is on going.

AT-B-14 There are changing community conditions at these reactors. I don't mean to be disrespectful to the representative from NEI, but we don't have a problem in the Charlotte area of a resident farmer. We're more likely to have a golfer going on the site of a former nuclear plant to retrieve a golf ball because the -- against a unanimous decision by the Mecklenburg County Planning Board -- last night the Mecklenburg County Board of Commissioners approved a 4,000-plus home development by Crescent, which is, of course, Duke, around the Catawba reactor. So there are changing conditions at these nuclear power plants that deserve your attention and will not fit into any generic environmental impact statement.

AT-B-15 Twenty-five millirems additional per year of exposure added to an increasing background, which is certainly man made, and I say man made. I mean women had very little to do with the decisionmaking that went into increasing the background radiation that all of us are exposed to. But 25 millirems per year additional exposure is way too much.

Mr. Scaletti may have that kind of dose to salt his cells, and his gene repair mechanisms may be sufficient to withstand that dose and he may not get a fatal cancer. Mr. Masnik may get a fatal cancer from an additional 25 millirem per year dose. This is a roulette game. So the dose is way out of line for the restricted use, not to even mention the unrestricted use, which I'll get distressed if I do, so I won't.

So I do ask you to look at what we were promised by the PR in slick talking pictures in color when nuclear power was first laid out to decision makers and to the people of the North Carolina Electric Membership Corporation who -- well, unsuspecting, idealistic folks decided to buy two-thirds of Catawba 2 nuclear plant. Which actually I guess as a member of one of those coops, I own a piece of it as well.

AT-B-16 And we were tacitly or directly promised a 50-year cooling period for the nuclear power plants. I can go back and drag out some of those documents if you want to see that. And two-year cooling periods for Yankee Rowe before it's chopped up and decommissioned is unthinkable. You know, we will not approve of and we will fight diligently in every opportunity and arena we have a hot, quick and dirty decommissioning which violates the promise of future -- safety to future generations.

AT-B-17 So I'm really interested in this entombment rule making process and I promise you that we will have a lot to say about that because that really is the only option for what to do with these plants.

AT-B-18 I certainly heard Eva loud and clear, that the amount of exposure for decommissioning is less than for operating reactors. So our organization is certainly in favor of decommissioning. Let's just do it right.

AT-F Mr. Zeller: My name is Lou Zeller and I'm on staff of the Blue Ridge Environmental Defense League and I have been since 1986.

My comments tonight fall into several general areas, but I want to begin with one brief comment, which I think is worth quoting directly because it's so striking. Within the executive summary it talks about the potential radiological impacts following license termination related to activities during decommissioning are not considered in this supplement.

AT-F-1 Within the same paragraph it talks about the non-radiological impacts following license termination that are related to activities performed during decommissioning are considered in this supplement. We are considering in this supplement the non-radiological impacts following license termination, not the radiological impacts after a license termination. This is a radiological device, a nuclear reactor. I cannot understand how that could even be in the executive summary to describe the document which is under review.

AT-F-2 I do want to talk about the physical protections and the existing regulations under 10 CFR 7355. I guess I could state this as more or less of a question. For example, what measures will the Commission employ during decommissioning to protect against radiological sabotage?

AT-F-3 I understand fully that this document is to cover non-accident decommissioning activities, but once a reactor is decommissioned, I find nothing in this thick document where it addresses at all the generic, or under generic or site-specific issues the impact and the effects on the structure, systems and components of an event which happens during decommissioning.

AT-F-4 And, of course, the radioactive fuel pools are the principle source in that case of radioactive contamination. Even 10 CFR 73.55 falls short in our estimation in the preparations for such a scenario. 10 CFR 73.55 considers only primary physical security barriers for vehicles, for isolation zones, for access to the plant, for detection of intrusion and what not. For example, it mentions that there be bullet resistant walls, floors and doors in reactor control rooms. Well plainly this 10 CFR 73.55 needs to be updated because this is woefully inadequate to consider anything which is now possible after September the 11th.

Even within this existing rulemaking process for existing outline of environmental impact assessment, the actions to date which the Commission is taking leave me to scratch my head. For example, on November the 21st of this year, Maine Yankee received information regarding as classified, safeguards information that is, for the purpose of amending the license for an exemption from 10 CFR 73.55.

This document here, which was pulled down by my colleague from the Adams site, talks about it quite specifically. Although there's not a lot of detail here, it does talk about the fact that the independent fuel storage installation sabotage assessment performed by the staff in review of Maine Yankee Atomic Power Company's application for license amendment and exemption, Maine Yankee is undergoing decommissioning.

AT-F-5 Now my point in bringing this up is that the NRC cannot continue to allow rulemaking to be driven by exemption as it has been done in the past. It lowers the bar for all subsequent actions every time an exemption is made.

The second major issue that I would like to cover in my comments tonight -- and we will be submitting written comments before the comment deadline -- has to do with radiation effects during decommissioning operations. In appendix G there is a fair amount of detail about the Veer 5 (ph) report and the excess cancer deaths and the estimates from that.

Within appendix G, there is information which gives an estimate from radiation impacts to the public of 0.8 percent. That is 800 fatalities per 100,000 people. It's also outlined as 8 times 10 to the minus 4 fatalities per person rem. Those are stochastic effects, of course, only outlined in this report.

AT-F-6 One problem here is that the only non-stochastic effects considered in the GIS -- GEIS are those related to above threshold doses which cause such things as cataracts or other high dose morbidities. This is unacceptable. There are many morbidities which are associated with low dose radiation which do not rise to the level of effects on cataracts, such as the effect on the human immune system and many other non-cancer effects. This is missing from the generic statement.

Okay, to continue on to the effects outlined with regards to radiation protection considerations in decommissioning, the generic -- the appendix G on page G-4 says that in Veer 5, quote, in general, estimates of risk derived for doses of less than one gray or 10 rems are too small to be detected by direct observation in epidemiological studies.

Number one. The linear dose response model, which is outlined again in this document, does not meet reasonable conservative risk analyses which are based on the super linear dose response relationship, which is, I think, once again a conservative method of estimating the effects on the public as well as workers in a plant during decommissioning -- well at actually any time.

Continuing along these same lines, the risk factor here of 0.8 percent amounts to, as I said before, 800 fatalities per 100,000 people. If we look at the existing decommissioning estimates of 11-person rems from the Haddam Neck Plant in Connecticut, this would amount to 8,800 fatalities per 100,000 people.

AT-F-7 Now, again, the document here outlines the fact that most -- the major impact from radiation would be from low level radioactive waste transport of the reactor itself, the vessel, to a low level radioactive waste site. People living all along the waste site, primarily people living in town around that reactor, and all along the transport route along the way to -- if it's South Carolina or Nevada or whatever ultimate destination this reactor vessel would have, amounts to many thousands of people, if not hundreds of thousands or millions of people. This level of human carnage cannot and should not be considered as quote, too small to be detectable.

Thank you.

AT-G Ms. Carroll: I'm so impressed with what I'm hearing here tonight. My name is Glen Carroll and I'm with Georgians Against Nuclear Energy. I met Chip Cameron eight years ago -- nine years ago over this issue. I want to say that I feel really honored to be participating. I feel like we're all here, we're pioneers. We don't know how to decommission and we're trying to figure it out.

So I would say with this kind of work, with maintaining good will towards each other and maybe a little prayer and divine assistance, I hope we're going to end up doing a good job.

Oh, Eva -- now I don't know, this is a pretty good thing to keep up there. Do you think you could get the definition up there because I'd kind of like a power point assist. However, I did keep looking and I did find it in the EIS. It's sort of like rubblization.

(Laughter.)

Ms. Carroll: Oh, hey, Warren. He transcribes all of our stuff when we intervene at the NRC. I've known him for a long time, too, through Georgia Tech, which is decommissioning and they didn't invite me to a meeting.

Okay, the process of safely removing a facility from service followed by reducing residual radioactivity to a level that permits termination of the NRC license.

So, you know, except for the fact that there's only one universe I know about and it's got all of this radiation in it and there's like no way to take it to -- I don't know, it's not a real perfect
AT-G-1 premise. I'm real happy to see entombment is coming up and getting more discussion because it is the area that we look to, the avenue that we think will yield the most protection for the public ultimately.

AT-G-2 One of the things that has to be acknowledged I think or anticipated is the failure of the United States nuclear waste program on all levels, so that low level dumps are not getting established, high level dumps are not getting established. Therefore, we may really have to keep a lot more of this radiation on site than we had anticipated.

AT-G-3 There's a financial assurance gap here, I feel, and this has been mentioned several times tonight. I'll say two syllables -- Enron. And we've got nuclear power plants, you know, they're fast becoming white elephants and getting snapped up at Salvation Army prices by multi-national corporations -- Enron. And we don't really know if we're saving up enough money -- and I could be wrong about this but I thought the money was somewhat linked to the rate base and all these plants are not operating for their design life.

And so I'm real concerned that the fund was never -- the goal was never set correctly to begin with and that we would fall short on raising the money, it may not be enough. There is inflation. So what I don't know is are these figures periodically revisited and adjusted -- they are. I would think the utilities would tend to howl about that.

Is there assurance or something for a corporation a couple of generations removed from the corporation that actually originally licensed and built the plant? They are paying, you know, sometimes a tenth or a quarter of the decommissioning fund that they acquire with the plant, and so, you know, I would like to know what the assurance is that that money won't be absconded with and just disappear -- Enron.

AT-G-4 Love Canal, kudzu, gypsy moths, zebra mussels. One idea that we've talked about for a long time, and we actually had a big meeting about it and I think the idea is probably still alive, the site-specific advisory board. Really this is outside of engineering and physics, this is thinking political science, archaeology. But thinking archaeology ahead of time, how can the people remember -- whatever we decide, how can the people remember, how can we regulate -- you know, what kind of systems can we set up?

And so I'm an artist by profession that wandered into this arena. I don't get this lax visual imagery, I'd like to see more pictures. So I'm going to describe an idea I have for you --
AT-G-5 entombment taken to an aesthetic level.

You've got like contaminated soil, maybe even mill tailings if we could figure out how to get them there -- fill everything in and just build out soil barriers, barriers, barriers, make it a pyramid, make it vast, make it huge -- sell tickets for the first few generations. And I even think possibly the geometric -- the geology of this might even be an earthquake that just keeps falling in on itself. You hit it with something, it just keeps falling in on itself.

Now there's a question of subterranean -- what's the subterranean issue here and, you know, forget practicality, forget cost, which I would like to do that, I mean I really would not like cost to be much of a factor here. We need to do what it takes. So probably you need some subterranean things, definitely a site-specific idea I've got here.

And then let's plant spider worts around it because everybody knows that spider worts are shown to -- they have these little blue hairs, maybe they're called stamens or something that's the pollinator part of it, and they are like these incredible plants that -- there's this perfect correlation for the amount of radiation exposure it gets.

These little things turn pink, these little hairs turn pink. And it's been like studied and it's a good correlator. So we need to plant the spider worts, which is basically a weed and then we need to teach the people how to analyze. You know, we can't forget the technology of microscope. That's pretty easy -- lenses. And the site-specific advisory board and actually, you know, this sounds kind of corny, but I'm your artist speaker tonight -- the nuclear priesthood has been talked about seriously. Religion is probably a good model for long memory.

I cannot thank my colleagues enough for being really prepared with really thoughtful, with technical comments. I think the fact that we've been working on this for nine years -- I remember you from previous meetings -- this is deliberate and it's what's required to do it.

Thank you.

Ms. Carroll: I'm not going to invoke Atlantis or Elvis -- I could -- and Diablo. I figure it's getting subducted over there on that leading edge and that might be a solution, you know, underneath the mantle.

AT-H Mr. Ferguson: Tom Ferguson, Physicians for Social Responsibility. Very few words.

AT-H-1 My executive director asked me to express our concern for we want this process to be transparent. Allow public accessibility to the process, knowledge of the standards. Do no harm. We represent physicians who take the Hippocratic Oath. Take no risks that can be avoided. It seems ridiculous to come in here and say to professionals "be careful." But Adele quoted the too cheap to be metered promise and there's some credibility problems, so be careful.

We'll be submitting written comments.

Mr. Cameron: Okay, thank you, Tom.

I think there's a number of things that we might be able to clarify. This is not the time for the NRC staff to try to comment on the comments that we've heard, but there were a number of questions within the comments that I think that it might be useful since we have a little bit of time, for the NRC to provide some clarification on.

I'm just going to list some of these that I took down and then I'm going to ask Barry Zalcman from the NRC staff to just give us a little bit of a review of what the NRC is doing. We heard this top to bottom or bottom to top, whatever, review.

But I think Sara Barczak indicated that there was some ambiguity about how was spent fuel treated under this decommissioning process and of course there's various ways to store spent fuel and maybe Eva can talk a little about that one when we get there.

Again, Sara talked about using the example of how do you explain to a fisherman small, medium, large; that that might not sit well. And I thought, Eva, perhaps you could just talk a little bit more about the small, medium and large. I know you already talked about where that was derived from, from the Council on Environmental Quality, but perhaps you can say a little bit more about that.

Lou Zeller read a statement from the executive summary about non-radiological after license termination being considered, but yet some radiological not being considered. And I think there's a fairly straight-forward answer to that, that I think Eva can also address.

And finally, I think it might be -- Glen brought up Enron and decommissioning and is the fund tied to operation. And Steve, it might be worthwhile for you to just say a little bit about that fund and what happens, the bankruptcy implications, all that sort of deal so that we can give some assurance on that.

And I think that other people in the audience may have some comment. I don't want us to be commenting on other people's comments, okay? Because I don't think that that's appropriate to do that. But if you do have a fact that might be useful information for people, I'm thinking, Paul, you said that you had a couple perhaps comments, maybe facts we can get out here to increase all of our understanding of this.

And before we get to those questions, Barry, do you want to come up and just say a little bit about what the Commission is doing in what we call Safeguards, protecting these facilities against possible terrorist attack? Barry -- it's Barry Zalcman.

Mr. Zalcman: Barry Zalcman again from staff.

Actually I was going to talk a little more --

Mr. Cameron: I hate to give this to you since you said I'm going to talk a little bit more --

Mr. Zalcman: I like this instrument a little better.

Before I go into security, I touched on it at the outset, I'll talk a little more about it, I want to bring us back because there's a lot of good points that you had raised, all of you, about issues perhaps that don't apply to this supplemental GEIS. I want you to understand what happens with information that comes to the agency. We take away your comments and we identify what is relevant to the action that we're trying to deal with now -- this is a supplemental GEIS, we identified what the scope of the GEIS is.

It's operating in environmental space under the guise of the National Environmental Policy Act and the agency's regulations in that arena. It is not operating in safety space -- that's an important distinction. There are matters in safety space that have environmental components. You talk about the design of the facility and the environmental factors that lead to adequate protection -- earthquakes, tornadoes and the like. Those are environmental factors but they are considered part of the design basis of the facility. That is different than what we look at in environmental space under NEPA -- that's an important distinction.

And a couple of the issues that you raised, while they may not be directly attributable to the scope of the environmental impact statement, we think are going to be sufficiently important to share with the other groups within the agency and particularly issues associated with the events of September 11. The Safeguards Group, we will share that information with them as they consider what the actions of the agency should be in response to the events of September 11.

Now we have already taken some actions. We've gone into high alert, we've issued advisories, licensees have enhanced their security activities at the plants. The agency has an operations facility, operations center, it's manned 24 hours a day. We beefed up our staffing of that. Management is engaged in that process as well as additional staff. Our regions have incident response centers, they have been manned as well.

I can share with you that we do have an ongoing intergovernmental dialogue at the federal level. We also have it at the state level, interactions with state organizations, governors and the like.

So there are a lot of activities that are already ongoing immediately in response to September 11 and then we have to look at where do we go from here. That's where I talked about the top down review. The Commission has already directed the staff, there is a task force underway looking at what needs to be done. That is likely to result in perhaps changes. That will be shared in a public arena.

Now I lament the same challenge that you have -- and I'm looking at Sara -- the same challenge that you have. When the events of September 11 occurred, the nation went into a lockdown. We were looking at not just the infrastructure that was challenged, meaning our economic base in the World Trade Center, but there is our entire infrastructure across the country that is vulnerable and we are looking at target assessments. I'm talking about the federal government, not just the Nuclear Regulatory Commission -- target assessments to decide what additional measures need to be taken.

We're in contact with Homeland Security, we're in contact with the NSC/NSA, National Security Council, National Security Agency, as to what we need to deal with. And we're not alone, it's going to affect a lot of other things as well.

So looking forward as the agency comes out and lays out its recommendations, I will share with you that some of it is not going to be publicly accessible. You don't want us talking about this in public. Some things will be publicly accessible and we will seek stakeholder engagement on those issues and when the opportunity presents itself, do stay aware of it.

Now what is the formal mechanism for the agency releasing information? It's through the Federal Register. The agency did make an attempt to release it. Since we went into lockdown as the government, we decided that there was information that could lead to vulnerabilities that could support unlawful acts that we had to guard against. And because of that, we brought down our website and we are rebuilding it as best we can. It is still www.nrc.gov.

If you go to that, you'll be able to see the best information that we have available. Our ADAMS system is back up, but there is information regarding sites that we are not going to share until we feel comfortable enough that we're sharing the right information.

When we did release the GEIS for public comment, it did go through the Federal Register, but it is a GEIS, it is not all things to all people. It's not going to satisfy every single issue. In some of the issues that you have raised, we've identified what is within scope and what is outside scope. There are different processes involved.

You know, license termination is at the back end of decommissioning. Some of these activities are at the front end of decommissioning. And it's not that we're parsing the issues, but we have a fundamental responsibility to provide the best information available. The GEIS is 13 years old, we have additional information that we can share with the public. We think it's fundamental to share that with the public. It is a living document. This is Supplement 1. There will be a Supplement 2, there will be a Supplement 3. There will be additional information that we gain through the experience that we have to continue to update this information.

Sara, you have the opportunity to participate with us on license renewal. We have a commitment, we have a GEIS for license renewal, we have a commitment every 10 years to revisit that, just to make sure we learn from the experience and we update the information. So we are moving in that direction, we are going to update the information.

Hopefully that brings you back to focusing your opportunity. We've taken your comments already, we look forward to written comments and hopefully this kind of dialogue is what can expand your understanding of the document, focus your issues and we look forward to receiving them certainly before the end of the year.

We hope that that provided sufficient opportunity, we distributed how many, over 300 copies of the GEIS nationwide through our earlier experience with scoping and through the interactions that we've had trying to reach out to those parties that did have an interest, expressed an interest already. We may not have covered everybody, but we're hoping that communication does exist within the public as well to focus issues, target the issues and get us the best information you can share with us.

So hopefully that is useful. I didn't want to take anybody else's thunder away, but this kind of interaction is essential and how we operate in safety space may not be the same as how we operate in environmental space. This is an open process, this is a transparent process.

I don't know if any of you realize but Sara has changed the way we do our environmental documents already. There was an issue that was raised on Hatch between scoping and the draft document, there wasn't a clear path and we have changed not just the document you worked on, which was the Hatch Environmental Impact Statement, but even in this one, Appendix A is the in scope activities that were raised during the scoping period, and from now and hopefully forever more, that's the way we're going to do business. But it's through the public interaction that helps us do our job better.

So with that, thank you.

Ms. Hickey: Okay. Spent fuel is one of those issues where there were parts of the spent fuel issue that we looked at in decommissioning activities and that was removing the fuel from the reactor and putting it into the spent fuel pool. The storage of spent fuel from there on out either in the spent fuel pool or in dry cask storage is one of those activities that's considered outside of scope. And in Appendix D, we talk about where those issues on spent fuel are further addressed.

From our perspective, it's not that they aren't addressed, it's just that we're not addressing them in this GEIS. They are addressed in other documents.

And I guess with that, likewise I will say once again that's also true for the radiological impacts after license termination. Those impacts are addressed in NUREG-1496, I think is the appropriate number. And that's the GEIS for license termination.

What we tried to do in the document is direct the reader where the other areas were addressed. And there are a number of them, but in Appendix D, there's a little more discussion about that. Okay?

Ms. Hickey: Okay. I think the thing to do is discuss that right now. Because the radiological impacts are discussed elsewhere, we've chosen to say they are out of scope. However, the non-radiological impacts after decommissioning are not addressed in other NRC documents, and therefore, that's why we've addressed those in our document. We say they are in scope.

I like to think that in fact what we've tried to do is look at this process holistically. I think somebody used that term. We couldn't put everything in the supplement, it would have been too large and too difficult to handle. But what we've tried to do is tell the reader where to go to find the other information.

And hopefully with your comments, if that's -- if we weren't totally successful in that from your comments, we can go back and take another stab at that.

But that's why we've addressed non-radiological impacts in this document, following license termination, but not the radiological impacts.

Okay, now let me talk a bit about the small, moderate and large. And since you were specifically interested in some of the aquatic impacts, I'm going to put Duane on the line here. I'd like you, Duane, if you could just explain the evaluation and the conclusions from the aquatic analysis and the fact that we've said that those impacts are small, and what that means.

Mr. Neitzel: I need that definition.

Mr. Cameron: And I would just note while Duane is coming up that in reference to where Sara was starting from in terms of the fishermen, for example, that the fact that an impact is said to be small doesn't mean that it's not an important issue, an important resource to be looked at. And I don't know if there's any confusion about that or not.

Ms. Hickey: Oh, okay.

Mr. Neitzel: When we were doing the impact stuff and going through those matrices, I was responsible for focusing on the aquatic stuff. As a team, we kept looking back to this level of significance that's listed here in the executive summary and then it occurs again, it's on page xiii in the executive summary.

And that's what we kept coming back to, small being not detectable or so minor that it won't destabilize or noticeably alter the attribute or the resource that we were dealing with. Moderate, sufficient to alter but not destabilize. And large, clearly noticeable and are sufficiently large and could alter the system -- so we looking at those. Again, whether it was aquatic, terrestrial, but in those terms -- detectable -- or not detectable, detectable but not going to destabilize the situation, or clearly detectable and could cause some alterations.

So that was our guidance and then when we looked at issues and subissues like in aquatic, we looked at fish, plants, the community -- you know, all these issues. And are the activities that are within the scope -- and then we went back to the definition of generic, which is also in here, that the impacts -- again, this starts on, in the executive summary on page 8 of the executive summary. Has the issue been determined to apply to all plants or some plants of specific -- we've got examples here -- specific size, specific location.

I remember on location, we were dealing with fresh water versus marine, riverine versus lake. So specific location. For specific type of cooling system or site characteristics and then looking now does this type of impact to fishery apply to all sites, or do we have to lump them in marine or freshwater.

Then we described, we looked at these criteria for small, moderate and large, and assigned that. And those are in these matrices that are in the appendix, on how we stepped through that matrix each time, each time going back and looking at these definitions. That's what we dealt with and we're hoping we communicated to all the readers. And then, you know, what does it take to mitigate that if there is some associated impact.

So it was stepping through the matrices that are in here by those definitions. And I think one of the things that we talked about a lot on Eva's team and we talked with NRC on this, on making these statements, is the generic, we were not asked to preclude an assessment of an impact at a later date.

Generic was at this point in time with this information to say here are the impacts that are going to require site-specific information, you know, as this process proceeds. And one of the important things that we keep hammering ourself with, NRC keeps saying is there's always new and significant information that can arise and working for NRC, it's our responsibility. NRC has it, I know they look for it, the licensees do. We get stuff from the public also. You know, new and significant information means a new assessment.

So don't take -- or at least this is the way I've been taught in working this -- don't take generic as it's off the table, take generic as, you know, we've lumped these together so you can focus on what we think at this time is important and then look for new and significant information so we can come back to these that are new and significant. But these definitions were really important to following that. And I think if you apply that -- no disruption, you can apply that to terrestrial plants, to a fish community, a mussel community -- all these other issues.

Ms. Hickey: So in fact when we say that to the aquatic ecology, the impact is small and generic, what we're saying is for all the decommissioning activities and the evaluation that we did, that we didn't see any disturbance in --

Mr. Neitzel: Detectable, nothing detectable.

Ms. Hickey: Detectable disturbance to the aquatic ecology.

Mr. Neitzel: And that's based on information we got from the public, it's based on the review of literature, it's based on our visiting power plants that were being -- were in the process of decommissioning. The -- what do you call it -- history or the experience -- you had a specific phrase, what we've learned so far, what we're learning as we go along. And then the open literature, technical reports and published documents.

And so what we're saying is based on all that information, we don't see where the activities inside the operating fence for aquatic communities will even be detectable, they're so small that you won't even see them, they're small, they're going to be the same everywhere and that's the statement we've -- that was the conclusion we came up with. That's how we did that.

Mr. Lewis: Steve Lewis, General Counsel's Office, NRC.

One thing I wanted to say is that a number of comments that I heard which were to the effect that we ought to include more on the costs of decommissioning in this GEIS, was something that struck me as a very, very thoughtful comment and I'm accordingly, thinking about them, which means I don't have a response to them right now, but I thought they were good points.

The -- as far as bankruptcy goes, this is obviously a point of considerable concern to the federal government and fortunately the Department of Justice agrees with us that there's a good deal of case law that we have on our side to the effect that these funds are not part of the assets of the estate that are available to be invaded, if you will, or used by other creditors. They're treated as outside the estate for that purpose. They are considered to be governmental in nature and they also partake of a protection that is related to their health and safety and environmental protection function.

Having said that, bankruptcies are very contentious proceedings and so we don't just rest on the fact that we have cases that say what we think will protect us. We go to the Department of Justice and we get the Department of Justice attorneys to represent us and vigorously make sure that those cases are accepted by the bankruptcy judge and that the monies in those trust funds are preserved for the purpose that was established.

That's really all I had to say unless there was some aspect of this that I missed.

Mr. Cameron: No. I think that what you're -- in case it isn't clear, but that the decommissioning fund is not going to be affected by bankruptcy because the fund is there and the creditors of that corporation can't get at that fund. It's preserved. So I think you've done it, Steve.

Mr. Lewis: That's correct.

Mr. Cameron: Thank you very much.

This is, is the fund tied to operation. Is that what you're going to talk about? Who knows what you're going to talk about.

(Laughter.)

Mr. Masnik: Rather than try to interpret your understanding of his question, I'll just respond directly to hers. She had a couple of comments. One had to do with periodically updating the fund, which periodically it is updated, and the staff does an assessment of burial costs which change over time, and licensees then adjust their amount of money that they put aside. That was the question.

AT-G-7 Ms. Carroll: And the other is, isn't this fund built through rates, so what happens if it goes off line or even if the company is no longer billing. There seems to be a couple of vulnerabilities.

Mr. Masnik: Yeah, the requirement of the regulations is to put the fund aside. It doesn't really specify how the licensee gets the money. Licensees of course hope that they can pass that cost on to the ratepayers but if the PUC, for example, doesn't approve it, the licensee has to put in the funds out of their own profits.

You mentioned also that you were concerned about premature shutdowns and we've actually had a number of plants -- the regulation to establish a decommissioning trust fund came into being in 1988. We had a number of plants shut down in the late '80s and early '90s and obviously the fund was not fully funded.

In those cases, the licensee has continued to collect funds and contribute to their decommissioning trust fund. And what they have done, of course, is model their decommissioning activities around the availability of funds. If they still have 60 years to do it, in some cases the licensee would either put the plant in long term storage for a couple of years or they would pace the decommissioning activities to match the funds.

In one case, in Trojan, there was a period of time where they actually exceeded the amount of funds that they -- or they speculated that they would exceed the amount of funds in their trust fund, in which case they went out and borrowed money to continue the decommissioning.

So the bottom line is that licensees have been very creative about obtaining the money and continuing the decommissioning process. We were very concerned about these plants, particularly the premature shutdowns, whether or not they would be able to accumulate the funds. It appears that so far everything has been going along reasonably well.

Mr. Genoa: Thank you, Chip. Paul Genoa, Nuclear Energy Institute.

AT-E-2 It was Ed Martin who asked the question about sort of the discrepancy or the debate between the EPA and the NRC standard for site cleanup or license termination and I think that has been an obstacle to public understanding and acceptance of decommissioning. While it's not unexpected, if you gave two different regulators authority over the same activity that they might develop different approaches towards regulating that activity -- and in fact that is the case.

They did develop different approaches, but when one looks into it and if one really goes in depth into looking at it -- and of course, these are technical issues and we all like to sort of come up with a quick sound bite like answer and unfortunately they don't always lend themselves to that, the reality is, as was noted in a GAO report on the EPA and NRC standard, that the results actually are very similar, of the two approaches, that they both protect public health and safety.

Now one would think that 15 millirem on average per year versus 25 millirem on average per year -- that one would look at that and say well obviously 15 is less than 25, therefore, it must be more protective. In fact, one has to look more closely at what the assumptions are. Twenty-five millirem by the NRC is an all pathway analysis that assumes the worst case in any year.

EPA assumes a 30-year average, what is the average exposure over an entire 30-year period. In fact, when you look at light water power reactors that we're talking about here, who typically have cobalt and cesium as the prime isotopes that drive the exposure, you find that the NRC model of 25 millirem for those isotopes which doesn't take into account decay because it's the worst case, generally the first year after license termination -- actually results in a more strict standard than a 15 millirem average over 30 years. In other words, you can leave more radioactivity behind under the EPA standard, by the way it's designed, for light water reactors than you can under the NRC standard.

So that was the point I wanted to make. And the most recent policy issue that you could look to is that recently at the West Valley Project, the EPA found that the NRC standard of 25 millirem was acceptable and was protective of public health and safety at that site. It met EPA's criteria.

Mr. Cameron: Thank you very much, thank you, Paul.

Janet, do you want to give us one comment before we adjourn for tonight?

AT-B-19 Ms. Zeller: I guess I'd like to just comment that to the public and to many non-profit organizations, generic means you may say this, you may not say that; this is on the table, that is not on the table. And what happens is that people do make comments that affect their communities and affect their safety and if they are indeed outside the scope of a particular process, I would truly love to believe that those comments are not lost. But at this point, my experience doesn't lead me to be sure that that's the case.

So I'm challenging NRC staff, all of you I believe are genuine in your concern about our welfare,
AT-B-20 and I would challenge you not to lose any of the comments that have been made about security or any other issue that you consider outside the scope. And make certain that those do surface somewhere.

AT-B-21 I'd also like to point out that what happens in the real world is different from your idealistic presentations and your idealistic views of what ought to be happening. And we have such things as the nuclear waste train carrying Yankee Rowe waste coming into the town of Roanoke at 9:00 on a Friday evening with a street festival going on and you know where the railroad track goes in Roanoke, it comes right into downtown.

And all of the highways were blocked off for the festival, there were thousands of people there, having come into the county for this festival. And that train sat there for hours. And if they were really only emitting 10 millirem per hour at six feet -- and believe me, people were closer than six feet, a bunch of them ran up to it, although our people who were there tried to stop them and get the crowd to move away from the train. There was nobody there who was doing that function except us.

And so, you know, in the real world, what -- the decisions that you make come down to people's communities and so I don't need to preach at you -- well, yeah, I do. You've got to do better, you've got to make assumptions that are way more conservative than what you're doing. And you've got to assume human failings.

AT-B-22 And so much of what is in this document depends on the skills and the experience level, which are lacking, because decommissioning is new, just like plutonium fuel is new. NRC does not know what it's doing, the people who are on these reactor sites don't know what they're doing and so if safety depends on human capability, it does too much by the way in this document, then you know, that's not very reassuring and I'm glad I've got the last word.

(Laughter.)

Letter 1, page 1

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Manager of Nuclear
Oversight and Regulatory Affairs

December 27, 2001

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Subject: **"Notice of Availability of the Draft Supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities and Notice of Public Meetings," 66 Federal Register No. 218, page 56721 (November 9, 2001)**

Gentlemen:

In the subject Federal Register Notice, the U S. Nuclear Regulatory Commission (NRC) solicited comments on the draft supplement to the Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities as issued in October, 2001

For the past thirteen years, the original GEIS on Decommissioning of Nuclear Facilities, NUREG-0586, has provided a comprehensive and robust evaluation of the environmental impacts associated with decommissioning of nuclear facilities. Nevertheless, we support
CL-01/1 the NRC's current efforts to update the GEIS for nuclear power plants to reflect the industry's experience in decommissioning and to more fully consider issues like partial site release and re-use of concrete rubble as fill

The draft supplement provides a detailed discussion of the impacts of decommissioning on eighteen environmental issues. Overall, the conclusions provided in the draft supplement seem reasonable There are, however, some issues that would benefit from additional clarification by the NRC:

CL-01/2 1. **The time frame for assessing the magnitude of the environmental impacts is not clearly discussed.** In some instances (terrestrial ecology page 4-20, lines 39-41), the draft acknowledges that some impacts will be temporary but once decommissioning is completed, not significant The discussion of other issues is silent with regards to when the impact is assessed For example, dewatering for a relatively short period while sub-surface foundations are removed would be performed in accordance with a National Pollutant Discharge Elimination System (NPDES) permit (section 4 3 2).

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Letter 1, page 2

However, the impact on the water table during this period of decommissioning would probably be noticeable. Once dewatering has ceased, the water table would most likely return to its pre-decommissioning level. The licensee would reasonably conclude that dewatering during decommissioning is a SMALL (not noticeable, does not de-stabilize any important attribute of the resource) impact once decommissioning has been completed and is addressed in this GEIS Supplement. The NRC should revise the GEIS Supplement to clarify that the magnitude of the impact should be assessed once decommissioning activities have ceased and the license is terminated

CL-01/3 2. **Activities that require State or local permits or approval should be considered to have a SMALL impact under the GEIS.** Licensees will be required to obtain approval from State and/or local agencies for several activities performed as part of decommissioning and site restoration These activities may include routine discharge of non-radiological liquids, dewatering, removal or modification of circulating water conduits, and use of portable combustion engines. Typically, the regulations governing approval for these activities require that the regulatory agency perform an assessment of the environmental impact(s) and, as appropriate, establish mitigating measures as permit conditions In the case of water quality issues, the NRC relies on the licensee's compliance with the NPDES permit to conclude that the magnitude of the impact(s) is SMALL. The NRC should revise the GEIS Supplement to clarify that the NRC will consider the impact of an activity to be SMALL and rely on the licensee's compliance with a state or local permit, including any mitigating conditions

CL-01/4 3. **The water quality (section 4.3.3) discussion does not address the potential impact of dewatering on the quality of ground water.** If, for example, the ground water is a source of potable water and the facility is located near an ocean, dewatering could impact the quality (salinity) of the potable water. The NRC should revise the GEIS Supplement to clarify that the NRC will rely on the licensee's compliance with the NPDES permit for dewatering to conclude that the impact is SMALL

CL-01/5 4. **The potential impacts of removing circulating water conduits on water quality or aquatic ecology are not consistently discussed or are considered an exception from the staff's conclusions.** The Executive Summary states that the "removal of uncontaminated SSCs (such as the intake structure or cooling towers) that were required for the operation of the reactor" are included in the scope of the GEIS. However, chapter 4 does not discuss the potential impacts of removing circulating water conduits on water quality (section 4.3 3) and the staff considers removal of these structures to be an exception to the generic evaluation for aquatic ecology (section 4 3 5) Similarly, the tables in Appendix H do not address this issue. Realistically, the licensee will have to comply with state and/or local regulations to

remove the circulating water conduits or cooling towers The state and/or local agency would perform an environmental assessment and, as appropriate, establish conditions in the permit to mitigate any environmental impact(s). As in the case of water quality issues, the NRC relies on the licensee's compliance with the NPDES permit to conclude that the magnitude of the impact(s) is SMALL. The NRC should revise the GEIS Supplement to clarify that the NRC will rely on the environmental assessment performed for and any mitigating conditions included as part of the state or local permit for removal of circulating water conduits.

CL-01/6 5. **Facilities included in the NRC's review of information during preparation of the draft supplement should be able to use the NRC's conclusions on socioeconomic impacts instead of performing an additional assessment along with a license-amendment request.** In section 4.3.13, the results of the evaluation stated (page 4-56, lines 30-32) that "In the 21 decommissioning case studies observed, it is concluded that facility decommissioning should have a SMALL socioeconomic impact on low-income and minority populations". At the same time, given that populations differ near each reactor site, the staff concluded that environmental justice was a site-specific issue. The NRC should revise the GEIS Supplement to clarify that licensee of a plant that was one of the case studies can refer to the staff's assessment that this was a SMALL impact instead of having to perform a site-specific evaluation and submit a license amendment request.

CL-01/7 6. **Public opposition to a facility is not an objective criterion for determining the impact of decommissioning on aesthetics.** In section 4 3.15 2, the magnitude of potential impacts on aesthetics is described as proportional to how vigorously the plant is opposed by the host community. Opposition to a facility is frequently expressed by a few vocal individuals or groups who do not necessarily reside in the area but who are philosophically opposed to the peaceful use of nuclear power. These individuals will continue to speak in opposition against a facility as a matter of principle, even when the facility begins decommissioning and site restoration Since aesthetic issues are a function of each individual's perception, opposition to the facility should not be used as a criterion for assessing environmental impact A more objective and justifiable approach would be to apply the other criteria described in this section (the facility's impact on the skyline, noise, land disturbance, traffic) or to consider recreational use, if any, in determining the magnitude of decommissioning impacts

CL-01/8 In a related issue, there continues to be a gap in regulations concerning the release of slightly contaminated solid materials. In both partial site release without a license termination plan and license termination for the entire site, residual radioactivity may

remain as long as the exposure criterion of 10 CFR 20 Subpart E is satisfied. Conversely, this same residual radioactivity is treated as licensed material prior to license termination — regardless of how little the amount, concentration, or dose significance — and can only be disposed of at a licensed facility. This double standard poses an incentive to retain radioactive material on-site until the license has been terminated to avoid potentially excessive costs for radwaste disposal, while creating a longer term risk for additional site cleanup required by other regulatory authority or court of law. While we recognize that the US Nuclear Regulatory Commission (NRC) is seeking to resolve this discrepancy through study by the National Academy of Sciences and further agency deliberation, this process may take several years. Prolonged delay contributes to the erosion in public understanding and confidence in government policy as well as the lack of resolution mentioned above for licensees. Public policy is needed to define the quantitative dose and radionuclide characteristics that have no discernible public health consequences.

Southern California Edison appreciates the opportunity to comment on the draft supplement. If you have any questions concerning these comments, please contact me.

Sincerely,

RC Clark for
A.E. Scherer

11/9/01
66 FR 56721
(2)

December 28, 2001

BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION
OFFICE of NUCLEAR REACTOR REGULATION
Washington, D.C. 20555-0111

THREE MILE ISLAND ALERT &
The EFMR MONITORING GROUP's
COMMENTS on the NUCLEAR REGULATORY COMMISSION's
GENERIC ENVIRONMENTAL IMPACT STATEMENT on
DECOMMISSIONING of NUCLEAR FACILITIES, NUREG-0586:
DRAFT SUPPLEMENT DEALING WITH
DECOMMISSIONING of NUCLEAR POWER REACTORS

Prepared by Eric Joseph Epstein,
Chairman, Three Mile Island Alert
Coordinator, EFMR Monitoring Group

Template = ADM-013 E-RIDS = ADM-03
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December 28 , 2001

Mr. Michael T. Leaser, Chief,
Rules and Records Branch
Division of Administrative Services
Office of Administration
Rules of Directives Branch
Mail Stop T 6 D 59
United States Nuclear Regulatory Commission
Washington, D C. 20555-0001

Dear Mr. Leaser:

Enclosed please find Three Mile Island Alert's (TMIA) and the EFMR Monitoring Group's (EFMR) Comments on the **NUCLEAR REGULATORY COMMISSION's GENERIC ENVIRONMENTAL IMPACT STATEMENT on DECOMMISSIONING of NUCLEAR FACILITIES; NUREG-0586: DRAFT SUPPLEMENT DEALING WITH DECOMMISSIONING of NUCLEAR POWER REACTORS**

The comments were prepared by Eric Joseph Epstein, on behalf of behalf of Three Mile Island Alert and the EFMR Monitoring Group Mr. Epstein is Chairman of TMIA and the Coordinator EFMR. (*See Enclosure I*). Since 1985, Mr. Epstein has testified and intervened in hearings and proceedings before the Nuclear Regulatory Commission (NRC) and Pennsylvania Public Utility Commission (Pa PUC) on nuclear decommissioning and radioactive waste isolation issues (*See Enclosure II*). Mr. Epstein's research and testimony have focused on the following nuclear generating stations. Peach Bottom 1, 2 & 3, the Susquehanna Steam Electric Station (SSES) 1 & 2, and Three Mile Island (TMI) 1 & 2. Since 1993, EFMR, along with General Public Utilities Nuclear (GPU) and Exelon have sponsored and invested $1,590,000 in remote robotics research relating to nuclear decommissioning (*See Enclosure III*).

Respectfully submitted,

Eric Joseph Epstein,

Chairman, Three Mile Island Alert

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DATED: December 28, 2001

NOTARY

NOTARIAL SEAL
Donna L. Zumbo, Notary Public
City of Harrisburg, Dauphin County
My Commission Expires October 25, 2003

State of Pennsylvania
County of Dauphin
Sworn and subscribed before me this
28 day of DECEMBER 20 01

ii

TABLE OF CONTENTS

I. INTRODUCTION 1

II. BARRIERS to DECOMMISSIONING 5

A) Current Problems with Cost Estimates of Radiological Decommissioning 5

B) Planned Operating Life for Nuclear Generating Stations 11

C) Spent Fuel Isolation 15

D) Low Level Radioactive Waste Isolation 20

E) Rate Payer Equity 23

F) Plant Valuation 26

G) Joint Ownership 28

H) Regulatory Ambiguity 32

III. SUMMARY 34

IV. NEPA & "PSYCHOLOGICAL STRESS" 35

V: CRITICISMS & SUGGESTIONS of 4.0 ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS 37

VI. APPENDIX J: INCORRECT or MISSING DATA 50

VIII. TRANSPORTATION 53

I. INTRODUCTION

CL-02/1 Three Mile Island Alert (TMIA) and the EFMR Monitoring Group (EFMR) do not dispute the contention of "electric utilities" (1) and the Nuclear Regulatory Commission (NRC) that radiological decommissioning and radioactive waste isolation expenses are

CL-02/2 subject to change and likely to increase. However, the Nuclear Regulatory Commission has

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1 The NRC promulgated revised rule making for decommissioning nuclear power plants, including an amendment to its regulations.

"...on financial assurance requirements for the decommissioning of nuclear power plants. The proposed amendments are in response to the potential deregulation of the power generating industry and respond to questions on whether current NRC regulations concerning decommissioning funds and their financial mechanisms will need to be modified The proposed action would require power reactor licensees to report periodically on the status of their decommissioning funds and on the changes in their external trust agreements (Federal Register, Financial Assurance Requirements for Decommissioning Nuclear Power Reactors, 10 CFR Part 50, RIN 3150-AF 41, September 10, 1997, (Volume 62, Number 175, pp. 47588-47606.)

In fact, the Commission specifically addressed the particular condition of nuclear utilities under the jurisdiction of regulatory authority:

"...the NRC is proposing to revise its definition of "electric utility" to introduce additional flexibility to address potential impacts of electric industry deregulation. The Commission notes that the key component of the revised definition is a licensee's rates being established either through cost-of-service mechanism or through other non-bypassable charge mechanisms, such as wire charges, non-bypassable customer fees, including securitization or exit fees, by a rate-regulating authority.. Should a licensee be under the jurisdiction of a rate-regulating authority for only a portion of the licensee's cost of operation, covering only a corresponding portion of the decommissioning costs that are recoverable by rates set by a rate-regulating authority, the licensee will be considered an "electric utility" only for part of the Commission's regulations to which those portions of costs pertain. (Pages 47593- 47594.)

Clearly, the NRC has anticipated the nuclear industry's financial apprehension, and acted accordingly by promulgating regulations to resolve the industry's concerns Furthermore, the Commission extended the definition of an "electric utility" to include

"An entity whose rates are established by a regulatory authority by mechanisms that cover only a portion of the costs collected in manner Public utility districts, municipalities, rural electric cooperatives and Sate and Federal agencies, including associations of any of the foregoing, that establish their own rates are included within the meaning of "electric utility." (Section 50.2, Definitions, p. 47605)

steadfastly refused to address the fundamental problem that has created and perpetrated financial gaps between "target" (2) decommissioning funding and actual assets on hand to complete radiological decommissioning (3). In fact, the Commission has no statutory authority to compel "electric utilities" to physically raise, maintain, secure and account for radiological decommissioning funding The NRC can authorize and mandate a preferred "mode of decommissioning", but the Commission lacks the ability to ensure the existence of adequate funding levels, i e , accretible external sinking funds

The NRC's GENERIC ENVIRONMENTAL IMPACT STATEMENT (GEIS) on DECOMMISSIONING of NUCLEAR FACILITIES-NUREG-0586: DRAFT SUPPLEMENT DEALING WITH DECOMMISSIONING of NUCLEAR POWER REACTORS does not adequately factor the financial disconnect between NRC "funding targets" and actual and realized funding pools accrued by "electric utilities". Moreover, there

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2 By the NRC's own admission, a "funding target" is below the actual amount an "electric utility" will actually need to complete radiological decommissioning

Prior to deregulation, and in states not affected by deregulation, "Electric utilities" must petition state utility commissions to recover "targeted" funding levels "suggested" by the NRC. But the Companies are not mandated by the Commission submit detailed funding plans until two years prior to site closure. In addition, if a utility has been saving for DECON, but SAFSTOR is necessitated, the funding package becomes grossly inadequate.

3 The amount of monies necessary to complete non-radiological decommissioning fluctuates from plan to plant, and in many cases "electric utilities' are not saving the eventuality.

remains a chronic shortfall between "targeted" funding levels and actual costs for nuclear decommissioning. (4)

CL-02/3 In addition to the economic gash in the GEIS portal, this fatally flawed document does not adequately address, acknowledge, account for, or compute a number of significant barriers related to radiological decommissioning; including: Cost Estimates for Radiological

CL-02/4-10 Decommissioning; Planned Operating Life of a Nuclear Generating Stations; Spent Fuel Isolation; "Low Level" Radioactive Waste Isolation; Rate payer Equity; Plant Valuation, Joint Ownership; and, Regulatory Ambiguity.

TMIA and EFMR's comments also include: III. SUMMARY; IV. THE PROBLEM with NEPA & "PSYCH STRESS"; V: CRITICISMS & SUGGESTIONS of 4.0 ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; VI. APPENDIX J: INCORRECT or MISSING DATA; and, VIII. TRANSPORTATION.

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4 WASHINGTON, Dec 20, 2001 (Reuters) - The Nuclear Regulatory Commission falls short in its oversight of funds for U S. nuclear power plant decommissioning, according to a report released on Thursday by Congress' main investigative arm.

Decommissioning a retired nuclear plant typically costs between $300 million and $400 million, and involves dismantling it and removing its radioactive components for safe storage.

The General Accounting Office report said that in some instances, the NRC's reviews were "not always rigorous enough" to ensure adequate decommissioning funds, according to the report

" The commission will review the report carefully and take whatever action they feel is appropriate," an NRC spokesman said. The agency oversees all 103 U.S. nuclear plants.

CL-02/11 The Nuclear Regulatory Commission can no longer evade its responsibilities and duties without considering the practical consequences, financial limitations, and political

CL-02/12 realities. Does any one of sound mind or body residing within the Commission really think that a nuclear power plant can be radiologically decommissioned if the funding is inadequate

CL-02/13 and the plant is prematurely shut down? Can the Commission identify a pragmatist, physicist, chemist, policy analyst, or behavioral scientist who is willing to testify that radiological decommissioning can be achieved with the fate of Yucca Mountain in perpetual limbo and the three, current "low-level" radioactive waste facilities limited by finite capacity

CL-02/14 and geopolitical considerations? Did the Nuclear Regulatory Commission "encourage" its economists, accounts, and actuaries to ignore the impact of deregulation and plant devaluations on local communities? Is it unreasonable to ask the NRC to view decommissioning through a global lens that accounts for economic reality, objective science, and fiduciary accountability? Or is the Commission intent on viewing radiological decommissioning through surrealistic prescription monocles prescribed by the Nuclear Energy Institute, the Edison Electric Institute, Electric Power Research Institute, and the Institute for Nuclear Power Operations?

CL-02/15 **The NRC, once again, has missed an opportunity to constructively participate in solving the nuclear decommissioning riddle. Radiological decommissioning requires inter-agency cooperation among federal, state, and**

CL-02/16 **local shareholders. At some point, the NRC will have to create a decommissioning vessel the incorporates reality as its guide. Frankly, the GEIS resembles a script for "Abbott and Costello" prepared by Norman C. Rasmussen, Bernie Snyder and Ken Lay.**

II. BARRIERS TO NUCLEAR DECOMMISSIONING:

A. Current Problems Associated with Cost Estimates for Radiological Decommissioning

CL-02/17 Power reactor licensees continue to rely heavily on nuclear decommissioning projections provided by the industry consultant, Thomas LaGuardia and TLG , Inc. Furthermore, TLG continues to base decommissioning estimates on flawed and specious "field" studies extrapolated from small, minimally contaminated, and prematurely shutdown nuclear reactors

No reasonable, sound or prudent financial officer operating outside of the nuclear industry would accept funding formulas and that rely on so many fluid caveats and assumptions. Recently, David Hayward, president of Hayward Consulting stated:

> In my judgment, AmerGen Energy Co.'s strategy to purchase and operate nuclear power plants does not make a lot of sense for the following reasons First, from a historical perspective, many nuclear power plants have closed down prior to the expiration of their licenses Thus, their financial performance has been lower than that originally anticipated **Second, nuclear plant owners have historically underestimated the cost of decommissioning nuclear power plants (Bold face type added)** Third, the issue of disposing nuclear waste has not been fully settled. ("Plant Valuation: Book Value and Beyond", *Public Utilities Fortnightly*, September 1, 1999, p. 58.)

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The wild fluctuation in the cost estimates for radiological decommissioning are attributable to the lack of actual decommissioning experience at large nuclear generating stations (over 1,000 MWe, or at plants that have operated for their full and planned lifespan. (See Discussion **B. Planned Operating Life of Nuclear Generating Stations)** The largest commercial nuclear power plant to be fully decommissioned, Shippingport, is a 72 megawatt (MWe) light-water breeder reactor and is substantially smaller than the Susquehanna Steam Electric Station-1 & 2 (1,050 Net MWe for each unit) (5) During Pennsylvania Power & Light's Base Rate Case ("PP&L" or "PPL") (*PA PUC v. PP&L*, 1995; Docket No R-00943271; R-00943271COO1, *et seq*). Company witness Thomas LaGuardia, President of TLG, admitted that Shippingport was "almost like a pilot plant." (1995 PP&L Base Rate Proceeding; Official Transcript, Page 2103, Lines 17-20) (6) Shippingport was owned and operated by Duquesne Light Company under special agreement with the Department of Energy. The entire core was removed and replaced three times prior to decommissioning, and as noted by Company witness LaGuardia during cross examination, "[T]here were several cores at Shippingport starting out as a

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5 PPL announced it would petition the NRC to increase the capacity of SESS by 100 megawatts, while decreasing the property value of the plant "The 120 million of improvements at the Susquehanna plant are expected to add to earnings as soon as they go into operation" (*Reuters*, April 23, 2001.

On July 17, 2001, he NRC approved PPL's capacity expansion request. Unit 1 will be increased this month while the upgrade at Unit 2 is planned for Spring, 20002, after the planned refueling outage.

6 This methodology was reconfirmed in 1997:

> The cost estimating methodology employed in developing the decommissioning estimates, have been field verified by the Company's decommissioning consultant [TLG] in work performed during the decontamination and dismantling of the Shippingport Atomic Power station, Shoreham Nuclear Station and Pathfinder Atomic Station as well as for activities ongoing at the Yankee Rowe, Trojan and Rancho Seco nuclear units (Question & Answer 155, PP&L's Response to Interrogatories of Environmentalists, Set 3, Dated May 19, 1997.)

6

pressurized water reactor and later being converted to a light water reactor." (1995 PP&L Base Rate Proceeding; Page 2105, Lines 19-21). Furthermore, the reactor vessel was shipped to the Hanford Reservation (through an exclusive and unique agreement with the Department of Energy) thus depriving the industry of critical hands-on decommissioning experience. In fact, Shippingport was dismantled and not decommissioned. The immense differences between Shippingport and the large, commercial nuclear generating stations make any financial comparison between inadequate and baseless.

Several other nuclear reactors are being prepared for decommissioning but provide little meaningful decommissioning experience that could be used reliably to predict decommissioning costs.

For instance, Yankee Rowe was cited during the 1995 PP&L Base Rate Case as a reliable predictor of the decommissioning cost estimates associated with a large commercial reactor. Yankee Rowe, however, is a small commercial plant (167 MWe) that had a unique advantage which make it an unlikely predictor of decommissioning costs at other nuclear plants: The most significant component removal, steam generators, was completed without Nuclear Regulatory Commission approval. PP&L's witness, Thomas LaGuardia, admitted, "[t]hat's correct, at the time. They [Maine Yankee Atomic Power Company] didn't have the decommissioning plan approved at that time." (PP&L Base Rate Case, Page 2095, Lines 17-18.) Moreover, this plant is only in the initial phase of decommissioning and costs have already mushroomed from $247 to $370 million from 1993 to 1995 primarily for spent fuel management costs. (PP&L witness, Thomas LaGuardia, confirmed the figures on Page 1029, Lines 16-22)

Shoreham, a large Boiling Water Reactor (809 MWe), was decommissioned after two full power days of operation or 1/7,300 of the "expected" operating life of the SSES. Therefore, Shoreham is also an unpredictable and unreliable indicator of future decommissioning costs at the Susquehanna Steam Electric Station

The Nuclear Regulatory Commission and "electric utilities" rely heavily on TLG, to construct decommissioning cost estimates based on work completed at Shippingport, Shoreham, Yankee Rowe and small, prototype reactors such as: BONUS (17 MWe) placed in ENTOMBMENT; Elk River (20 MWe) a reactor approximately 2% of Susquehanna's size which operated for five years; and, Pathfinder (60 MWe), which operated for 283 full power days (PP&L Base Rate Case, LaGuardia, Page 1044, Line 1) before being placed in SAFSTOR in 1989.)

TLG's are specious and depend on: 1) The development of nonexistent technologies; 2) Anticipated projected cost of radioactive disposal, and, 3) The assumption that costs for decommissioning small and short lived reactors can be accurately extrapolated to apply to large commercial reactors operating for forty years.

In Response to Interrogatories of the Environmentalists, Set 3, Dated May 19, 1997, PP&L stated: "However, at this time, the Company cannot predict future changes in decommissioning technology, decommissioning costs or nuclear regulatory requirements Accordingly, the Company cannot anticipate future decommissioning cost requirements or the associated rate recovery levels." (Q. & A., 157.)

At the Susquehanna Steam Electric Station, projected costs for decommissioning have **increased by at least 553%** in the last 19 years. In 1981, PP&L engineer Alvin Weinstein predicted that PP&L's share to decommission SSES would fall between $135 and $191 million By 1985, the cost estimate had escalated to $285 million, and by 1991 the cost in 1988 dollars for the "radioactive portion" of decommissioning was $350 million.

The Company then contracted out for a site-specific study which projected that the cost of immediate decommissioning [DECON] would be $725 million in 1993 dollars. The 1994 cost estimate remained steady at $724 million, but the market value of securities held and accrued in income in the trust funds declined, and thus the estimate reflected another increase in decommissioning costs. (7) (PP&L Base Rate Case, Page, 1016, Lines 7-27 and Page 1017, Lines 1-24.)

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7 "PP&L has not performed an analysis which compares the PP&L estimate of $4.6 billion to $5 6 billion in stranded costs to the $3.1 billion estimate prepared by Resource Data International/POWERdata reported on page 12 of the May 1997 edition of Public Utilities Fortnightly." (PP&L's Response to Interrogatories of the Office of Small Business Advocate, Set I, Dated May 22, 1997, Q. & A. 38.)

However, three days earlier, the Environmentalists asked PP&L (Q. & A. 156 b.): "Is the Company aware of any such [decommissioning] studies conducted by others? Please identify and provide each such study conducted by others and in the Company's possession or control."

"PP&L is unaware of any such studies." (PP&L's Response to Interrogatories of the Environmentalists, Set 3, dated May 19, 1997.)

Furthermore, PP&L has never analyzed or evaluated decommissioning cost discrepancies and predictions offered by separate entities

Q.4 a. "Are you aware that PP&L's decommissioning estimates from 1981 (Alvin Weinstein, $135 to $191 million) through 1995 have increased by 553% when TLG projected nuclear decommissioning costs at $724 million?"

A. 4. a. The S.M. Stoller Company study and the TLG studies were prepared using different assumptions. PP&L has not done any study that would compare or equate the two estimates. (PP&L's Response to Interrogatories of Eric Joseph Epstein, Dated June 3, 1997.)

The industry "leader", Exelon, has filed comments attesting to the imprecise and speculative nature of radiological decommissioning estimates (*See diagram below*). Unfortunately, these figurers (8) are already anachronistic, inaccurate, and grossly underestimate decommissioning since they represent data from studies conducted by TLG (9) from 1995-1996, but *not* filed until January 1, 1998. Therefore, Exelon is not preparing to revise decommissioning estimates until 2003.

Generating Station(s)	*1985 Study/1995 Study*	*$ Increase/% Increase*
Limerick 1& 2	$272m/$986m	$714m/610%
Peach Bottom 2& 3	$273m/$947m	$674m/724%
Salem 1 & 2	$271m/$701m	$430m/600%
Three Mile Island 1 (a)	$60m(b)/$368m or $431m(b)	$308-$371/-(c)

(a) GPU reported that the cost to decommission TMI-2 more than doubled in 48 months By 1997, the decommissioning estimate had risen 110% in four years to $433 million. (1997, GPU Annual Report.)

(b) TMI-1 total, projected decommissioning expense based on ENTOMB, (1986, GPU Annual Report, p. 39).

(c) TLG's estimate as referenced in the 1998, Annual Report, p 59.

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8 **PECO Energy's Response to Eric Epstein's: I-4,** *BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION,* Eric Joseph Epstein's Testimony APPLICATION OF PECO ENERGY COMPANY, PURSUANT TO CHAPTERS 11, 19, 21, 22 AND 28 OF THE PUBLIC UTILITY CODE, FOR APPROVAL OF (1) A PLAN OF CORPORATE RESTRUCTURING, INCLUDING THE CREATION OF A HOLDING COMPANY AND (2) THE MERGER OF THE NEWLY FORMED HOLDING COMPANY AND UNICOM CORPORATION, DATE. Docket No A-110550 F0147, FILED APRIL 17, 2000)

9 All of the above referenced studies were conducted by TLG Industries (TLG) ComEd's net nuclear decommissioning costs have almost doubled from 3,089 million in 1990 to 5,426 million in 1999. (PECO Energy's Response to EE-I-4)

In 1995, ComEd estimated that its decommissioning costs had risen from $2 9 billion to $4 2 billion

However, should Limerick, Oyster Creek, Peach Bottom 2-3, or TMI-1, shut down prematurely, the entire residue of decommissioning funding must necessarily be derived from shareholder and/or Company resources due to the advent of deregulation.

The Company added that, "The original [1985] and current [1995] mode of decommissioning funding is geared toward a DECON method of decommissioning." (PECO's Response to EE-I-4, d) However, since there is no permanent nuclear waste isolation site for spent fuel, SAFSTOR is the most likely decommissioning mode available when PECO's nuclear plants come off-line. (10)

CL-02/18 The GEIS stated, "Based on the number of reactors shut down and the date that they permanently ceased operations, over 200 facility-years' worth of decommissioning experience have accumulated since the 1988 GEIS." (**Executive Summary**, xi). However, based on this statement, and NRC's inability to grasp the "exponential nature" of radiological decommissioning estimates, it appears that the Commission has had the same experience 200 times. Moreover, the GEIS's sophomoric tone in declaring vast decommissioning experience is similar to the NRC's rhetoric at the time of the 1988 GEIS. On May 26, 1988, in Harrisburg, Pennsylvania, the Commission confidently stated they have "considerable experience [decommissioning] with reactors that have not had a significant accident before the end of their useful lives". (NRC, TMI Advisory Panel, May 26, 1988).

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10 "A search of ComEd's records reveals that ComEd does not have records of the initial estimates of the indicated decommissioning costs." (PECO's Response to EE-Informal-I-4.)

B. Planned Operating Life of Nuclear Generating Stations

CL-02/19 Experience at large commercial nuclear power plants over 200 MWe has clearly demonstrated that TLG's assumption that nuclear units will operate for 40 years, i.e., "PP&L expects that Susquehanna will operate for its full license life" (11) contradicts existing nuclear reactor experience. The Company's witness, Thomas LaGuardia, was asked by Mr. Epstein: "[H]ow many commercial nuclear power plants in this country have completed their full operating lives?" Mr. LaGuardia replied, "[N]one, essentially." (PP&L Base Rate Case, Page 1023, Lines 20-22.) Additionally, George T. Jones, Vice-President of Nuclear Engineering, was asked by Mr. Epstein:

Q: "In your experience, which is rather extensive at TVA, Entergy and CE, can you at least let me know what is the longest life of a plant you've been associated with?"

A: Mr. Jones, I've never been associated with one that -- none of them have ever reached the end of their licensed life

There has been a lot of work done and continues to be done on life extension, not by us but by the industry. I don't know." (Page 2272, Lines 8-16.)

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11 Pennsylvania Power & Light Company, Response to Interrogatories of the Environmentalists, Set 3, Dated May 19 1997, Question and Answer: 167 (Also see, Pennsylvania Power & Light Company, Response to Interrogatories of the Office of Consumer Advocate, Set III, Dated April 17, 1997 and PP&L's Response to Interrogatories of Eric Joseph Epstein, Set I, dated June 3, 1997.)

Additionally, PPL admitted (in the same set of Interrogatory Response of the Environmentalists) that TLG "has not performed, nor is he aware of, any generic studies or studies that address the premature closure of a nuclear unit and the cost of decommissioning under such a scenario " (Q. & A. p. 190)

Moreover, PP&L believes that while the SSES may operate for 40 years, they are not confident that this critical assumption applies to other commercial nuclear power plants

Q 9. "Is the Company aware that if the Susquehanna Steam Electric Station operated for 40 years, it will be retired at the same time as the majority of nuclear reactors in America?"

A. 9. "This question is premised upon an assumption that the majority of other nuclear reactors in America will operate for their full license lives **There is no evidence that this premise is correct.**" (**Boldface type added.**) (PP&L's Response to Interrogatories of Eric Joseph Epstein, Set I, Dated June 3, 1997.)

Even Mr. MacGregor, counsel for PP&L, wavered on Susquehanna's ability to operate for its full-life. Mr. Epstein asked him: "But his [LaGuardia] methodology is based on the fact the plant will operate for 40 years; is that not correct." Mr. MacGregor answered, "I'm not sure that's true." (Page 456, Lines 15-18.)

The Company reconfirmed the 40 year assumption in the 1997 Rate Case. "PP&L expects that Susquehanna will operate for its full license life. Moreover, the Company believes that it can meet 'higher than expected decommissioning costs,' if they arise, and can avoid 'financial difficulties at the responsible entity' by operating its system in a efficient and cost effective manner. The Company has not contemplated additional measures at this time." (Pennsylvania Power & Light Company Response to Interrogatories of the Environmentalists, Set 3, Dated May 19, 1997. Q. & A. 167.) This assertion **contradicts PP&L's direct testimony** about their apprehension and financial vulnerability if the Company is no longer defined as an "electric utility." **(Bold face type added.)**

Mr. LaGuardia's and Mr. Jones's acknowledgments are confirmed by empirical data contained in the GEIS. **(Appendix F & J.)** For example, the following reactors have been shut down prematurely: Shoreham, 809 MWe, operated for two full-power days (which is .000136986% of the estimated life of the Susquehanna Steam Electric Station) and closed before it could begin commercial operation in May 1989; Trojan, 1095 MWe which operated for 40% of its operating life, and completed a unique disposal arrangement with the Hanford Nuclear Reservation (May 1976 to November 1992); Three Mile Island-2, 792 MWe which operated for 1/120 of its operating life (December 1978 to March 1979), Dresden, 200 MWe which operated for 45% of its operating life (July 1960 to October 1978); Indian Point-1, 257 MWe which operated for 30% of its planned operating life (January 1963 to October 1974); San Onofre-1, 436 MWe which operated for 35% of its expected life (from January 1968 to November 1992); and, Fort Saint Vrain, 330 MWe which operated for 27.5% of its expected life (January 1979 to to August 1989) and Big Rock Point a 67 MWe General

Electric BWR which began commercial operation in March 1963 prematurely shut down on August 29, 1997. (World List of Nuclear Power Plants: Operable, Under Construction, or on Order (30 MWe and Over) as of December 31, 1994. "Nuclear News," March, 1995, pp. 38-42.)

On December 4, 1996, Haddam Neck, a 582 MWe Pressurized Water Reactor operated by Connecticut Yankee Atomic Power Company, closed prematurely in the hope of saving rate payers $100 million ("Nuclear Monitor", p. 4, December 1996.) The plant came on-line in January 1968 and operated for 72.5% of its predicted life. Six months later, on May 27, 1997, Main Yankee was shut down and became the first Combustion Engineering reactor to be prematurely retired. The plant, an 860 MWe Pressurized Water Reactor, opened in December 1972 and was scheduled to operate through 2008.

The Connecticut Department of Public Utility Control removed Millstone-1 from the rate base on December 31, 1997. Millstone-1, a 660 MWe General Electric Boiling Water Reactor operated by Northeast Utilities, began operation in March, 1971 before being prematurely retired. More importantly, the decision prevents Northeast Utilities from charging rate payers for costs associated with the shutdown.

And, on January 15, 1998, Commonwealth Edison(ComEd) announced it was permanently shutting down Zion-1 and Zion-2, 1040 MWe Westinghouse PWRs. Zion-1 began commercial operation in December 1973 followed by Zion-2 in September 1974. ComEd also reported this decision will cost shareholders $515 million or $2 38 per share. With the shutdown of Zion, premature closure has occurred for every nuclear reactor type and supplier in the United States of America.

A sense of fair play, intergenerational equity, and risk sharing between rate payers and taxpayers on one hand, and shareholders and Board Members of on the other, necessitate that the Nuclear Regulatory Commission and licensees plan for decommissioning based on the assumption that their nuclear units will be prematurely shut down. As previously noted, operating capacity and historical evidence from commercial nuclear power plants give no valid indication that nuclear generating stations will operate for 40 years. (12) On the contrary, reactor history has resoundingly demonstrated that nuclear power plants have not operated for the term of their license.

CL-02/20 Obviously, there are chronic shortfalls between "targeted" funding levels and actual costs for nuclear decommissioning. The burden of proof rests squarely on the shoulders of power reactor licensees, their partners and the NRC to demonstrate that a 40 year operating life, which they predicate their financial planning upon, is realistic. Furthermore, the nuclear industry has exacerbated this problem by resolutely refusing to put aside adequate funds for non-radiological decontamination and decommissioning

12 In *Re Wolf Creek Nuclear Generating Facility*, 70 PUR 4th 475 (1985), the Kansas State Corporation Commission was confronted with the pudency of the construction of a nuclear generating plant. On the issue of decommissioning, the Commission stated that "Decommissioning cost estimates are inherently uncertain and speculative" and that "[t]o date, there has been no actual experience decommissioning a large, commercial nuclear plant and cost estimates have been traditionally low."

In addition, the Commission held that "The current shortage (indeed nonexistence) of the site for the disposal of large quantities of radioactive waste makes detailed estimates of shipping distance and cost virtually impossible." Id. at 540-41. In the *Wolf Creek* rate case, Mr. LaGuardia (also a Company witness in the 1995 PP&L Base Rate Case) failed to include inflation in his cost estimates and assumed a forty year operating life for the nuclear plant. Id. On the basis of this omission and the speculative predictions of operating life, the Commission chose a "midpoint" of LaGuardia's testimony.

The Commission also declared, **"We believe that the NRC and general industry estimates of 30 years is a valid and realistic life to utilize for purposes of decommissioning estimates"** Id. at 541. **(Bold faced typing added.)** The NRC must adopt and promulgate consist decommissioning mandates, which includes planning for nuclear decommissioning around a thirty (30) planned operating life

C. Spent Fuel Isolation

CL-02/21 Spent fuel "disposal" is an unresolved and hugely problematic area. Each reactor produces approximately 20 to 30 tons of I high-level radioactive waste per year. There is presently, and at least until 2010, nowhere to put this waste. The technology to safely manage spent fuel for an indefinite period of time does not exist. While the manner of spent fuel management may differ, i.e. re-racking and possibly dry cask storage all operating nuclear power plants are forced to store high-level, radioactive waste in the form of spent fuel on-site.

There is no location to permanently store spent fuel and high level radioactive waste (HLW) generated by nuclear power plants. This is significant problem for Exelon Nuclear which operates the largest nuclear fleet in America (13) In fact, many of Exelon's reactors are close to losing Full Core Off load Capability.

Reactor	*Core Size*	*Lose Full Core Off load Capability*
Limerick 1	764	2006
Limerick 2	764	2006
Oyster Creek	560	LOST
Peach Bottom 2	764	2000
Peach Bottom 3	764	2001
Salem 1	183	2012
Salem 2	193	2018
Three Mile Island	177	NA

(Source: PECO Energy's Response to Eric Epstein's, I-12, Unicom Merger Proceedings, PA PUC, 2000)

13 "...PECO Energy Company, each decommissioning cost evaluation presumes a date for a permanent high level radioactive waste (HLRW) facility This allows for a cost comparison with other estimates. The following dates are included as 'presumed' in the cost estimates...Oyster Creek: DOE commences pickup in 2010...TMI: DOE commences pickup in 2010...PBAPS [Peach Bottom Atomic Power station] 2 & 3: DOE commences pickup in 2010, LGS [Limerick Generating Station]: DOE commences pickup in 2010, Salem 1 & 2: DOE commences pick up in 2010." (PECO Energy's Response to EE-I-10)

Exelon's response to the critical shortage in spent fuel capacity has been to gamble, CL-02/23
and increase storage capacity through an untested, commercial dry cask technology

Station	*Dry Cask Technology*	*Deployment Date*	*Contractor*
Limerick	BD	Summer 2010	TBD
Oyster Creek	NUHOMS 52B (c)	July, 2010	None
Peach Bottom	Trans-Nuclear TN-68	June, 2000	Raytheon
Salem (a)	None	TBD	None
TMI (b)	None	TBD	None

(Source: PECO Energy's Responses to EE-I-11 & EE-I-12.)

(a) Salem has no plans to extend spent fuel capacity though dry cask storage or re-racking

(b) TMI-1 plans to increase spent fuel storage capacity by re-racking in 2002.

(c) Holtec is the new vendor chosen to provide dry cask services at Oyster Creek (PECO's Response to Eric Epstein's Informal I-8)

CL-02/22 When, and if, spent fuel storage is increased (14) at the above mentioned facilities, the additional upward 'adjustments' will have a significant impact on decommissioning funding This cost, which was omitted from TLG's estimate, "None of the estimates we have prepared include the cost of disposal of spent nuclear fuel" (1995 PP&L Base Rate Proceeding, Page 1032, Lines 20-12) is the main contributing factor to the escalation of decommissioning CL-02/24
costs at Yankee Rowe. Thomas LaGuardia, the Company's witness, admitted the increase during cross examination:

Mr. Epstein: "Are you aware that the cost has increased for the decommissioning of Yankee Rowe from $247 million to $370 million over the last two years?"
Witness: "Yes. I'm aware of what the estimate concludes."

Mr. Epstein. "And half of the cost was attributable to spent fuel storage?"
Witness: "That's correct." (Page 1029, Lines 16-22.)

14 "PECO Energy Company is participating in research projects on spent nuclear fuel (SNF), and Transportation methods for SNF, through EPRI and NEI. The total spending on these projects is in excess of $250,000 per year." (PECO's Response to EE-Informal-I-11).

Aggravating the critical shortage of HLW storage space is the bleak estimate for the completion of Yucca Mountain, the designated repository for high level nuclear waste. The earliest date this repository could be available is 2010. Lynn M. Shishido-Topel served as the Overseeing Commissioner of the Illinois Commerce Commission testified on behalf of the National Association of Regulatory Commissioners before the House Subcommittee on Energy and Mining Resources and the House Committee on Oversight and Investigations (March 17, 1995.) Shishido-Topel recognized **eight years ago** that she was "fairly certain that DOE would not meet its revised 2010 deadline to begin accepting spent fuel from commercial reactors " [Bureau of National Affairs (BNA), "Federal Facilities: Industry, DOE Struggle to Find Acceptable Solution to Interim Storage of Spent Fuel, Daily Environment Report News, March 18, 1994 [1994 DEN 52 d10]. She also predicted that the amount of spent fuel generated by 2000 will be 40,000 metric tons (MTU). This amount of waste would exceed Yucca Mountain's capacity, and the State of Nevada has demonstrated that Yucca Mountain will probably hold about 20% of the total 85,000 MTU of spent fuel earmarked for the facility. (State of Nevada, Nuclear Waste Project Office, Scientific and Technical Concerns, pp 8-11.)

As early as 1995, concerns about Yucca Mountain's integrity surfaced from scientists at Los Alamos National Laboratories. Dr. Charles Bowman warned that plutonium would remain after the steel casks holding the nuclide dissolved Plutonium could then migrate and concentrate. (*The New York Times*, p 1, March 13, 1995.) And in February 1999, the scientific peer review panel for Yucca Mountain commissioned by the Unites sates Department of Energy (DOE) produced a "highly critical" report. "The review panel said the model [DOE's computer model] has so many uncertainties - like the corrosion rates of waste containers, the area's vulnerability to earthquakes and how climate changes would affect rainfall - that its reliability was limited " (*The New York Times Science*, "New Questions Plague Nuclear Waste Storage Plan," Jon Christensen, August 10, 1999)

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CL-02/25 Furthermore, on October 4, 1999, LeBoeuf, Lamb, Green & MacRae, filed a complaint alleging a conflict of interest by the Department of Energy in their selection and awarding of $16 million legal contract to Winston & Strawn Former general counsel to the Energy Department, R Tenney Johnson, in a sworn affidavit, stated: "[A] situation has been created which an entity [Winston & Strawn] will pass judgment on its own work." (Matthew Wald, *New York Times*, October 5, 1999.)

Exelon's "political strategy" relative to finding a solution for a permanent spent fuel storage facility has been disappointing, and reflects the philosophy of the Nuclear Energy Institute

> The planned fall-back scenario in the event of unavailability of low-level radioactive waste disposal facility would be to continue political pressure on the Sates and US Government to support the development of permanent low-level waste facilities. In the event that a high-level radioactive waste facility is unavailable, the station would continue spent fuel management under "dry storage". Any station without dry storage capability would establish dry spent fuel storage management if its likely that the DOE would not receive spent fuel in a prudent time frame and wet fuel storage is no longer feasible.
> (PECO Energy's Response to EE-I-14)

CL-02/26 Isolation of high-level radioactive waster, which is primarily composed of spent fuel, can not be separated from radiological decommissioning The earliest Yucca Mountain will be available is in the year 2010. Nuclear generating stations can not be decommissioned or decontaminated with the presence of HLW on-site or inside the reactor vessel. Aggressive decontamination process will be precluded, necessitating utilities to place retired reactors into extended-DECON or SAFSTOR. If a long term solution to spent fuel isolation is not found in the immediate future, some of the nation's nuclear generating stations will be shut down prematurely due to an absence of spent fuel storage capacity. **Cost projections**

CL-02/27 **by "electric utilities" must be revised to necessarily include funding scenarios that anticipate premature closure.**

D. Low Level Radioactive Waste Isolation (15)

CL-02/28 TLG provided nuclear waste storage and nuclear decommissioning costs estimates for all Pennsylvania utilities regulated by the Public Utility Commission. However, TLG's testimony during the 1995 PP&L Base Rate Proceeding discredits their projections. Mr. La Guardia based his cost estimates for low-level radioactive waste (LLW) disposal on the assumption that the Appalachian Compact would be available when the SSES closes (PP&L Base Rate Case, Page 1034, 17-20). He concluded that the disposal of LLW is the most expensive component in the decommissioning formula (Page 2091, Lines 21-25.) Furthermore, Mr. LaGuardia conceded that it may be necessary to recompute cost estimates for disposal because it now appears imminent that Barnwell will open for seven

15 This term is imprecise and "low-level" is not analogous to low-risk

The GEIS definition of LLW on M-11 is **misleading** and is symptomatic of problems embedded in **Appendix M: Glossary.**

The overwhelming majority of "low-level" nuclear waste comes from nuclear power plants and includes· irradiated components and piping; control rods, poison curtains, resins, sludge, filters and evaporator bottoms; even the remains of entire nuclear power plants if and when they are decommissioned.

Radioactive medical waste comprises less than .1% of the radioactivity to shipped all "low-level" radioactive waste sites. If you factor academic waste into the formula, 2% of all "low-level" radioactive waste is derived for biomedical sources

The above mentioned figures are national averages derived from the Department of Energy between 1987-1990. What does the"low-level" radioactive waste stream look like in the Appalachian Compact? Of the compact states of West Virginia, Delaware, Maryland and Pennsylvania, the Commonwealth generates approximately 85 % of the radioactive waste or 170,000 cubic per year. The source of radiation is as follows: nuclear power plants· 80%; industry: 12%; medical. 5%, and academic institutions less than 1% However, the amount of radioactivity present in the volume is even more unbalanced: nuclear power plants: 92%; industry 7%; medical .1%; and academic institutions:.07%. The nuclear waste site planned for Pennsylvania is primarily for the use of the nuclear industry

to ten years for all states except North Carolina (Page 2108, Lines 4-9.) However, the Company has not yet taken the step of reconfiguring costs of LLW disposal now that Barnwell has been open since **July 5, 1995. (Bold face type added.)**

Q. 7. "Has TLG or the Company recomputed decommissioning estimates since Barnwell has reopened?"

A. 7. "No." (Pennsylvania Power & Light Company Response to Interrogatories of Eric Joseph Epstein, dated June 3, 1997.)

Barnwell is currently operating and has the capacity to function through 2006 In a response to a formal inquiry posed by Mr. Eric Epstein, Chairman of Three Mile Island Alert, Inc., on May 18, 1996, concerning Barnwell's operating and capacity status, Chem-Nuclear Systems, Incorporated, the owners and operators of the Barnwell, declared:

> Our analysis is based on the insights and understanding that come from having a major operation in South Carolina. The realities are that Chem-Nuclear LLRW disposal facility in Barnwell, S C. has sufficient disposal capacity to remain open to the nation for approximately 10 years based on volume received (Walter E. Newcomb, Ph D., Vice President and Project Manger, CNSI Pennsylvania Office, May 18, 1996.)

CL-02/29 In addition to recomputing the cost of LLW disposal, the reopening of Barnwell has indefinitely postponed the siting of a waste facility in Pennsylvania Marc Tenan, Appalachian Sates LLW Commission executive director observed: "If Barnwell's going to open to the entire country for at least the next 10 years, is there really a pressing need to continue work on regional disposal facilities?" ("ACURIE Newsletter, About Low-Level Radioactive Waste Management," May 1995, Page 1.)

On June 18, 1998, the Appalachian States LLW Commission voted to support the Pennsylvania Department of Environmental Protection's suspension of the siting process for a Low-Level Radioactive Waste Disposal Facility.

CL-02/30 Limerick, Oyster Creek, Peach Bottom, Salem, and Three Mile Island are among the nation's nuclear generating stations currently serving as "temporary" repositories for low-level radioactive waste. Limerick, Peach Bottom, and Three Mile Island do not meet the standards set by the Appalachian Compact in regards to a permanent LLW facility.

> Neither PECO nor ComEd consider its nuclear generating sites to be appropriate for permanent isolation of either low-level or high-level radioactive wastes generated as a result of operations. ComEd will continue to store only radioactive waste generated at each site on a temporary, as-needed basis.
> (PECO Energy's Response to EE-I-13)

E. Rate Payer Equity

CL-02/31 Objective empirical data clearly demonstrate that the majority of commercial nuclear power plants will not operate through their planned operating life of forty years (40) While the power reactor licensees are entitled to recover a portion of decommissioning funding through the rate, they are not entitled to a full and complete rebate on "stranded investments", and shortfalls that will certainly arise do to the underfunding of nuclear decommissioning "funding targets". Shareholders and Board Members of electric utilities and Rural Electric Cooperatives (REC) must assume responsibility for their business decisions. These aforementioned entities aggressively sought to license, construct, and operate nuclear power plants To allow artificial definitions concerning ownership of nuclear generating stations to insulate those who cogently made capital investments is immoral, unethical, and an endorsement of corporate socialism That is, shareholders profit from imprudent investment decisions and are accorded relief when error of mismanagement becomes manifest.

The issue of rate payer equity and the mandated feasibility of shared costs was highlighted in PP&L's Base Rate request before the PUC. The Company went on record during the hearings as being disgruntled with the manner in which decommissioning costs are unfairly distributed among rate payers. Mr. Douglas A. Krall, Manager-Integrated Resource Planning for PP&L is on record decrying the current decommissioning formula during the PP&L Base Rate Case:

Mr. Epstein: "That if the rate increase for decommissioning fossil fuel plants are delayed future customers would unnecessarily be at risk "

Mr. Krall: "Yes. There would be an exposure that a customer who came on the last day of operation of the plant would get very little service from the plant and end up paying the whole cost of decommissioning." (Page 1925, Lines 16-24.)

Mr. Epstein: "But you would not be adverse to assessing future customers who got no electrical benefit from a plant decommissioning costs?"

Mr. Krall. "It doesn't seem to me to be an equitable situation." (Page 1927, Lines 9-13.)

Yet, PP&L sidestepped the issue of intergenerational rate equity and focused on intraclass and interclass cost shifting prior to the *Joint Petition For Full Negotiated Settlement of PP& L Inc 's.'s Restructuring Plan and Related Court Proceedings*, August 12, 1998:

> For any customer, a change in the recovery of CTC costs from a usage rate to a customer charge does not constitute an intraclass or interclass shift in cost recovery, as long as those charges are developed consistent with the rate cap and so that the customer's total bill is held constant during rate restructuring, absent any changes in usage. The Company's approach meets these tests. No customer is picking up costs for another customer within his or her class or from other rate classes. (S.F. Tierny, Pennsylvania Power & Light Company response to Interrogatories of the Pennsylvania Petroleum Association, Set A, Dated June 10, 1997. Q. & A. 20.)

This formula only serves active and hostage PP&L rate payers. The Company has made no provisions to insulate near future customers (seven to ten years) from financing stranded debt on a nuclear generating station.

The Pennsylvania Public Utility Commission cited Nuclear Regulatory Commission guidelines that suggested five criteria for evaluating alternative financing mechanisms for nuclear decommissioning. One of the components of was titled "Intergenerational equity - that the cost of decommissioning be spread equitably to all rate payers throughout the life of the facility" Unless a more equitable funding formula for nuclear decommissioning is established, rate payers and tax payers who received little or no direct electrical benefit from nuclear generating, will be financially exposed.

The nuclear industry must assume responsibility for their investment strategies. Creating and perpetuating intergenerational debt is reckless and fundamentally inequitable and undemocratic

Future generations may be exposed to gross rate payer inequity if adequate decommissioning funding based on realistic estimates (and not "funding targets") are not assured. The solution should not be a financial safety net provided by hostage rate payers and tax payers excluded from internal corporate decision making "Electric utilities" must assume financial responsibility for their decisions to invest in nuclear power which necessarily means the shareholder should bear a substantial portion of post-deregulation decommissioning expenses. Clearly, a formula must be established that recognizes rate payer and tax payer equity for the realized service that power reactor licensees provide. It is timer for the Nuclear Regulatory Commission to recognize, through its Environmental Impact Statements, that consumers and tax payers are human beings and not abstract, hypothetical billing invoices

F. Nuclear Plant Valuation

CL-02/32 Since deregulation, numerous nuclear plants have changed hands To "cushion" the transition from regulated monopoly to competitive marketplace, many states allowed "electric utilities" to recover "stranded costs". Rate payers are saddled with paying for the industry's uneconomical investments, i.e., "stranded costs. " Two of the most "bullish" nuclear corporations, Exelon and PPL, recovered over $8 3 billion in "uneconomical investments". This figure does not include the millions in savings Exelon and PPL have accrued by unilaterally devaluing the combined PURTA and Real Estate tax assessments for their nuclear generating stations.

The Susquehanna Steam Electric Station is the most glaring example of a company "devaluing" their property at the expense of taxpayers, while billing the same hostage rate payer for uneconomical investments, and exposing this rate payer/taxpayer to further financial exposure related to the underfunding of nuclear decommissioning.

In the of Winter 1999-2000, PPL unilaterally devaluated the combined PURTA and Real Estate tax assessments for the SSES. Prior to the 1998 Joint Petition for Negotiated Settlement, the nuclear power generating units were assessed by PP&L at approximately $1 billion. PPL now claims that the SSES is only worth $74 million or the same amount as the valuation of the Columbia Hospital. Not only did the Berwick School District and Luzerne County experience revenue shock, but PPL refused to pay or escrow any monies they owed to Luzerne County and the Berwick School district while the case was being appealed.

PPL's behavior is all the more egregious in an era where nuclear plant's value on the open-marker are equal to, or in excess, of fossil generating stations. For example. Entergy and Dominion resources engaged in a bidding war to purchase the Fitzpatrick and Indian Point 3 nuclear generating stations from the New York Power Authority (NYPA). The sale established a record high.

> According to press reports, Entergy's winning bid for the total 1,805 megawatts of capacity offered $967 million, or 535 per kilowatt...The price per kilowatt not only exceeds the previous average unadjusted price for nuclear assets - $75 per kilowatt-but also exceeds the average price paid for fossil capacity-$360 per kilowatt." "NYPA's Nuke Auction: More at Sake Than Price?", *Public Utilities Fortnightly*, July 15, 2000, p. 90.

CL-02/33 The GEIS failed to address the issue of nuclear plant "devaluation" and revenue

CL-02/34 shock. This "revised" document also failed to adequately address and factor the socioeconomic impact of "Greenfield" on the revenue base of local municipalities. (*Please refer to Enclosure IV for a report on the impact devaluation has had on communities in Pennsylvania*).

G. JOINT OWNERSHIP

CL-02/35 The most disturbing and financially bizarre component of radiological decommissioning is the relationship between a "power reactor license" and the "minority power reactor licensee ". Unlike "power reactor licensees", " fractional licensees" are not subjected or mandated by the Nuclear Regulatory Commission to empirically verify, report or monitor record keeping relating to nuclear decommissioning funding mechanisms In some instances, even Public Utility Commissions lack the ability to mandate or regulate savings levels from "fractional licensees", e g., Rural Electric Cooperatives.

At PPL's Susquehanna Steam Electric Station, the "minority licensee", the Allegheny Electric Cooperative, is scheduled to contribute 10 (ten) to the total cost of decommissioning funding. The "power reactor licensee's" estimated PPL's share decommissioning share to $724 or 90% of the total cost of decommissioning. Based on this calculation, AEC 's 10% share of $804 million should be $79 million. However, Allegheny is setting aside a figure based on 5% of the final decommissioning costs even though Laurence V. Bladen, Director of Finance and Administrative Services told Mr. Epstein that AEC is basing its decommissioning costs on data supplied by PP&L. (Telephone conversation, March 30, 1995) "Allegheny's portion of the estimated cost of decommissioning SSES is approximately $37.8 million (same figure enumerated in the AEC 1993 Annual Report, p 27) and is being accrued over the estimated useful life of the plant." (Decommissioning Trust Fund Allegheny Electric Cooperative, 1994 Annual Report. **Cost of Decommissioning Nuclear Plant**, p 49) The AEC's cost projections have not changed since 1993.

Unfortunately, Exelon has a similar financial relationship at Peach Bottom with its proportional partner, Public Service Electric and Gas (PSE&G). At Salem, where, PSE&G is the "power reactor licensee," PECO has a similar financial stake but asserted:

> The 42.6 % ownership share in Salem requires that the percentage of the decommissioning be PECO Energy's responsibility. A decommissioning trust fund has been established by PECO Energy and coordinated with PSE&G for that portion of the ownership share
>
> (PECO Energy's Response to EE-I-5a)

PECO and PSE&G have a history of protracted and acrimonious litigation, and decommissioning coordination can not be guaranteed or mandated After the NRC ordered the shut down of Peach Bottom 2 & 3 in 1987, PSE&G, Delmarva Power & Light Company and Atlantic City Electric sued PECO in 1988, and alleged the Company had "breached" its contract under the Owners Agreement. Several tort claims were also filed "As part of the settlement, Philadelphia Electric will pay $130,985,000 on October 1, 1992 to resolve all pending litigation." (Joseph Paquette, President & CEO, PECO, April 8, 1982.)

After Salem's chronic mechanical and technical kept the plant shut down for a prolonged outage, beginning in 1995, Exelon sued PSE&G, and,

> On December 31, 1997, the Company received $70 million pursuant to the May 1997 settlement agreement with PSE&G resolving a suit filed by the Company concerning the shutdown of Salem. The agreement also provides that if the outage exceeds 64 reactor unit months, PSE&G will pay the Company $1 million per reactor unit month.
> (PECO Energy, 1997 Annual Report, **Note 21. Other Income**, p 44)

Clearly, this history of protracted litigation does not foster an ideal environment of comity nor does it facilitate a rational coordination of decommissioning funding

ComEd also has a dysfunctional relationship with its proportional shareholder at Quad Cities. "ComEd ["power reactor licensee"] does not know the mode that MidAmerica Energy [proportional owner] uses for nuclear decommissioning nor the amount of money being set aside by MidAmerica Energy." (PECO Energy's Response to EE-I-6.)

The impact of this uncertainty between decommissioning partners is clear. PECO has no enforcement mechanism to compel PSE&G to fund 42.49% of the decommissioning costs at Peach Bottom. While PSE&G may be obligated to come with their share of decommissioning costs, the "minority licensee" is under no obligation to accept the "power reactor licensee's" estimates or mode of decommissioning. PSE&G tenuous financial position in regard to inadequate decommissioning savings will place a greater fiscal burden on PECO and, thereby; 1) Create further uncertainties about the Company's ability to meet its financial commitments to decommission Peach Bottom 2 & 3; 2) Undermine TLG's net decommissioning estimates; and, 3) Dilute TLG's contingency factor.

CL-02/36 The cost estimates for non-radiological decommissioning (an imprecise term) are not mandated by the NRC. "For PECO Energy Company and ComEd, the costs for 'Greenfield' are included in the cost estimates and in the funding streams established for decommissioning." (PECO Energy's Response to EE-I-8b.) However, Greenfield, i.e., the original environmental status of nuclear generating station prior to construction of the nuclear power plant, has never been achieved by an operating nuclear generating station. Moreover, this site status is unattainable if a station is placed in delayed-SAFSTOR, DECO, or ENTOMB.

One only need look at Three Mile Island to see why this is a potential financial boondoggle. Three Mile Island is owned by three different companies, and controlled by one holding company: General Public Utilities. Jersey Central Power & Light (JCP&L), which owns 25% of the plant, was granted permission to raise decommissioning funds anticipating DECON as the method of decommissioning. Metropolitan Edison (Met Ed), which owns 50% of the plant, was denied decommissioning funding based. Met Ed is anticipating SAFSTOR as the preferred method of decommissioning. As it stands, 25% of the decontamination and decommissioning of TMI-2, a plant that operated for 1/120 of its projected life is being picked by JCP&L customers while the other 75% (Pennsylvania Electric owns 25% of TMI) remains in limbo and will most probably be assessed against the shareholders In turn, the shareholders are likely to opt for the cheapest method of decontamination and decommissioning. i.e, ENTOMB.

Exacerbating an already bizarre situation is the fact that AmerGen (PECO Energy and British Energy) owns TMI-1 AmerGen has sole financial and technical responsibility for decommissioning this facility. GPU owns the Possession Only License at TMI-2 which has yet to be decommissioned or decontaminated. Further complicating the situation is First Energy's merger (November 7, 2001) with GPU which includes ownership of Three Mile Island Unit-2

H. REGULATORY AMBIGUITY

CL-02/37 Former Senator John Glenn and the General Accounting Office announced in November 1994, that it is time for the Environmental Protection Agency (EPA) and the NRC to coordinate radiation protection standards which are based on risk-assessment. **Eight years later**, the agencies have been unable and unwilling to settle their conflicting regulatory standards As it stands, how would the nuclear industry determine what levels constitute "Greenfield?" (16) Worker exposures remain decidedly liberal. The NRC allows a 1-in-286 lifetime fatal cancer due to "acceptable" routine releases from NRC licensed facilities and NRC occupational standards for workers is 1-in-8 lifetime fatal cancer Translating this into human terms, Dr. Peter Gartside, Professor of Bio-Statistics at the University of Cincinnati, found workers at Fernald died at significantly younger ages and suffered a higher incidence of intentional and blood cancers than the US population (April, 1994). The Commission has already approved a 1-in-285 lifetime cancer, or 100 MR/year and rejected the Staff's recommendation of 3 MR/year of residual radiation

CL-02/38 The most formidable governmental regulations facing nuclear related industries is conflicting regulatory authority. Uncertainty is the enemy of the electric industry. This is most clearly evident in the decontamination and decommissioning of nuclear power plants

CL-02/39 Funding targets to bring a site back to "Greenfield" are set by the Nuclear Regulatory

CL-02/40 16 The GEIS's glossary superficially glosses over "Greenfield" and equates it with an " an end state of decommissioning..." (M-7 & 2-5).

According to NRC Regulations, Greenfield is achieved when a nuclear generating station is returned to "original status" prior to licensing, construction, and generation of nuclear power. The NRC would then clear the site for "free release" and allow a "school or playground" to be constructed at the former nuclear power plant.

Commission and do not include spent fuel disposal or non-radiological decommissioning. However, the NRC has no rate making authority and electric utilities must go before state utility commissions to recover funding levels "suggested" by the NRC. But the Companies are not mandated by the federal government to submit detailed funding plans until two years prior to site closure. In addition, if a utility has been saving for DECON, but SAFSTOR is necessitated, the funding package becomes grossly inadequate.

Moreover, as Mr. LaGuardia attested (1995 PP&L Base Rate Case, Page 2100, Line 24), there are conflicting radiation clean-up standards for soil, water and surface as defined by the Environmental Protection Agency and the Nuclear Regulatory Commission and each agency has conflicting cleanup standards for site restoration (16). (Witness, LaGuardia, Page 2099, Lines 20-25 and page 2100, Lines 1-18)

17 For further discussion see FR 52061, October 23, 1981; 42 FR 60956, November 30, 1977; 40 CFR 192, 12, July, 1989 and US NRC, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use of Termination of Licenses for Byproduct, Source, or Special Nuclear Material " Policy and Guidance Directive FC 83-23, Division of Industrial and Medical Nuclear Safety, Washington, DC, August, 1987.]

III. SUMMARY

> I find it highly unlikely, in today's uncertain utility industry, that anyone would invest in the new plant designs for nuclear power, which are still highly capital intensive. "The Bush Plan and Beyond: Toward a More Rational U.S. Energy Policy," *Public Utilities Fortnightly*, July 1, 2001, p. 37.

CL-02/41 **As of this filing, no commercial nuclear power plant has been decommissioned, decontaminated, and returned to free-release. Nuclear decontamination and decommissioning technologies are in their infancy and several identifiable industrial trends are apparent when reviewing the Nuclear Regulatory Commission's treatment of prematurely shutdown reactors: 1) There is a reluctance to undertake, initiate or finance decommissioning research;**

CL-02/42 **(18); 2) Prematurely shutdown reactors place an additional financial strain on the licensee; and, 3) These reactors have been retired for mechanical or economic reasons. [United States Nuclear Regulatory Commission, *Advisory Panel for the Decontamination of Three Mile Island Unit-2*, September 23, 1993.]**

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18 Q 12. "What technological initiatives are PP&L pursuing to ensure decommissioning technology is available when the SSES is no longer operational?"

A. 12. "PP&L expects that appropriate decommissioning technology will be available at the time Susquehanna is decommissioned, and accordingly, is not pursuing additional 'technological initiatives' at this time." (Company's Response to Interrogatories of Eric Joseph Epstein, Set I, Dated June 3, 1997.)

IV. NEPA & "PSYCHOLOGICAL STRESS"

Before discussion the **ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER**

CL-02/43 **REACTORS; Conclusions,** it is important to address NEPA and "psychological stress." **(Scope - D)** The GEIS correctly paraphrases PANE vs. Metropolitan Edison, and excludes "psychological strews" from the "scope of this supplement". (1-8).T However, the reality is that "psychological stress" exists, and will continue to exist. In fact, if the NRC had revisited the issue of "psychological stress" and the TMI community, it would have found the following:

On June 22, 1979, Governor Richard Thornburgh (R) wrote to the NRC, expressing his "deeply felt responsibility for both the physical and psychological well being of the citizens of Pennsylvania." Thornburgh affirmed his "strong opposition to any plans to reactivate Unit -1 until a number of very serious issues are resolved."

Three years later, on January 7, 1982, the D.C. Circuit Court decided psychological (psych) stress does not need to be covered during the restart hearings. However, the Court ruled, that under the **National Environmental Policy Act (NEPA), psych stress must be addressed. The Court ordered an injunction on restart until a study on psych stress was conducted.** However, on April 19, 1983, The United States Supreme Court reversed the D.C. Circuit Court's opinion on psych stress and ruled an environmental study is not necessary.

Two months later, on May 5, 1983, GPU revealed for the first time to the NRC that management audits, including psychological evaluations, concluded by BETA and RHR, completed in February and March, 1983, were critical of plant operations and management.

In August 1985, Marc Sheaffer, a psychologist at the Uniformed Services University of the Health Sciences in Bethesda, released a study linking TMI-related stress with immunity impairments.

Subsequently in August, 1987, James Rooney and Sandy Prince of Embury of Penn State University reported that chronically elevated levels of psychological stress have existed among Middletown residents since the accident.

Additionally, in April, 1988, Andrew Baum, professor of medical psychology at the Uniformed Services University of the Health Sciences in Bethesda discussed the results of his research on TMI residents in *Psychology Today*. "When we compared groups of people living near Three Mile Island with a similar group elsewhere, we found that the Three Mile Island group reported more physical complaints, such as headaches and back pain, as well as more anxiety and depression. We also uncovered long-term changes in levels of hormones These hormones affect various bodily functions, including muscle tension, cardiovascular activity, overall metabolic rate and immune-system function .."

The NRC can hide behind NEPA or any other convenient acronym, but "psychological stress" is a verifiable fact of life for people who live and work, in and around, nuclear power plants

V: CRITICISMS & SUGGESTIONS of 4.0 ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS

CL-02/44 **(4.1.1) Terms of Significance of Impacts**

The Nuclear Regulatory Commission employed a "standard of significance" developed by the Council of Environmental Quality (CEQ).

> **Context** means that the significance of an action must be analyzed in several contexts, such as a society as a whole (human, national) the affected region, the affected interests, and the the locality (4-1.)

However, no "electric utility" constructs, operates, or decommissions a nuclear station without economics being the paramount consideration Yet, the NRC and CEQ have created a nuclear Potamkin Village where economic imperatives are subordinated to the behavioral science flavor-of-the-day. In the NRC's world, an "electric utility" can apply for a loan using NEPA as collateral. I hope that at the end of the GEIS process the Commission can provide me with an address so that I can relocate my family to a neighborhood-without-economic considerations

CL-02/45 **(4.3.1.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; On site/Off site Land Use - Conclusions:**

The GEIS stated, "It is rare for decommissioning activities to affect off-site land use ." (4-7) This statement fails to recognize that most nuclear generating stations are located in close proximity to substantial water resources. The Susquehanna Steam Electric Station, Three Mile Island and Peach Bottom are located on, or adjacent to the Susquehanna River which feeds the most productive estuary in America, i e., the Chesapeake Bay.

CL-02/46 Decommissioning and decontamination tasks affect people's perception, especially when these visibly intrusive and audibly offensive activities are in close proximity to their homes and recreational areas Peach Bottom and Three Mile Island are located next to prime water skiing and boating areas on the Susquehanna River. Dozens of summer cabins are located less than 100 yards from TMI on Sholley. Fishing takes place on a daily basis, and Boy Scout badges are available by completing outdoor activities on Three Mile Island.

CL-02/47 The Staff should visit TMI and then travel to Clinton Lake to examine how perceptions and reality affect "off site land use".

> After the terrorist attacks, the U.S. Nuclear Regulatory Commission advised all nuclear power plants to move to the highest level of security. Exelon Nuclear, which operates the Clinton nuclear power plant and owns the sprawling, 5,000-acre Clinton Lake, promptly ordered all boats off the lake and closed it.
>
> It remains closed to this day nearly two months later. The power plant uses water from the lake to cool the reactor core.
>
> The closure is causing economic hardship for a number of businesses that cater to boaters, who value Clinton Lake because of its size and its lack of restrictions on boat horsepower. Some business owners say they'll have to shutdown if the lake isn't reopened by next spring.
>
> (*The News Gazette*, Champaign , Illinois, November 4, 2001)

The GEIS must acknowledge the potential for adverse economic impacts on a community during decommissioning

CL-02/48 **(4.3.2.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Water Use - Conclusions:** (The discussion **4.3.1.4 is also relevant)**

The GEIS stated, "The overall water use of a nuclear facility will dramatically decrease one the once the reactor has stopped operating and the demand fro cooling and makeup water ceases." (4 9-4.10) On the surface, this statement appears to be correct. However, at Three Mile Island, a considerable amount of "cleanup water" was created ***after*** the plant was shut down:

In 1980, the Susquehanna Valley Alliance, based in Lancaster, successfully prevented Met Ed (GPU) from dumping **700,000 gallons of radioactive water** into the Susquehanna River. Ten years later (December, 1990), despite legal objections, GPU began evaporating **2.3 million gallons of accident-generated radioactive water** (AGW). From December, 1990 to January 1991, the evaporator was shut down five times due to electrical and mechanical "difficulties." And from April-May1991, the evaporator was shut down for most of this period so GPU could "rewrite the main operating procedure." The Nuclear Regulatory Commission (NRC) issued a Notice of Violation related to evaporator operations. Two months later (June, 1991) the NRC noted repeated mispositioning of AGW valve. The valve in question was also involved in the NRC's Notice of Violation issued in April.

By February 1992, the "portable" evaporator was shut down again due to the failure of the blender-dryer. Replacement of the blender was delayed until August. By May 1992, GPU decided to use a "temporary" blender-dryer until a permanent replacement was installed in August. However, from August-September 1992, some of the water in the evaporator's borated water storage tank was "processed" twice due to "slightly higher activity levels." And in November 1992, approximately **600,000 gallons** of AGW was processed twice due to "slightly higher activity levels." Two months later, (January, 1993) GPU "discovered" they failed to take periodic samples of approximately **221,000 gallons** of AGW in the borated water storage tank

Finally, in August 1993, over six months behind schedule, evaporation of 2.3 million gallons of accident, generated clean-up water was completed...Can anyone at the NRC point to an official document that classifies 700,000 gallons of radioactive water (which later grew to 2.3 million gallons) as "SMALL"?

The people who live and work around TMI have found that the risks associated with additional cleanup water are not "SMALL".

CL-02/49 **(4.3.3.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Water Quality - Conclusions:** (The discussion in **4.3.2.4** is also relevant.)

"The staff concludes that the issue of surface or ground water quality for all decommissioning activities is generic and that the environmental impacts for these activities will be SMALL " (4-12).

Persistent "water quality" problems continue to plague TMI, a prematurely shut down reactor

On November 2, 1993, in a letter to the NRC, GPU Nuclear acknowledged: "During the TMI-2 accident, the cork seam located in the Auxiliary Building Seal Injection Valve Room (SIVR) was contaminated with radioactive water. Attempts to contain the contamination within the room have been unsuccessful During the past 14 years, radioactive material has spread along the joint in one direction into the Annuls, and in the other direction into the Auxiliary Building, Service Building and Control Building West (R L. Long, GPU Nuclear, Director, Services Division/TMI-2)"

On June 4, 1998, "GPUN found several pipes penetrating the wall between the turbine building basement and the control building in Unit-2 to be open on both sides of the wall. This condition was contrary to the Unit-2 post-defueling monitored storage safety analysis report (PDMS-SAR) which requires entrances to the control building area to be watertight or provided with flood panels and openings that are potential leak baths to be sealed." (NRC Inspection Report, 50-289/98-08.) Less than a month later, on July 2, 1998, an LER was necessary due to the breaching of flood barriers "between the turbine building and the control building area due to inadequate fieldwork documents" (NRC Inspection Report, R 50-289/98-08.)

As recently as January 9 and 19, 1999, elevated tritium levels and potential leaks from the waste evaporator condensate storage tank for the months of January, February and March, 1999 were reported. (NRC Inspection Report, 50-289/99-01).

Based on the above documented water quality problems the staff should revisit the rating of "water quality "

CL-02/50 **(4.3.1.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Air Quality - Conclusions:**

"Fugitive dust from those activities performed outside of the building is temporary (19), can be controlled mitigative measures, and will generally not be noticeable off site." (4-16). Once again the experience of TMI-2 is instructive:

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19 Please note that the term "temporary" has been applied unevenly in the GEIS. "Temporary" storage of LLW and HLW is essentially analogous with "indefinite."

In June-July, 1980, for 11 days, Met Ed vented 43,000 curies of radioactive Krypton-85 (10-year half-life; beta and gamma) and other radioactive gasses into the environment without having scrubbers in place. Yet in November, 1980, the United States Court of Appeals for the District of Columbia ruled that the krypton venting was *illegal*.

From July 24-27, 1984, during the reactor head lift, which was delayed to brake failure on the polar crane, GPU vented radioactive gasses into the environment The venting occurred despite pledges by GPU and the NRC that no radioactive releases would take place during the head lift operation. GPU was fined $40,000 for the violation by the NRC.

On July 12, 1985, two workers who participated in the initial phase of the cleanup and contracted cancer, joined 2,500 area residents suing GPU.

On September 25, 1989, two cleanup workers received radiation exposures while handling a "small piece of reactor core debris " in the decontamination area "Officials said preliminary calculations show one worker may have a radiation exposure on the hands above 75 rem. The second worker may have an exposure greater than 18.75 rem. The federal occupational limit for exposure to extremities is 18.75 per calendar quarter." By November 1, 1989 , one of two workers involved in a radiation exposure "incident" may have received 220 rems to the hands, i e., "extremities." The other worker harmed the incident is projected to have received 35 rems of exposure. The incident began when the workers picked up an object they thought was a "nut" or "bolt", but was in fact a piece of highly radioactive fuel. The workers were then advised to throw the "object into the reactor vessel." Since the fuel was "discarded", GPU had to use models to predict dose calculations and exposure rates

GPU was also in violation for failing to report this incident in a timely fashion Additionally, the workers have reported contradictory statements about the event. On January 13, 1990, GPU was fined $50,000 for a violation of "requirements protecting workers "

After ten years of defueling activities, 5,000 TMI workers had received "measurable doses" of radiation exposure. The NRC staff should reconsider the placement and value of the terms "temporary" and "fugitive", and rethink the adverse affects of "air quality" on workers

CL-02/51 **(4.3.5.2) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Aquatic Ecological Resources- Conclusions:**

(Discussions in 4.3.2.4 & 4.3.3.4 are also relevant.)

The staff found that ". the impact to aquatic ecology for all decommissioning activities is generic and that the environmental impact for these activities is SMALL". (4-19) Unfortunately, the staff biologists are unfamiliar with the unique water chemistry of the Susquehanna River and historic infestations that have afflicted Three Mile Island

In February 1986, one celled organisms believed to be fungus, bacteria and algae-like creatures were discovered. These creatures obscured the view of the reactor core, and **impeded the cleanup** of Three Mile Island -2.

On June 23, 1999, "Three Mile Island, trying to rid itself of clams, recently released too much of a potentially hazardous chemical into the Susquehanna River State regulations allow TMI to release 0 3 parts per million of Clamtrol back into the Susquehanna River. For about an hour, the plant was releasing 10,500 gallons per minute containing twice the amount " (*York Daily Record*, July 7, 1999.)

CL-02/52 The NRC staff correctly concluded, "...the magnitude, (I e , SMALL, MODERATE, LARGE) of potential impacts will be determined through a site specific study...: (4-19). This flexible barometer should be applied to all of the above mentioned **Conclusions.**

CL-02/53 **(4.3.6.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS: Conclusion - Terrestrial Ecological Resources:**

The NRC staff aptly stated, "...the magnitude, (i.e., SMALL, MODERATE, LARGE) of potential impacts will be determined through a site specific study..." (4-23). These flexible barometer should be applied to all the above mentioned **Conclusions**

CL-02/54 **(4.3.10.1) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Occupational Issues - Conclusions:**

(The discussion in **4.3.1.4 is also relevant)**

Labor relations is an essential component, and potential impediment to prompt decommissioning activities. For example:

On August 12, 1982, William Pennsyl, a cleanup worker, was fired for insisting he be allowed to wear a respirator while undressing men who entered highly radioactive areas Pennsyl filed a complaint with the U.S. Department of Labor. William Pennsyl settled out-of-court two days before an administrative law judge was scheduled to hear his case. (April 11, 1984).

On March 22, 1983, TMI-2 senior-safety engineer Richard Parks publicly charged GPU and Bechtel Corporation with deliberately circumventing safety procedures, and harassing him and other workers for reporting safety violations Parks filed a complaint with the U.S. Department of Labor. On August 12, 1985, GPU and Bechtel were fined $64,000 for the incident by the Nuclear Regulatory Commission (NRC). Between March 22, March 27, and April 2, 1983, three senior level plant employees, Richard Parks, Larry King, and Edwin Gischel, charge GPU and Bechtel with harassment, intimidation and circumvention of cleanup safety procedures.

On July 31, 1990, the NRC announced "that an allegation that a shift supervisor on duty at Three Mile Unit 2 control room, during defueling operations in 1987, had sometimes slept on shift or had been otherwise inattentive to his duties, was true..."

> Although some key members of the site management staff were aware of the sleeping problems and some actions were taken to correct it, it [sic] was not effectively corrected until utility corporate management became involved. The NRC staff proposes to fine GPU Nuclear, Inc. (GPUN) the company that operates the TMI site, $50,000. The staff also proposes a Notice of Violation to the former shift supervisor.

Also, in February 1991 an operator "inadvertently flooded the vaporizer" and several days later an operator was discovered "apparently sleeping "

CL-02/55 In 1986, the TMI-2 defueling work force peaked at 2,000 Today less than a dozen AmerGen employees police Unit-2...

Based on the experience at Three Mile Island, the SMALL and MODERATE evaluations need to be upgraded to "LARGE".

CL-02/56 **(4.3.10.3) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Costs - Conclusions:**

TMIA and EFMR object to the absence of a **Conclusion** in this section, and reassert the merits of its argument articulated in: **A. Current Problems Associated with Cost Estimates for Radiological Decommissioning**, pp. 5- 10.

CL-02/57 The most troubling aspect of this section is the assertion that, "The cost of decommissioning results in impacts on the price of electricity paid by rate payers." (4-45) Due to deregulation, additional decommissioning recovery is either limited or "under-funding" is the sole responsibility of the "electric utility," e g., Three Mile Island Unit-1. The "hostage rate payer" is being replaced by the shareholder who is not likely to advocate paying for the "under-collected" portion of the fund after the plant is permanently shut down.

This section needs to be redrafted and include the following variables:

Cost Estimates for Radiological Decommissioning (20); Planned Operating Life of Nuclear Generating Stations; Spent Fuel Isolation; Low Level Radioactive Waste Isolation; Rate Payer Equity; Plant Valuation, Joint Ownership, and, Regulatory Ambiguity.

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20 On January 25, 2000, the Citizens Utility Board (CUB) petitioned the Illinois Commerce Commission, and requested that ComEd's $480 million decommissioning charge for Zion be denied. "CUB cited a state court ruling that decommissioning costs may be collected while a plant is in service. Zion was taken out of service in 1997 and shut down permanently in 1998." (*Public Utilities Fortnightly*, March 15, 2000, pp. 18-19.)

CL-02/58 **(4.3.1.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Socioeconomics - Conclusions:** (Also Refer to discussion on **F. PLANT VALUATION**, pp. 26-27.)

> The staff concludes that shutdown and decommissioning of nuclear facilities produces socioeconomic impacts that are generic. The impacts occur either through the direct effects of changing employment levels on the local demands for housing and infrastructure or through the effects of the decline of the local tax base on the ability of local government entities to provide public services.(4-53)

There can be no generic measure of the socioeconomic impact of any community without an in-depth study of a number of driving variables. Nuclear plants are subject to various regulations and tax codes based on location, plant history, levels of corporate investment, composition of work force, state and municipal legislation, economic diversity, and municipal relationships.

The number of employees working at TMI has decreased from 900 in 1999 to 650 in 2001. Unlike GPU, AmerGen is a non-union entity, and out of the 650 employees at TMI, it is not clear how many reside in Central Pennsylvania since the Company rotates workers on a regional basis TMI was once a large corporate donor, and one of the region's top 50 employers. Within the last five years, community giving has decreased, and GPU, along with former community scions, AMP, Armstrong Industries, and Rite Aid, have slashed thousands of jobs. Any further cuts in tax revenues, community giving or employment levels, i e , "SMALL 10%" or "MODERATE 10-20%", create undue economic hardships

The amount of taxes paid by TMI-owners prior to the plant's acquisition are listed below, and contrasted with current corporate assessments The plant's assessment value at market rate was $92 million after the purchase in July, 2000. AmerGen has disputed the $49 million valuation (October, 2000).

	AmerGen	GPU
School District	$394,500 (Net)	$210,000-220,000
County:	$146,940 (19)	$635,000 (PURTA)
Township:	$30,000	$8,000
	$571,440	$853,000-$863,000

Amount of Revenue Decrease: $281,560 - $ 291,560 (21)

(Follow-up data from Exelon will be provided by mid-January, 2001. Similar decreases have occurred at Peach Bottom 2 & 3.)

CL-02/59 Before TMI reaches decommissioning, the community has already lost 250 jobs, and over $220,000 in tax revenues. Pennsylvania is not similar to Connecticut (22) whereby the difference in pre- and post-deregulation revenues are made up by the state. These are jobs and revenues are lost forever. Most local and state taxing authorities classify "Greenfield" as non-commercial, tax-paying status.

Moreover, TMI and Peach Bottom are located in rural areas that are sensitive to seasonal fluctuations Farm revenues in the 1980s were sharply down due to drought, avian flu epidemics, and an informal boycott by consumers who did not want to purchase TMI-tainted produce, dairy products, or beef and poultry.

21 Refer to discussion in *Enclosure IV*

CL-02/60 **(4.3.13.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS Environmental Justice - Conclusion:**

The NRC made the appropriate demarcation and concluded, "..the issue of environmental justice requires a site-specific analysis " (4-57) (For further discussion please refer to **VI. APPENDIX J: INCORRECT or MISSING DATA; 6)**

CL/02/61 **(4.3.14.2) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS Cultural Resources; Conclusions:**

The NRC properly concluded, "...the magnitude, (i e., SMALL, MODERATE, LARGE) of potential impacts will be determined through a site specific analysis." (4-61)

CL-02/62 One issue that needs to be factored into the equation is what happens when the object of decommissioning has been declared a historical marker, i e., Three Mile Island-2?

CL-02/63 **(4.3.15.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS On site/Off site Aesthetics - Conclusion:**

The staff posited that, "any visual intrusion (such as the dismantlement of buildings or structures) would be temporary (22) and would serve to reduce the aesthetic impact of the site " (4-63) By nature, aesthetics is subjective Therefore the staff's conclusion is arbitrary "Because there will be no readily noticeable visual intrusion beyond what is already present from the an operating facility, consideration of mitigation is not warranted " (4-63-64)

22 Please see footnote for a brief discussion on the concept of "temporary "

CL-02/64 The GEIS could have looked more closely at TMI-2, and considered the following "visual scenarios"

On August 5, 1992, GPU "declared an event of potential public interest when the Unit-2 west cooling tower caught fire " The fire lasted for ten minutes. This was the third fire at TMI-2 during the cleanup The Department of Environmental Resources subsequently instructed GPU to dismantle the wooden paneling and waffling at the base of the cooling towers. The cooling towers now serve as a nesting ground for "fugitive" swallows.

(4.3.16.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Noise - Conclusions:

Please refer to the discussion in **4.3.1.4.**

CL-02/65 **(4.3.17.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Transportation - Conclusions:**

Please refer to *Enclosure V* which features articles highlighting problems with transporting damaged fuel from TMI to Idaho.

VI. APPENDIX J: INCORRECT or MISSING DATA

CL-02/66 **1)** All references to Three Mile Island-2 as a "decommissioned reactor are in error The plant has not been decommissioned or decontaminated. TMI-2 was placed in Post-Defueling Monitored Storage in December, 1993.

The plant has been substantially defueled, and debate remains around the K-effective:

> Dr Michio Kaku, Professor of Theoretical Nuclear Physics at City University of New York, evaluated studies conducted or commissioned by the NRC on the amount of fuel left in TMI-2. Kaku concluded: "It appears that every few months, since 1990, a new estimate is made of core debris, often with little relationship to the previous estimate...estimates range from 608.8 kg to 1,322 kg...This is rather unsettling...The still unanswered questions are therefore precisely how much uranium is left in the core, and how much uranium can collect in the bottom of the reactor to initiate re-criticality. (August, 1993)

Three Mile Island Unit-2 was built at a cost to rate payers of $700 million, and had been on-line for only 90 days, or 1/120 of its expected operating life, when the March 1979 accident occurred. One billion dollars was spent to defuel the facility. Three months of nuclear power production at TMI-2 has cost close to $2 billion dollars in construction and cleanup bills; the equivalent of over $10.6 million for every day TMI-2 produced electricity. The above mentioned costs **do not** include nuclear decontamination and decommissioning or restoring the site to "Greenfield."

At the time of the accident, TMI's owners had no monies put aside for decommissioning. General Public Utilities' (GPU) customers contributed three times as much for the defueling effort than the corporation that caused the disaster, i e , $246 versus $82 million (GPU Nuclear Press Release, January 10, 1985) In January 1993 the Public Utility Commission (PUC) refused GPU's request to hand their customers the TMI-2 decommissioning bill estimated to be at least $200 million. However, several months later the PUC reversed itself and gave GPU permission to pass the cost of the decontamination and decommissioning of TMI-2 onto the rate payer. This decision to financially assess GPU rate payers for the accident was upheld by the Pennsylvania Supreme Court. In 1995, GPU hired a consultant to conduct a site-specific decommissioning study for TMI-2. The "retirement costs" for TMI-2 was estimated to be $399 million for radiological decommissioning and $34 million for non-radiological removal (**GPU, 1997 Annual Report, Nuclear Plant Retirement Costs, p. 52.**)

Although TMI-2 is scheduled to be decontaminated and decommissioned in 2014, if AmerGen requests a license extension at TMI-1, decommissioning will not begin until 2034 or 55 **years after the accident.**

CL-02/67 **2)** In Table J-2, the location of Peach Bottom is incorrect. Peach Bottom resides in Delta, and is located less than a mile from Lancaster County and the State of Maryland.

3) In Table J-2, the location of Three Mile Island by county is incorrect. Three Mile Island resides in Londonderry Township, Dauphin County. "Northampton" County is located in Northeastern Pennsylvania

In addition, there are four counties located within five miles from Three Mile Island, i.e., Cumberland, Lancaster, Lebanon, and York.

CL-02/68 **4)** J.1 2. and Table J-3. All relevant information is provided on pages 45-46.

CL-02/69 **5)** Table J-4 should incorporate data provided in **F. Nuclear Plant Valuation** pp. 26-27 and pages 44-45.

CL-02/70 **6)** In Table J-5 fails to acknowledge that the "white" population is not monolithic In the case of Three Mile Island a "special white population", i e., the Amish does not utilize electricity, telecommunications, or mechanical transportation, and lives in close proximity to the plant.

VIII. TRANSPORTATION

CL-02/71 Please refer to **(4.3.17.4) ENVIRONMENTAL IMPACTS of DECOMMISSIONING PERMANENTLY SHUTDOWN NUCLEAR POWER REACTORS; Transportation - Conclusions:**

Please refer to the *Enclosure V*, which features articles highlighting problems with transporting spent fuel from TMI to Idaho.

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December 31, 2001

VIA COURIER AND ELECTRONIC MAIL

Chief
Rules and Directives Branch
Division of Administrative Services
United States Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, Maryland

Re: **Draft Supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, 66 Fed. Reg. 56,721 (Nov. 9, 2001)**

Dear Sir or Madam:

The Metals Industries Recycling Coalition ("MIRC") submits the following comments on draft Supplement 1 to the United States Nuclear Regulatory Commission's ("NRC's") "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" ("the GEIS"), dealing with decommissioning of power reactors 66 Fed. Reg 56,721 (Nov. 9, 2001) The National Environmental Policy Act requires federal government agencies to complete a detailed environmental impact statement for every "major" action that "significantly affects" the environment. 42 U S C. § 4332(C) NRC will rely on this GEIS and the draft Supplement to meet its statutory obligation to prepare an environmental impact statement in future decommissioning activities

MIRC is concerned because the draft Supplement does not contain any meaningful discussion regarding the serious environmental, economic, and socioeconomic impacts of the radioactively contaminated scrap metal that would be released into the economy from facilities preparing for and undergoing decommissioning Such releases would affect the metals industries' ability to recycle scrap metal and threaten the economic viability of metals companies MIRC urges NRC to consider these impacts when preparing the final Supplement to the GEIS.

I. THE METALS INDUSTRIES RECYCLING COALITION

MIRC is an ad hoc coalition of metals industry trade associations comprised of the American Iron and Steel Institute ("AISI"), the Copper and Brass Fabricators Council ("CBFC"), the Nickel Development Institute ("NiDI"), the Specialty Steel Industry of North America ("SSINA"), and the Steel Manufacturers Association ("SMA") The metals industries comprise a major sector of the nation's economy. A significant and growing portion of this production is

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based on recycled scrap metal In a recent study commissioned by the National Recycling Coalition, R W. Beck, Inc reports that combined ferrous and nonferrous metals recycling industry employment totals approximately 350,000 jobs, with a payroll in excess of $12 billion annually and receipts of approximately $90 billion [1]

All of the members of MIRC consume metal scrap to make new metal products The recycling of enormous tonnages of scrap by MIRC members provides substantial environmental benefits, including reusing material that otherwise would be discarded and conserving energy. The energy savings from the steel minimill industry alone in one year are enough to supply the energy needs of the city of Los Angeles for eight years. The recycling of scrap is a sophisticated, technology-based industry, involving highly controlled scrap selection and blending processes to meet detailed customer specifications A growing number of customers are setting specifications that include certification of minimum radioactivity levels in metal components and products.

The metals industries that MIRC represents strive to boost public confidence in the safety, strength and recyclability of metal products, and they invest significant time and resources in product promotion, sponsoring advertising, grass-roots initiatives, and educational activities. Moreover, all of the metals industries expend considerable resources on research regarding the effects of metals on human health and the environment, with an emphasis on creating safer products.

In the metals business, scrap metal is a valuable feedstock that is bought and sold as a commodity. Scrap accounts for a significant, if not the largest, portion of metals companies' production costs Given that scrap metal has such a high value, the metals industries generally support public policies that serve to increase the quantity of scrap metal available in the economy and actively promote recycling Scrap metal with residual radioactive contamination, however, including scrap metal that would be released from nuclear power reactor facilities in preparation for and during decommissioning, would undercut efforts to protect the scrap supply from radioactivity, and is not acceptable to the metals industries.

II. METALS INDUSTRIES' RESPONSE TO RADIOACTIVITY

Since the 1980s, metals companies have been installing and using sensitive, highly sophisticated radiation detection systems Metals producers also have developed sophisticated monitoring protocols and procedures to ensure that they do not inadvertently allow contaminated scrap metal, including sealed sources that have escaped NRC regulation, to enter their mills. The metals industries' objectives in doing this are to protect workers and consumers and to prevent radioactive contamination in their mills. Inadvertent meltings of sealed sources can contaminate products, waste streams, mill equipment and the surrounding property. Radioactive contamination has caused individual metals companies to incur tens of millions of dollars in

[1] R.W. Beck, Inc., *US Recycling Economic Information Study* (July, 2001) at ES-6, Figs. ES-3 & ES-4

clean-up and decontamination costs, per incident. These incidents can bankrupt individual metals companies. Metals companies have a financial interest in keeping radioactivity out of their mills, and have set their detectors to detect at or slightly above background radiation levels, to protect against the possibility of sealed sources ending up in the melt. Accordingly, scrap metal that sets off metal company radiation detectors is rejected

III. NRC'S RELEASE GUIDANCE

CL-03/1 Since at least as early as 1974, NRC has espoused a policy of "unrestricted release" of solid materials, including scrap metal, from nuclear fuel cycle facilities, without any specific, health-based release criteria. Unlike NRC requirements applicable to gaseous and liquid releases from nuclear facilities, there are no specific criteria governing releases of solid materials by licensees. Requests to release solid material are approved on a case-by-case basis using existing regulatory guidance and license conditions.

The regulatory guidance is a generic, five-page document entitled "Regulatory Guide 1 86, Termination of Operating Licenses for Nuclear Reactors" ("Reg Guide 1.86"). Reg. Guide 1 86 was published in 1974, without public notice and comment, by NRC's predecessor agency, the Atomic Energy Agency. Under Reg. Guide 1.86, nuclear fuel cycle facilities are allowed to release for unrestricted use solid materials that meet "acceptable surface contamination levels." *See* Table I, Reg. Guide 1.86 These "acceptable" contamination levels are based on surface activity as measured in disintegrations per minute. They are based on the detection technology readily available in 1974 and not on public health or environmental considerations The measurements in disintegrations per minute have no bearing on doses to the public or exposure, nor do they account for the impact of the radioactive contamination on metals industry operations

Under Reg Guide 1.86, nuclear fuel cycle facilities do not have to employ the same level of screening for small amounts of residual surface activity that metals companies must use to keep radioactivity out of their mills. Scrap released pursuant to surface activity levels in Reg Guide 1 86 has caused radiation detectors at metals company facilities to alarm when no sealed sources were present. In short, a load of scrap metal that is acceptable for a power reactor facility to release is not an acceptable feedstock for metals company manufacturing operations

IV. THE DRAFT SUPPLEMENT

A. Environmental Impacts

NRC's intent in producing this Supplement was "to consider in a comprehensive manner all aspects related to the radiological decommissioning of reactors." NUREG-0586 Draft Supp. 1 CL-03/2 at xi (Oct. 2001). Yet, the Supplement does not discuss the potential environmental impacts of releasing scrap metal or other solid materials pursuant to NRC's unrestricted release guidance, except to state that licensed facilities must comply with standards in 10 C F R. part 20, limiting

the sum of allowable internal and external doses to individual members of the general public to 0 1 rem per year. NUREG-0586 at 4-26 (Allowable doses to individual members of the public following license termination are limited to 25 millirem per year during the control period and 100 millirem per year after the end of institutional controls. *See* 10 C.F.R. § 20 1402) As discussed in the previous section, 10 C.F.R. part 20 does not contain any release standards for CL-03/3 solid materials. Although it is not certain, a strong possibility exists that power reactors could release scrap metal that has a serious impact on the environment, such as by contaminating the soils or groundwater underneath a scrap yard or by escaping detection and becoming melted inadvertently in a metal company furnace. Furthermore, certain isotopes in scrap metal that escape detection before melting may accumulate and concentrate in emission control systems at metals company facilities, to the extent that metals producers could generate low-level wastes ("LLW") or mixed wastes.

CL-03/4 Even if NRC eventually does establish dose-based clearance standards for solid materials, thousands of tons of scrap metal with residual radioactive contamination still would be released into the economy or sent to LLW or industrial waste landfills. If the scrap is released for reuse in the economy, it could have a devastating effect on metals recycling. The introduction of added radioactivity in the scrap supply would make it difficult or impossible for metals producers to meet certain product specifications. Customers who require their metals components to be free of radioactivity are driven by consumer demand for safe products and by the necessity in sensitive applications, such as in computers, for the metal to be radiation-free

The mere possibility that products made with recycled metals may contain materials that were released from nuclear facilities could cause a significant number of consumers to purchase consumer goods made of substitute materials. A survey commissioned by the Steel Alliance found that 61 percent of Americans believed it would be a bad decision (42 percent said "very bad") to allow steel from closed down nuclear facilities to be recycled into the mainstream production of new steel products.[2] When those who opposed the idea of recycling radioactive scrap metal were asked if they would change their mind if they were assured that the material met government safety standards, they remained skeptical, with 74 percent continuing to oppose such recycling (and 51 percent saying it would be a "very bad" decision). If radioactive scrap were recycled into the manufacturing of new steel, three out of four Americans (73 percent) said they would be less likely to purchase food products packaged in steel cans; 62 percent would be less likely to purchase a steel-framed house; and half (53 percent) would be less likely to purchase an automobile made of steel. Finally, survey respondents' favorable impression of steel before and after discussing the potential introduction of steel from nuclear facilities being recycled into everyday products plunged 24 points on a 100-point rating scale,[3] from

[2] The survey was conducted by Wirthlin Worldwide, an independent research firm, and involved polling of four focus groups followed by a phone survey of 1,007 individuals.

[3] On the 100-point scale, a score of 50 indicates a neutral opinion, above 50 a positive opinion. and below 50 a negative opinion.

approximately 68 to 43.6. Hence, the impression of steel went from solidly positive to negative as a result of the radioactive scrap recycling issue.

Therefore, it is not implausible to expect that retail consumers would demand certification that their products are made with mined virgin ores or would eschew metal consumer products altogether. This consumer reaction, coupled with the fact that many sensitive applications, like computer components, require radiation-free metal, would lead manufacturers to demand that the metal they purchase be free of residual radioactivity. This result would be a marked reduction in metals recycling rates and an increase in consumption of virgin mined ores. Thus, the introduction of added radioactivity into the scrap stream would undermine the environmental contributions made each year by recycling scrap metal

B. **Economic and Socioeconomic Impacts**

CL-03/5 The draft Supplement discusses the economic impacts of decommissioning, including the fact that the Barnwell Low-Level Radioactive Waste Management Disposal Facility in South Carolina, the last remaining facility to dispose almost all classifications of LLW, is scheduled to stop accepting LLW from all NRC licensees except those in the Atlantic Compact, by 2009. *Id* at 4-43 Yet, decommissioning of most nuclear power reactors is not expected to occur until after 2009. The existence of the EnviroCare disposal facility in Utah, which can accept Class A wastes for disposal, mitigates the economic impact of losing Barnwell, but nuclear power plant operators still are expected to incur significant waste disposal costs. The Supplement discusses how these costs are passed on to electricity customers. The Supplement also analyzes the socioeconomic impacts of decommissioning with respect to the communities surrounding power reactors. These impacts include direct and indirect job losses, losses in tax revenues and reductions in local governments' ability to pay for public services *Id.* at 4-47 - 4-53. Yet, the draft Supplement does not discuss the economic and socioeconomic impacts on the metals industries related to the release of radioactively contaminated scrap metal into the economy.

1. **Impact on Metals Company Operations**

To prevent sealed sources from contaminating their operations, metals companies have installed sophisticated radiation detection systems and monitor all incoming shipments of scrap metal for radioactivity. When a radiation detector alarms, the metals company responds, typically by rejecting the load of scrap or hand sorting it to determine where the radioactive contamination is located This causes metals companies to incur significant costs. Often metals producers stop the production process whenever the radioactivity is detected, to take appropriate measures, including rejecting the load of scrap outright. These measures are necessary but impose unreasonable costs on the metals industries.

CL-03/6 The release of scrap metal from power reactors undergoing decommissioning will present a far more insidious problem than orphan sources, by greatly increasing the volume of radioactive scrap arriving at, and the frequency of alarms at, metals companies This poses a

serious problem for the suppliers and transporters, who must manage and arrange for the ultimate disposition of the rejected scrap It would have a similarly enormous adverse impact on the smaller producers, foundries, scrap dealers and processors, fabricators, and end product manufacturers Metals companies experiencing several alarms daily would continue to incur enormous costs, either unfairly increasing their manufacturing costs or compelling them to raise detection levels to above background, thereby exposing themselves to increased risk of inadvertently melting sealed sources Receipt of even slightly elevated levels of radioactively contaminated scrap imposes enormous costs on metals companies.

2. **Impact on Consumer Perception of Metal Products**

The unrestricted release of radioactively contaminated metal for recycling would tarnish the perception of recycling as a social good that should be encouraged Aversion to perceived radioactive risk could lead consumers to avoid products made of metal, especially those with a recycled metal content. Metals recycling industries have worked hard to build public confidence in the safety and utility of products made from recycled metal. This confidence would be lost if the public, rightly or wrongly, perceives such products to be unsafe. For this reason, metal companies have not, and will not, accept scrap that is known or perceived to be radioactively contaminated

The public's perception is that any level or type of radioactivity is unsafe, official assurances to the contrary notwithstanding. The public, including workers at metals companies, will neither understand nor accept the release of radioactively contaminated scrap from nuclear facilities and its use as a feedstock in the manufacture of consumer products

CL-03/7 Accordingly, MIRC urges NRC to look at all of the economic consequences (*i e*, lost sales, employment reductions, and losses in sales by suppliers of equipment, materials, and services to metals industries) to be incurred by the metals industries and allied sectors, as well as the losses in tax revenues to be incurred by governmental entities

3. **Incentives for Unrestricted Release**

CL-03/8 The economic and socioeconomic impacts of decommissioning, coupled with the lack of health-based release criteria using dose-based standards, create a disturbing incentive for the nuclear power industry to release as much surplus metal as it can into the economy and market it as useful material, rather than incurring additional disposal costs when the scrap metal meets general regulatory release guidelines but may contain levels of residual radioactivity unacceptable to metals producers. NRC's recognition of these economic and socioeconomic impacts and its concurrent failure to consider the impacts of contaminated scrap metal on the metals industries create the mistaken impression that the agency has covered all of the significant impacts of decommissioning

V. CONCLUSION

CL-03/9 MIRC appreciates the opportunity to comment on the draft Supplement and urges NRC to consider in the final Supplement to the GEIS the environmental impacts of releasing radioactively contaminated scrap metal into the economy for unrestricted use, as well as the economic impacts on the metals industries and related socioeconomic impacts.

If you have any questions, please contact us

Sincerely,

John L. Wittenborn/CBP

John L. Wittenborn
Christina B. Parascandola

11/9/01
66FR56721
(4)

December 27, 2001
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TO NRC "dgeis@nrc.gov"

UNITED STATES NUCLEAR REGULATORY COMMISSION
Attention. Chief, Rules and Directives Branch
Division of Administrative Services
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Washington, DC 20555-0001

Reference: (a) License No DPR-36 (Docket No 50-309)
(b) NRC Notice of Availability of the Draft Supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities and Notice of Public Meetings, 66FR56721, dated November 9, 2001

Subject: Maine Yankee Comments on NUREG-0586 Draft Supplement 1 "Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities"

CL-04/1 Overall, Maine Yankee (MY) believes that the Supplement provides a fair update of the sections of the 1988 NUREG versions relating to pressurized water reactor, boiling water reactors, and
CL-04/2 multiple reactor stations. However, while the stated intent of the Supplement is to consider in a comprehensive manner all aspects related to the radiological decommissioning of nuclear reactor facilities, the Supplement sometimes deviates from this intent by delving into activities and impacts related to the removal of uncontaminated structures, systems, and components such as intake structures or cooling towers While the consideration of these impacts may be useful and helpful, their inclusion without proper caveat may tend to blur the line of NRC jurisdiction.

Attached are some specific comments on the draft NUREG Supplement. We appreciate the opportunity to provide comments. If you have any questions with regard to our comments, please contact me.

Sincerely,

Original Signed by Michael A. Whitney for TLW

Thomas L. Williamson, Director
Nuclear Safety and Regulatory Affairs

c: Mr. M. K. Webb, NRR Project Manager
Mr. C. L. Pittiglio, NRC NMSS Project Manager, Decommissioning
Mr. R. Ragland, NRC Region I

Template = ADM-013 E-RIDS = ADM-03
Add = M. Masnik (MTM2)

Maine Yankee Comments on NUREG-0586 Draft Supplement 1 "Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities"

Mr. H. J. Miller, NRC Regional Administrator, Region I

I. General Comments

A. Supplement 1 represents a good effort by the NRC to update the environmental impacts of decommissioning based upon the actual experience encountered by nuclear facilities.

B. The Supplement sometimes deviates from this intent of considering impacts related to the radiological decommissioning, by delving into activities and impacts related to the removal of uncontaminated structures, systems, and components such as intake structures or cooling towers. While the consideration of these impacts may be useful and helpful, these considerations should be properly annotated with a caveat that these activities are beyond NRC's decommissioning jurisdiction.

II. Comments Related to Section 4 Environmental Impacts

CL-04/3 A. **4.3.4 Air Quality,** (4.2.4.2) pg. 4-14, last para., last full sentence: This statement indicates that in most cases the number of shipments of other materials (non-radioactive materials) will be small compared to those for LLW. This is not necessarily the case for a plant which is removing all above grade facilities. However, this fact should not affect the conclusion that the air quality related environmental impacts for these activities will be small.

CL-04/4 B. **4.3.5 Aquatic Ecology** (4.3.5.4) pg. 4-19, 1st para., last sentence. This conclusion would result in site-specific analyses for the use of areas beyond the previously disturbed areas if there is a potential to impact the aquatic environment. The vagueness of the condition "potential to impact" could be result in a site-specific analysis for any potential no matter how remotely possible. The NRC should consider rewording the condition to say "there is expected to be or likely to be an impact" Also on the previous page (pg. 4-18 last para in section 4.3 5.2,) it appears that a site-specific assessment would be required merely if the aquatic environment has not been characterized. NRC should clarify that a site specific EIS is not necessary just because the lack aquatic environment characterization, but rather, if an area beyond the previously disturbed area is to be used and no associated characterization of the aquatic environment, if applicable, exists, then such a characterization should be conducted. Then as stated above, if there is expected to be or likely to be an impact to the aquatic environment, then a site-specific analysis should be conducted.

CL-04/5 C. **4.3.6 Terrestrial Ecology** (4.3 6.4), pg. 4-23, last para in section 4.3.6 4, last sentence. This should be reworded to be the same as section 4.3.5 4 as modified in the comment above.

Maine Yankee Comments on NUREG-0586 Draft Supplement 1 "Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities"

CL-04/6 D. **4.3.7 Threatened and Endangered Species** (4.3.7.4), pg. 4-25, last para., last sentence. This conclusion indicates that the NRC will meet its responsibilities on a site specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees.

CL-04/7 E. **4.3.8 Radiological** (4.3.8.3), pg. 4-29, 4th full para., last sentence. Maine Yankee agrees that it is not necessary to update the estimates for exposure found in the 1988 GEIS.

CL-04/8 F. **4.3.13 Environmental Justice** (4.3.13.4), pg. 4-57, last para., last sentence. This conclusion indicates that licensees will need to provide appropriate information related to environmental justice as part of the environmental portion of the PSDAR, but it does not specify what kind of information is needed or what evaluation criterion should apply.

CL-04/9 G. **4.3.14 Cultural, Historical and Archeological Resources** (4.3.14.4), pg. 4-61, last paragraph in section 4.3.14.4, last sentence. This conclusion indicates that the NRC will meet its responsibilities on a site specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees.

CL-04/10 H. **4.3.17 Transportation** This section does not seem to give sufficient attention to licensees that are removing all above grade structures from the site and transporting all of the above grade concrete offsite. The volume of concrete for PWR DECON is much to low for this situation by a factor of three or four. Provided below is Maine Yankee's update of its LLW Volume information. This information is consistent with Maine Yankee's License Termination Plan Revision 2. This waste volume is greater than that assumed in the GEIS. However, even with the increased LLW Volume associated with the removal of all above grade concrete, Maine Yankee's estimates of public dose is still less than that assumed in the draft supplement or the 1988 GEIS because of the extensive use of rail transportation.

III. Comments Related to Maine Yankee Data

Maine Yankee will be reviewing and updating all uses of Maine Yankee data including:

CL-04/11 A. **Appendix F Summary Table of Permanently Shutdown and Currently Operating Commercial Nuclear Reactors**, pg. F-1, Table F-1 Permanently Shutdown Commercial Nuclear Plants {Total Site Area (ac.) For Maine Yankee: 741 (should be 820)}

B. **Appendix G Radiation Protection Considerations for Nuclear Power Facility**

Maine Yankee Comments on NUREG-0586 Draft Supplement 1 "Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities"

Decommissioning

1. **G.2.2 Dose to Members of the Public**

CL-04/12 a. Pg. G-21, Table G-15 Summary of Effluent Releases Comparison of Operating Facilities and Decommissioning Facilities
The values associated with the maximum, minimum and average gaseous effluents for the Decommissioning Reactors do not add up. The Fission and Activation Gasses for gaseous effluents are incorrectly all the same for the maximum, minimum and average in each category (PWR & BWR). It appears that the minimum category for Decommissioning PWR's is Maine Yankee. If so, the minimum value for Fission and Activation Gasses for gaseous effluents should be "none detected". Making this correction appears to make the table added up assuming a PWR population of two.

CL-04/13 b. Pg. G-22, Table G-16 Summary of Public Doses from Operating and Decommissioning Facilities
This table is not well formatted and difficult to interpret. The table mixes the collective dose in person-rem with the individual dose in mrem. The years of concern are assorted. We suggest that the table be simplified and either further discussed in the Section G.2.2 text or eliminated. The following is Maine Yankee's data on individual public doses from Maine Yankee's effluents for 1998, 1999 & 2000:

Maine Yankee Effluent Data	1998	1999	2000
Liquid Effluents			
Total Body (mrem)	1.2E-2	1.5E-3	9.6E-3
Critical Organ (mrem)	4.3E-2	2.9E-3	1.8E-2
Gaseous Effluents			
Critical Organ (mrem)	5.0E-3	5.3E-3	4 3E-3
Beta Air (mrad)	ND*	ND*	ND*
Gamma Air (mrad)	ND*	ND*	ND*

* None Detected

Maine Yankee Comments on NUREG-0586 Draft Supplement 1 "Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities"

C. Appendix J Additional Supporting Data Related to Socioeconomics and Environmental Justice ***Guerrette/Howes/Arnold***

CL-04/14 1. Pg. J-2, Table J-1 Impact of Plant Closure and Decommissioning at Nuclear Power Plants Currently Being Decommissioning
Maine Yankee's Post Termination Workforce should be 360 rather than 246 resulting in a Maximum Workforce Change of 121 rather than 235.

CL-04/15 **D. Appendix K Transportation Impacts,** pg. K-2, Table K-1 Low-Level Waste Shipment Data for Decommissioning Nuclear Power Facilities {LLW Volume for Maine Yankee is indicated as 5920 cubic meters. The Maine Yankee LTP Rev. 2 states: 31,924 cubic meters for transport and 26,920 for disposal after processing}

IV. Typographical/Editorial and Other Comments

CL-04/16 **A. 3.1.4 Formation and Location of Radioactive Contamination and Activation in an Operating Plant,** pg. 3-15 This description should include the activation of corrosion products as a contributor to radioactive contamination.

CL-04/17 **B. 3.3.3 Decommissioning Process** pg. 3-29, 2nd full para. This paragraph is redundance to the preceding and the seceding paragraphs and can be deleted in its entirety.

CL-04/18 **C. 4.3.5 Aquatic Ecology (4.3.5.2),** pg. 4-17, 1st para in section 4.3.5.2, 4th sentence, "Aquatic environment s" should be corrected.

CL-04/19 **D. Appendix A Draft Generic Environmental Impact Statement Scoping Summary Report: Comments in Scope** pg. A-2, Written Comment Letters: George A. Zinke is listed as the "Director, Nuclear Safety & Regulatory Affairs, U.S. Environmental Protection Agency." This reference should be revised to indicate; "Director, Nuclear Safety & Regulatory Affairs, Maine Yankee Atomic Power Co."

Letter 5, page 1

11/9/01
66 FR 65721
(5)

From: "GENOA, Paul" <phg@nei.org>
To: "dgeis@nrc.gov" <dgeis@nrc.gov>
Date: 12/28/01 11 09AM
Subject: NEI Comments on Draft Supplement 1

Attached are NEI's comments. They are also being sent by mail---phg

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Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

Letter 5, page 2

NEI
NUCLEAR ENERGY INSTITUTE

James W. Davis
DIRECTOR, OPERATIONS
NUCLEAR GENERATION

December 28, 2001

Chief, Rules and Directives Branch
Division of Administrative Services
U. S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

SUBJECT: Industry Comments on Draft Supplement 1 to the Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear facilities

The Nuclear Energy Institute (NEI) appreciates the opportunity to provide the following comments on behalf of the nuclear industry. The industry attended all four public meetings held by the NRC on the draft GEIS to offer comments in support of the document. While the industry identified technical corrections or additions to improve the accuracy of the document, they do not alter the conclusions reached in the evaluation.

CL-05/1 Draft supplement 1 represents a useful update of the environmental impacts of decommissioning based upon over 200 facility-years' worth of actual decommissioning experience accumulated by nuclear facilities since the NRC published the initial GEIS in 1988. NEI concurs with the GEIS conclusions, which found that for the *"...environmental issues assessed, most of the impacts are generic and SMALL for all plants regardless of the activities and identified variables..."*

NEI commented in the scoping process that potential environmental impacts associated with the rubblization concept be analyzed in the GEIS Supplement. The non-radiological impacts are assessed, however *"...the staff has determined that Rubblization, or on-site disposal of slightly contaminated material, would require a site-specific analysis and the radiological aspects of the activity would be addressed at the time the license termination plan is*

submitted."

CL-05/2 In order to ensure that the radiological aspects of this activity are assessed consistently, NEI recommends that standard dose modeling assumptions be documented directly through the Q&A process associated with the NRC guidance consolidation project.
Specific comments on the draft are provided in the attachment. They are provided to improve the accuracy of the data included in the draft, however they do not alter the conclusions documented in the supplement.

Once again, NEI appreciates the opportunity to provide these comments. If you have questions concerning the enclosed comments, please contact me at (202) 739-8105 or Paul Genoa at (202) 739-8034.

Sincerely,

James W. Davis

PHG/maa
Enclosure

Draft NUREG-0586, Supplement 1
Specific Industry Comments

Comments on the Executive Summary:

CL-05/3 Executive Summary, page xiv, line 20 - references 10 CFR 50.82(a)(6)(ii) which states that the licensee must not perform any decommissioning activity that causes any significant environmental impact not previously reviewed. The supplement at page 1-8 beginning on line 23 defines three levels of significance SMALL, MODERATE, and LARGE. At which of these significance levels does the requirement of 10 CFR 50.82(a)(6)(ii) come into affect? This needs to be defined as several Environmental Issues, e g. threatened and endangered species are listed as site-specific.

Comments on GEIS Section 3:

CL-05/4 Section 3.1.3, p 3-8 – add "The systems described are typical and may differ at specific facilities." to end of the 1st paragraph.

CL-05/5 Section 3.1.3, p 3-10, 1st paragraph – add "or similar document" following "(ODCM)", since limits may be in Technical Specifications rather than an ODCM. Also, the description of effluent systems should include mention of an evaporator, since some facilities use evaporation to convert liquid waste to gaseous and monitor their discharge.

CL-05/6 Section 3.1 3, p 3-13, last paragraph – shipment of contaminated apparatus or hardware may also occur to support specific activities.

CL-05/7 Section 3.1.3, p 3-14, 1st paragraph – shipment may also occur on barges or other ships.

CL-05/8 Section 3.1 4, p 3-15, last paragraph – clarify whether the last sentence is referring to radiation exposure during decommissioning or operation. In context, the inference is that the activation products provide the main source of radiation exposure to plant personnel in an operating plant, but typically contaminated materials provide more exposure to plant personnel during operation.

CL-05/9 Section 3.2, p 3-16 – the definition of SAFSTOR should more clearly define that it includes the final decontamination of the facility. This would be more consistent with definitions used elsewhere.

CL-05/10 Section 3.2 p 3-20 - defines two ENTOMB options developed specifically to envelope a wide range of potential options by describing two possible extreme cases of entombment. These extremes are useful in bounding an analysis, however they may be inappropriate for analysis to support a potential rulemaking for this option.

Comments on GEIS Section 4:

CL-05/11 Section 4.3.4.2, p 4-14, 2nd paragraph – not all decommissioning sites have or will have building ventilation systems, especially those that are in SAFSTOR for many years. Temporary systems will be established, as needed, for gaseous effluents during decommissioning if installed systems are no longer functional.

Monitoring of air quality is not necessarily performed during the storage period, depending on activities, storage period and source term.

CL-05/12 Section 4.3.4.4, p 4-16, 1st paragraph – add the following sentence to the end of the paragraph: "Particulates produced by decommissioning activities within buildings will be filtered as needed so that air quality impacts will be small."

CL-05/13 Section 4 3 4 pg. 4-14, last paragraph - This statement indicates that in most cases the number of shipments of other materials (non-radioactive materials) will be small compared to those for LLW. This is not necessarily the case for a plant that is removing all above grade facilities. However, this fact should not affect the conclusion that the air quality related environmental impacts for these activities will be small.

CL-05/14 Section 4.3.5 pg. 4-19, 1st paragraph - This conclusion would result in site-specific analyses for the use of areas beyond the previously disturbed areas if there a potential to impact the aquatic environment exists. The vagueness of the condition "potential to impact" could be result in a site-specific analysis for any potential no matter how remotely possible. The NRC should consider rewording the condition to say "there is expected to be or likely to be an impact" Also on the previous page (pg. 4-18 last paragraph in section 4.3.5.2,) it appears that a site-specific assessment would be required merely if the aquatic environment has not been characterized. NRC should clarify that a site specific EIS is not necessary just because the lack aquatic environment characterization, but rather, if an area beyond the previously disturbed area is to be used and no associated characterization of the aquatic environment, if applicable, exists, then such a characterization should be conducted. Then as stated above, if there is expected to be or likely to be an impact to the aquatic environment, then a site-specific analysis should be conducted.

CL-05/15 Section 4 3 6, pg 4-23, last paragraph - This section should be reworded as in

section 4.3.5.4, as modified by the comment above.

CL-05/16 Section 4 3 7, pg. 4-25, last paragraph - This conclusion indicates that the NRC will meet its responsibilities on a site specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees.

CL-05/17 Section 4 3 13, pg. 4-57, last paragraph - This conclusion indicates that licensees will need to provide appropriate information related to environmental justice as part of the environmental portion of the PSDAR, but it does not specify what kind of information is needed or what evaluation criterion should apply.

CL-05/18 Section 4.3.14, pg. 4-61, last paragraph - This conclusion indicates that the NRC will meet its responsibilities on a site specific basis during any decommissioning process, but it does not specify how the NRC will meet its responsibilities or what information it will need from licensees.

CL-05/19 Section 4.3.17 pg. 4-68 - This section does not seem to give sufficient attention to licensees that are removing all above grade structures from the site and transporting all of the above grade concrete offsite. The volume of concrete for PWR DECON is much to low for this situation by a factor of three or four based recent experience.

Letter 6, page 1

From: "Routh, Stephen" <sdrouth@bechtel com>
To: "dgeis@nrc gov" <dgeis@nrc gov>
Date: 12/21/01 9 48AM
Subject: Bechtel Comments on NUREG-0586, Draft Supplement 1

11/9/01
66FR56572,
6

Template = ADM-013

E-RIDS = ADM-03
Add = M Masnik (MTM2)

Letter 6, page 2

BECHTEL

December 21, 2001

VIA E-MAIL TO DGEIS@NRC GOV

Chief, Rules and Directives Branch
Division of Administrative Services
Mail Stop T6 D59
U S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Public Comment on Draft Supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, 66 Fed Reg 56721

Dear Sir or Madam:

The purpose of this letter is to provide Bechtel Power Corporation's comments on draft Supplement 1 to NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities."

Comment #1

CL-06/1 Table 4-1 provides estimates of cumulative occupational dose for decommissioning reactors (comparison of the 1988 GEIS to new estimates compiled for draft Supplement 1) In order to reflect the conclusions of Section 4 3 8, it is recommended that a note be added to Table 4-1 to clarify that these estimates of cumulative occupational dose are generic and are not intended to be site-specific limits

Comment #2

CL-06/2 Out-of-scope activities are identified and discussed in Section 1 and Appendix D. It is recommended that "Interim Storage of Greater Than Class C Waste" also be identified as an out-of-scope activity, consistent with the final rule published in Federal Register Vol. 66, Number 197, dated October 11, 2001.

Comment #3

CL-06/3 Section 4 3 9 and Appendix I discuss the potential for, and consequences of, postulated radiological accidents. On page I-2 of Appendix I, the text states, "As a result of improvements in the technology used for decommissioning, several of the accidents listed in Table I-2 may now be considered to be of a much lower probability or, at the least, to result in much-reduced consequences " It is recommended that the text be revised to identify typical technology

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Chief, Rules and Directives Branch
U.S. Nuclear Regulatory Commission
December 21, 2001
Page 2

improvements. For example, some of the plants currently undergoing decommissioning intend to use single failure proof cranes to preclude the potential for certain postulated spent fuel cask drop or heavy load drop accidents.

Thank you for the opportunity to review and provide comments on draft Supplement 1 to NUREG-0586. Should you have any questions on the comments, please contact me at (301) 228-6245.

Sincerely,

S.D. Routh

Stephen D. Routh
Manager of Regulatory Affairs

December 27, 2001
Sent via certified mail
Emailed to dgeis@nrc gov

Chief of Rules and Directives Branch
Div. of Administrative Services
Mail Stop T 6 D 59
U S Nuclear Regulatory Commission
Washington, D C. 20555-0001

RE: Draft Supplement 1 to NUREG-0586, Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities

COMMENTS OF GEORGIANS FOR CLEAN ENERGY

Georgians for Clean Energy is a non-profit, statewide membership organization that has been working in Georgia for 18 years to protect air and water resources by changing how energy is produced and consumed. We are based in Atlanta, Georgia and have a field office in Savannah.

These comments and questions serve as a supplement to our oral statement made at the public scoping meeting held in Atlanta, GA on December 12, 2001 (see attached).

Public Participation Concerns

CL-08/1 Georgians for Clean Energy remains concerned about the ability for the public to effectively participate in this and other nuclear related issues that impact Georgia's communities. Due to the tragic events of September 11th the Nuclear Regulatory Agency's (NRC) website was not available for a time and is currently severely scaled back, making public access to important background information very difficult or impossible. NRC staff mentioned at the public meeting on 12/12/01 that a full, top-to-bottom review of security concerns would be conducted. Georgians for Clean Energy urges that this review be done prior to the issuance of the final generic impact statement for decommissioning (GEIS).

CL-08/2 Given the difficulty in accessing thorough and accurate information, including potentially relevant material such as the relicensing documents on Plant Hatch in South Georgia, we feel it is important to both extend the public comment period until these documents can be made readily available and to provide more meeting locations to adequately gather public comments. Since

nuclear reactors will eventually be decommissioned in many states the public should be given more than just four locations nationwide to voice their concerns. Public meetings should also be held in communities neighboring currently existing nuclear power plants.

Georgians for Clean Energy promotes the shutdown of our unsafe nuclear power plants here in Georgia and the phase out of nuclear power nationwide. We also advocate for sound, systematic policymaking regarding decommissioning. We continue to oppose the NRC's method of handling nuclear industry issues "generically" and urge that site-specific environmental impact statements be conducted as each nuclear reactor approaches final shutdown.

Security

CL-08/3 In light of September 11th it is now abundantly clear that nuclear materials are desired by terrorist organizations. Our nation's operating nuclear power plants represent terrorist targets, but so too does the nuclear waste they generate. Since a decommissioned nuclear power plant would have a greatly reduced security force, the closed plant could provide an easier opportunity for terrorists to obtain nuclear materials. In the case of plants like Hatch that have outdoor storage of nuclear waste, the notion of a reduced security force is even more troubling. Georgians for Clean Energy again stresses the need for a full evaluation of security measures to be assessed prior to issuing a final GEIS.

Site-Specific Concerns

CL-08/4 Georgians for Clean Energy does not believe that a generic environmental impact statement (EIS) regarding decommissioning of nuclear facilities is a sufficient tool for evaluating impacts borne to specific environments from decommissioning a nuclear power plant. After the explanation by the NRC staff at the public meeting in Atlanta, we further disagree with the process of using the significance levels of SMALL, MODERATE, and LARGE for a variety of issues at a variety of locations to come up with a generic, one-word answer. The classifications are generic in form, hard to understand, and it is difficult to figure out how the NRC came to those characterizations even after NRC staff attempted to explain it at the public meeting in Atlanta. If the NRC unwisely chooses to continue using this classification system, Georgians for Clean Energy urges that, at a minimum, layman's terms be used to define the levels and the methods used to categorize the issues.

CL-08/5

CL-08/6 Georgians for Clean Energy requests that the NRC require licensees undergoing or planning decommissioning to submit a new environmental assessment. We do not find it acceptable to give licensees the option of using "recent environmental assessments"

CL-08/7
CL-08/8 Some nuclear plants, like Hatch, have overflowing volumes of nuclear waste that are now being stored outdoors which impacts the environment and could affect decommissioning. The NRC

CL-08/9 has no experience in decommissioning nuclear reactors that have operated beyond the original 40-year license period. Nor does the NRC have any experience decommissioning nuclear power plants that used plutonium bomb fuel, also known as mixed-oxide fuel (MOX). Again, these factors, among others, must be incorporated in addressing the decommissioning of individual facilities.

Economic Concerns

CL-08/10 Georgians for Clean Energy does not believe that the GEIS adequately addresses decommissioning costs. Though assurances were made at the public meeting in Atlanta that decommissioning funds are adequate, real-world examples have proved otherwise. For instance, in the current world of mega-mergers of electric utilities and sudden dissolution of energy giants such as Enron, there is little guarantee in place that companies will be able to pay for the full costs of decommissioning. Additionally, we are concerned that the method of decommissioning a nuclear power plant is determined more by the cost implications to the licensee than the overall ramifications of leaving a contaminated site for the local communities.

CL-08/11 An Associated Press news article from December 5, 2001, "Japanese power company begins dismantling country's oldest nuclear reactor," highlighted the enormous financial and technical concerns that Japan is facing regarding decommissioning, "Japan Atomic Power Co., which took the Tokaimura plant off line in 1998, won't begin taking apart the reactor for another 10 years because extremely high levels of radiation remain inside, said spokesman Eichi Miyatani. It will completely dismantle the plant by 2017 and spend an estimated 92.7 billion yen (US$748 million), Miyatani said." These monetary figures exceed those that were mentioned as average decommissioning cost estimates at the NRC's public meeting in Atlanta.

CL-08/12 Furthermore, a report issued this December by the United States Government Accounting Office, "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could Be Improved--GAO-02-48," brings to light many concerns about the lack of adequate funding available for decommissioning activities. The following statement by the GAO makes it apparent that the NRC needs to improve, "However, when new owners proposed to continue relying on periodic deposits to external sinking funds, NRC's reviews were not always rigorous enough to ensure that decommissioning funds would be adequate. Moreover, NRC did not always adequately verify the new owners' financial qualifications to safely own and operate the plants. Accordingly, GAO is making a recommendation to ensure a more consistent review process for license transfer requests." (P.4)

CL-08/13 Georgians for Clean Energy requests that this extensive report be thoroughly reviewed by the NRC staff, be printed in it's entirety as an appendix in the final GEIS as the report did not come out before the draft GEIS was issued, and that the recommendations by the GAO be studied and incorporated into the final GEIS. Additionally, the public participation process should be

extended to allow for proper review of this important report.

CL-08/14 The GAO report also highlights several uncertainties relating to the costs of decommissioning:

> "Varying cleanup standards and proposed new decommissioning methods introduce additional uncertainty about the costs of decommissioning nuclear power plants in the future. Plants decommissioned in compliance with NRC's requirements may, under certain conditions, also have to meet, at higher cost, more stringent EPA or state standards. New decommissioning methods being considered by NRC, which involve leaving more radioactive waste on-site, could reduce short-term decommissioning costs yet increase costs over the longer term. Moreover, they would raise significant technical and policy issues concerning the disposal of low-level radioactive waste at plant sites instead of in regulated disposal facilities. Adding to cost uncertainty, NRC allows plant owners to wait until 2 years before their license is terminated—relatively late in the decommissioning process—to perform overall radiological assessments to determine whether any residual radiation anywhere at the site will need further clean-up in order to meet NRC's site release standards. Accordingly, GAO is recommending that NRC reconcile its proposed decommissioning methods with existing waste disposal regulations and policies and require licensees to assess their plant sites for contamination earlier in the decommissioning process. (P.4-5)

CL-08/15 Georgians for Clean Energy is also concerned about economic impacts to the local communities.
CL-08/16 The NRC needs to pay attention to decommissioning costs proposed by Georgia nuclear utilities during rate cases and other proceedings so there is not a situation created where much needed monitoring and maintenance is ignored simply because there was no regulatory attention to the real cost of decommissioning.

Environmental Comments

CL-08/17 Georgians for Clean Energy firmly believes that a site-specific analysis must be done for each individual nuclear plant. This includes the area of the site itself along with downstream and downwind regions and all areas within the ingestion radius of the facility. As we mentioned at the public meeting in Atlanta, there are already elevated levels of some radioactive contaminants nearly 100 miles downstream of Georgia's Plant Hatch and Plant Vogtle.

CL-08/18 We are still concerned that the NRC mistakenly poses that decommissioning activities will have a small impact on water quality or air quality. Construction and demolition sites across Georgia, most of which do not have nuclear contaminants, contribute to the degradation of our rivers and air. Georgians for Clean Energy would like to know how the NRC determined that an enormous project such as decommissioning an entire nuclear plant, which will involve the handling of

nuclear contaminated materials, would have a SMALL impact or air and water quality. We have already requested a copy of the analysis that was done to make this determination, and since we have not received that analysis yet we continue to urge that the NRC make this available to the general public and us.

CL-08/19 Additionally, a thorough analysis of groundwater impacts seems lacking. Given Georgia's current concern over the Floridan aquifer, we request that a site-specific assessment of groundwater quality be conducted prior to decommissioning. Also, we request that a more thorough analysis of groundwater issues be researched prior to issuing the final EIS. As an example, the NRC should request the most recent data from state agencies, such as the Georgia Environmental Protection Division, that are involved in negotiations regarding "water wars" between states—as in the ongoing dispute facing Georgia, Florida, and Alabama.

CL-08/20 Georgians for Clean Energy requests that the "rubblization" method of decommissioning be removed from the final EIS. Chopping up a plant and storing it on site not only sounds ridiculous but also is grossly negligent of the fact that there are facilities designed, built and licensed to handle radioactive materials. A point supported by the GAO report cited earlier in

CL-08/21 these comments. Georgians for Clean Energy does not promote the idea of shipping nuclear

CL-08/22 waste all over the country and recognizes that nuclear plant owners and the NRC never told communities near nuclear plants that they were also accepting a permanent nuclear waste dump. Rubblization is an egregious assault on the public participation process and a devious example of corporations casting aside those communities that supported them over the years.

CL-08/23 Georgians for Clean Energy also opposes any efforts by the nuclear industry or licensee of a decommissioning nuclear plant to "recycle" radioactive materials for release into the marketplace. No facilities should be able to sell their demolition debris. Instead, it should be dealt with as regulated nuclear waste since the bulk of the materials will be radioactively contaminated

Health & Safety Comments

CL-08/24 The nuclear facility's land, even after decommissioning, must not be allowed to revert to public or private use even if the NRC believes that the radioactivity on the land is less than 25 millirems per year. Additionally, under no circumstances should future buildings, structures, etc. be built atop the former nuclear site.

CL-08/25 After the meeting in Atlanta, we are increasingly concerned about the safety of the workers that will be involved in decommissioning. Will a more specific analysis of worker effects be dealt with in the final EIS or is there a separate report that will research health impacts? Georgians for Clean Energy requests that all worker exposures that have occurred at nuclear power plants that are currently being decommissioned be made available to the public and listed in the final GEIS.

Low-Income Population Impacts

CL-08/26 Reactor sites are often contaminated to the extent that the location is made undesirable and unsafe for future economic development. As we stated at the public meeting in Atlanta, Georgians for Clean Energy urges that site-specific studies be conducted. For example, the economy of rural Georgia is much different from that of urban New York. How can these impacts be treated generically? Some nuclear power plants are in urban settings where economic impacts could be much different that in rural areas that have little or no other major employer in the region.

Questions:

CL-08/27 1. How will on-site, outdoor nuclear waste storage dumps, [also known as Independent Spent Fuel Storage Installations—ISFSI] like at Plant Hatch, be affected by decommissioning? How will the licensee of an ISFSI be impacted by events that may happen during decommissioning, i e. what if there is an accident nearby and the casks are damaged or the site is rendered inaccessible?

CL-08/28 2. How will the facility licensee, in our case, Southern Nuclear, benefit from later sale of the nuclear plant's land to a new owner? Also, how will the land be tracked after it's deemed "safe" and the licensee sells it...especially in cases where there may be a leak or a release of radiation into the environment after the initial sale occurred? For instance, isn't it in the best financial interest of the licensee, in our case Southern Nuclear, to use the fastest and least expensive decommissioning option so that the license can be terminated and they can sell the land before deficiencies can be found in the manner in which a plant was decommissioned?

CL-08/29 3. How is the funding of decommissioning costs guaranteed to be met by a company in a day and age where gigantic utility companies can collapse at any moment, as has recently happened with Enron?

CL-08/30 4. What legislation or regulations are in place to compensate communities, such as fisheries, farmers, etc. in cases of releases or accidents during or after decommissioning?

CL-08/31 5. What agency or governing body is responsible for monitoring the site after the decommissioning is deemed "complete"? How do the licensee and a government agency, such as the NRC, which is mandated to protect the public health, allowed to walk away from a site that will essentially remain radioactive forever?

Conclusion

CL-08/32 As we have stated earlier, the methods used to decommission a nuclear plant will affect not only the communities of today but also the livelihood of future generations. The nuclear industry is leaving humankind a legacy of devastation—epitomized by its long-lived and highly dangerous nuclear waste. They are unable to solve their waste problem and now, when faced with the eventual shutdown of their plants, are unwilling to take measures to ensure that the public is protected.

CL-08/33
CL-08/34 The NRC is charged to protect the quality of the human environment and we ask that they all can uphold that charge. The current draft GEIS is not protective and needs major improvement. We again stress the need for site-specific Environmental Impact Statements on decommissioning for nuclear power reactors. Our communities—from the people to the waterways—are unique and are entitled to nothing less.

Sincerely,

Sara Barczak
Safe Energy Director
Georgians for Clean Energy

Attachment

Letter 9, page 1

11/9/01
66FR 56721
(9)

From: Lori Davis <davislj@dteenergy com>
To: <dgeis@nrc gov>, <swb@nrc gov>, <elk1@nrc gov>
Date: 12/28/01 6 59AM
Subject: Comments on Draft Supplement to GEIS on Decommissioning

Good morning.

Please find attached a letter on "Comments on Draft Supplement to GEIS on Decommissioning" (Fermi letter NRC-01-0087, dated December 28, 2001).

Should you have any questions or comments, please advise Ms. Lynne S. Goodman, Manager, Fermi 1 (Detroit Edison), at 1-734-586-1205 (Should you have any problems with the document transmittal, please advise the sender)

Thank you

CC: Lynne S Goodman <goodmanl@dteenergy com>

Letter 9, page 2

NRC-01-0087
December 28, 2001
Page 1

December 28, 2001
NRC-01-0087

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T6D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Reference: 1.) Draft NUREG-0586, Sup 1, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Draft Supplement Dealing with Decommissioning of Nuclear Power Reactors", dated October 2001

Subject: Comments on Draft Supplement to GEIS on Decommissioning

Detroit Edison appreciates the opportunity to comment on Reference 1.

CL-09/1 Overall, Detroit Edison agrees with the conclusions in the draft NUREG-0586, Sup 1. The supplement will be helpful and updates the previous Generic Environmental Impact Statement (GEIS) on Decommissioning to accommodate changes in regulations and experience gained in recent decommissioning activities. Detroit Edison does have specific comments on details in the document. The attachment to this letter details the comments. None of the comments should affect the overall conclusions in the supplement to GEIS.

If there are any questions on these comments, please contact Ms. Lynne Goodman at 734-586-1205.

Sincerely,

/s/

W. T. O'Connor, Jr.
Vice President, Nuclear Generation

WTO/LSG/ljd
Attachment
cc: S. W. Brown
E. Kulzer (NRC Region III)

Template = ADM-013
E-RIDS = ADM-03
Add = M. Masnik (MTM2)

NRC-01-0087
December 28, 2001
Page 2

D. Minaar (State of Michigan)
Regional Administrator, Region III
NRC Resident Office

NRC-01-0087
December 28, 2001
Attachment 1
Page 3

Specific Comments on NUREG-0586, Sup 1:

CL-09/2 Abstract, p iii, lines 16-17 – add "explicitly" before "consider" in the 5th sentence. The original GEIS did not explicitly cover reactors except BWRs and PWRs. However, other reactors were not explicitly listed in what was not covered by the GEIS. Also, other reactors were listed in the table of decommissioning reactors in the original GEIS. They have been considered covered for activities described in the GEIS.

CL-09/3 Executive Summary, p xi, 3rd paragraph, 4th sentence, lines 31-32 – change to "It does not include research and test reactors or the decommissioning of reactors that were permanently shutdown as a result of an accident." This change provides consistency with the report and does not imply exclusion of all reactors that have been involved in an accident at some time during their operating history.

CL-09/4 Section 3.1, p 3-2, line 21 – the LaCrosse Boiling Water Reactor site is smaller than San Onofre. McGuire Nuclear Station has two operating reactors rather than three.

CL-09/5 Section 3.1.1, p 3-2, line 39 and 3-3, line 1 – Fermi 1 is in the final phase (decontamination and dismantling) of SAFSTOR.

CL-09/6 Section 3 1 1 3, p 3-4, lines 10-14 – delete 2nd sentence and modify 3rd sentence. The Fermi 1 FBR used uranium as its fuel. The information on uranium capturing neutrons to produce plutonium is correct. Breeding rates are dependent on the FBR's specific design.

CL-09/7 Section 3.1 1.3, p 3-5, line 1 – add "commercial" before "FBR". The final decision on whether to permanently shutdown the FFTF, a DOE FBR, has not yet been announced.

CL-09/8 Section 3.1.2, p 3-6, lines 18-19 – The Fermi 1 Reactor Building is a steel domed structure. Below ground, there is considerable concrete shielding, but the building is not reinforced concrete.

CL-09/9 Section 3.1.3, p 3-8, line 32 – add "The systems described are typical and may differ at specific facilities." to end of the 1st paragraph.

CL-09/10 Section 3.1.3, p 3-10, line 7 – add "or similar document" following "(ODCM)", since limits may be in Technical Specifications rather than an ODCM. Also, the description of effluent systems should include mention of an evaporator, since some facilities use evaporation to convert liquid waste to gaseous and monitor their discharge.

CL-09/11 Section 3.1.3, p 3-13, last paragraph – shipment of contaminated apparatus or hardware may also occur to support specific activities.

NRC-01-0087
December 28, 2001
Attachment 1
Page 4

CL-09/12 Section 3 1.3, p 3-14, lines 5-6 – shipment may also occur on barges or other ships.

CL-09/13 Section 3.2, p 3-16, lines 18-24 – the definition of SAFSTOR should more clearly define that it includes the final decontamination of the facility. This would be more consistent with definitions used elsewhere, such as in the original GEIS.

CL-09/14 Table 3-2, p 3-27 – add footnote "c" to Fermi 1. Detroit Edison informed the NRC in late 2001 per the requirements of 10 CFR 50.82, that the final decontamination and dismantling phase of SAFSTOR would be started for Fermi 1.

CL-09/15 Section 3.3.3, p 3-29 – sentences are duplicated between the three full paragraphs on p 3-29.

CL-09/16 Section 4.3.3.3, p 4-12, line 16 – there appears to be a discontinuity between the previous paragraph and the paragraph starting on line 16. Is something missing?

CL-09/17 Section 4.3 3.3, p 4-12, line 23 – pH would not necessarily (normally) be measured per the LTP. Also, while considerable attention is placed on minimizing spills during decommissioning, hazardous spills have occurred at decommissioning sites. The same types of activities as performed at operating units, which have resulted in spills at operating units, can lead to spills at decommissioning units. The likelihood is less since less water treatment and so less bulk chemical handling is typically performed at decommissioning sites.

CL-09/18 Section 4.3.3.3, p 4-12, lines 28-30 – add "The processing of residual sodium products from an FBR is no more likely to result in water quality impact than decommissioning activities at a LWR."

CL-09/19 Section 4.3.4.2, p 4-14, lines 11-24 – not all decommissioning sites have or will have building ventilation systems, especially those that are in SAFSTOR for many years. Temporary systems will be established, as needed, for gaseous and particulate effluents during decommissioning if installed systems are no longer functional.

CL-09/20 Monitoring of air quality is not necessarily performed during the storage period, depending on activities, storage period and source term.

CL-09/21 Section 4.3 4 3, p 4-15 – other activities during decommissioning could result in release of particulate matter. This includes temporary suspension of particles during cutting activities and production of particulates from processing of sodium and NaK at an FBR. Such particulate matter is filtered, as necessary, prior to release, to avoid or minimize adverse air quality impacts. While this is recognized on p 4-14, it should also be included in the section on "Results of Evaluation".

CL-09/22 Section 4 3.4 4, p 4-16, line 11 – add the following sentence to the end of the paragraph: "Particulates produced by decommissioning activities within buildings will be filtered as

NRC-01-0087
December 28, 2001
Attachment 1
Page 5

needed so that air quality impacts will be minimal."

CL-09/23 Section 4.3.9.2, p 4-34 – it is not clear whether the physical injuries discussed in this section are only those due to radiological impacts or due to non-radiological aspects of an accident. The section is on radiological accidents so the former is implied, but the wording is not clear.

CL-09/24 Section 4.3.9.3, p 4-35, lines 19-21 – the category of hazardous (non-radiological) chemical related accidents is listed here, which is appropriate since such accidents are possible during decommissioning. The description only mentions potential for injury to the public. However, in Section 4.3.9.2, which describes the classification of accidents as small, moderate and large, effects on workers are also discussed. This should be clarified since it appears to be inconsistent.

CL-09/25 Section 4.3.10.1, p 4-37 – the hazard of flames and fires should be addressed in the section on physical hazards.

CL-09/26 Section 4.3.10.1, p 4-39 – the following items should be added to the list of activities that expose workers to chemical hazards:

- Removal of chemical containing systems, such as demineralizers, and acid and caustic containing tanks
- Removal of sodium and NaK residues

CL-09/27 Section 4.3.10.2, p 4-40, lines 12-14 – in the paragraph on FBR decommissioning activities, add that decommissioning a FBR involves removal of sodium and NaK, but that these decommissioning activities can be performed safely with the proper engineering controls.

CL-09/28 Section 4.3.11.1, p 4-41, line 7 – add "LWR" before "licensee" in the third sentence. The formula for the specified minimum amount of decommissioning funds applies to LWR's. The other regulations on decommissioning funds and evaluation of adequacy do apply to all reactors, so there is no adverse impact of the formula applying only to LWR's

CL-09/29 Section 4.3.11.3, p 4-45, lines 4-5 – delete or reword "and is either undergoing decommissioning or is in safe storage awaiting decommissioning" from the second sentence. SAFSTOR or safe storage is a form of decommissioning.

CL-09/30 Tables 4-6 and 4-7, p 4-71 – footnote "d" is not used in the tables, but probably belongs next to the 960 value for the number of shipments from a PWR using SAFSTOR.

CL-09/31 Section 4 3 18 2, p 4-72, lines 38-41 – other irretrievable resources include gases and tools, but these resources are also minor.

CL-09/32 Section 6 1, p 6-1 – for plants shutdown before existing decommissioning rules were adopted, the environmental reviews may not be in the PSDAR as discussed in this section. In such cases environmental aspects not previously addressed that need to be addressed will be covered in the LTP.

CL-09/33 Tables E-3 and E-5
The issue of occupational hazards applies to activities in addition to those indicated in Table E-3. Since Table E-5 is based on Table E-3, it also needs to be revised to reflect the following.

Such additional activities that can affect or involve occupational issues are as follows. A brief explanation of why follows each item.

Adjust site training (Industrial safety type training needs to be continued and revised based on job hazards to ensure workers are trained for activities or areas [e g. confined spaces] involved in decommissioning)

Establish a reactor coolant system vent pathway (Depending on specific method, this could involve cutting, welding and working at heights)

Establish containment vent pathway (Depending on specific method, this could involve cutting, welding and working at heights)

Do preventive and corrective maintenance on SSCs (Maintenance activities at an operating plant or decommissioning plant can involve industrial hazards, some more so than others. There can be energized systems, pressurized fluids, rotating equipment, etc.)

Chemical decontamination (Occupational hazards include chemicals and pressurized fluids)

High pressure water sprays of surface (High pressure sprays are themselves a hazard due to energy involved. Precautions need to be taken to use them safely)

Cut out radioactive piping (Cutting typically involves torches or cutting wheels, creation of fumes or particles, and rigging)

Remove large and small tanks or other radioactive components from the facility (Careful rigging is needed to maintain control and prevent injury. If this activity also involves cutting the equipment free, the hazards of cutting are also involved)

LLW packaging and storage (Handling the LLW and packages needs to be performed

ergonomically safe to prevent injuries)

Large component transportation (The transportation issues all involve lifting of materials to remove them or bring them onto the site. Care also is needed if vehicle is backing up during the evolution.)

LLW transportation

Equipment into site transportation

Backfill tracked into site

Non-radioactive waste transportation

Complete final radiation survey (The survey will involve working at heights if buildings remain, and possibly accessing hard to reach locations.)

CL-09/34 Table F-1
The site area for Fermi 1 is listed as 1,120 acres. That is the size of the Fermi 2 site; Fermi 1 is on a portion of that site. The original Fermi 1 site was 900 acres. Currently, the portion of the site considered to be the Fermi 1 nuclear facility on the Fermi 2 site is less than 4 acres.

CL-09/35 Fermi 1's cooling water source was Lake Erie. Saxton's area is listed as 1.1 acres, however, the text reported San Onofre as having the smallest site. Also, footnote "b" should be applied to the "Cooling System" header, rather than "Cooling Water Source."

CL-09/36 Table F-2, p F-4 – Fermi is in Michigan, not Ohio.

CL-09/37 Section G.1.1.4 1, p G-5 – delete or revise fourth bullet. Conditions typically encountered in exposures from normal facility operations result in external dose, rather than internal dose. Internal deposition of particles can occur, but this is less common than external dose. Also, clarify last bullet.

CL-09/38 Section G 1.1 4 3, p G-8, lines 13-22 – this somewhat explains selection of the occupational nominal probability coefficient in Table G-4 for fatal cancers, but does not explain selection of hereditary coefficient.

CL-09/39 Table G-6, p G-11 – the table per its title covers dose limits for an individual member of the public under 10 CFR 20. The ALARA air emission dose constraint listed in the table is not a 10 CFR 20 limit.

CL-09/40 Section G 2 1, p G-13, lines 26-45 – the conclusion in the first sentence of the third paragraph

NRC-01-0087
December 28, 2001
Attachment 1
Page 8

is misleading. The main reason that the occupational doses at reactors undergoing decommissioning are a small fraction of dose accumulated at operating facilities, as shown in Table G-9, is that there are many more operating plants than decommissioning plants. The average for decommissioning plants shown in the table is less than the operating plant, but not only a small fraction.

CL-09/41 It also is not clear how, why, and how many plants were selected for Tables G-11 and G-12. Additionally, the first sentence of the fourth paragraph should indicate that the data is estimated worker dose for major types of decommissioning activities. Actual data appeared to be listed for only one plant in the tables.

CL-09/42 Table G-12, p G-17 – the two numbers listed for San Onofre should be explained.

CL-09/43 Section G 2.1, p G-13 & G-19 – the conclusion reached that the doses for SAFSTOR and DECON are not substantially different is partly due to which decommissioning plants were selected to be evaluated.

CL-09/44 Table G-14 it appears strange that only 26-34 operating plants were listed as reporting dose from gaseous effluents each year, since all plants are required to report. Also, the selection of the years 1985-1987 appears strange for an update report.

CL-09/45 Section G.2.2, p G-21 – while the conclusion appears correct, it is strange that information was only available for a small sample of facilities. This data is reported to the NRC annually by licensees.

CL-09/46 Table G-15 – the basis of this table should be better explained. How were the plants selected? What years are covered?

CL-09/47 Table G-16 – how were the plants listed in this table selected? It appears to be a strange non-representative sample.

CL-09/48 Tables H-1 and H-2 – as addressed under comments on Tables E-3 and E-5, other activities involve occupational hazards.

Occupational issues do not seem to belong as an environment issue category. Safety of workers is considered as a separate category when planning work. From a regulatory perspective, OSHA and state agencies typically promulgate regulation on worker safety, not the EPA or state environmental agencies. The environmental issues typically are impacts to the air, water, or land both on and off site, while other environmental issues that impact people are evaluated for the public. The type of review is also different for occupational issues than other environmental issues. As each work package is planned, the hazards of the job need to be addressed in the planning and appropriate methods, engineering controls and

NRC-01-0087
December 28, 2001
Attachment 1
Page 9

protective equipment planned and workers briefed for each activity. This is an immediate, short-term (for the duration of the activity) type of review, while most environmental issues have longer term implications.

However, if occupational issues are to be included in this environmental review, the additional activities discussed earlier also need to be included.

CL-09/49 Tables E-3, E-5, H-1 and H-2 – some additional activities, for example, system dismantlement and large component removal, could potentially impact air quality. Provisions are needed for portions of these activities to prevent adverse impacts.

CL-09/50 Table H-2, p H-17 – in the "Impact and Summary of Findings" section, "water use" should be changed to "air quality".

CL-09/51 Table I-5, p I-20 – add fire and hazardous materials to associated accidents for removal of contaminated pipe and tubing.

CL-09/52 Table I-5, p I-21 – add fire and hazardous materials to associated accidents for metal component dismantlement, intact removal or partial segmentation of large components and the first three subcategories of removal of reactor pressure vessel and internals.

CL-09/53 Table I-5, p I-22 – add fire to associated accidents for cut piping attachments. Add fire and hazardous materials to associated accidents for decontamination, segmentation and disposal of RCS and other larger bore piping.

CL-09/54 Table I-5, p I-23 – add fire to associated accidents for deactivate systems, disposal of nonessential structures and systems; establish a permanent reactor coolant system vent path; establish a permanent containment vent path; remove dedicated safe-shutdown diesel and generator; and remove unused equipment during SAFSTOR. Add hazardous materials to deactivate systems; disposal of nonessential structures and systems; drain and flush plant systems; process, package, and ship liquid and solid radioactive wastes; remove dedicated safe-shutdown diesel and generator; dispose of non-radioactive hazardous waste; and limited decontamination of selected structures and systems.

CL-09/55 In general, any activities that involve cutting or welding could lead to a fire. Precautions are implemented to minimize the possibility and respond quickly if a fire starts. Depending on the materials in the systems during operation or during earlier decommissioning activities, a hazardous materials accident is possible when removing systems, handling waste or using decontamination materials. Again, precautions are planned to minimize the possibility.

CL-09/56 Section J.1.1, p J-1 – add, "selected" before "facilities" in the first sentence of the first paragraph. Identify the time period used for the comparison in the second paragraph.

NRC-01-0087
December 28, 2001
Attachment 1
Page 10

CL-09/57 Table J-1 – add footnote "c" to Fermi 1.

NRC-01-0087
December 28, 2001
Attachment 1
Page 11

CL-09/58 In conclusion, Detroit Edison thinks the draft supplement to the GEIS on decommissioning of nuclear facilities is a good effort and agrees with the overall conclusions. Some details should be revised to improve accuracy and to ensure planned decommissioning activities, intended to be covered by this supplement, are fully addressed. This will avoid future questions on whether activities are covered and/or bounded by this GEIS supplement.

11/9/01
66 FR 65721
(10)

From: adele kushner <adelek@alltel.net>
To: <dgeis@nrc gov>
Date: 12/29/01 6.48PM
Subject: NUREG-0586

Comments on Draft Supplement 1 to NUREG-0586, Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities.

CL-10/1 Although the alternatives proposed for decommissioning nuclear facilities all sound reasonable, the proposal in general has one major problem, which is the NRC's lack of credibility due to past errors and cover-ups.

CL-10/2 The present openness is most welcome, and a nice change, but past history hangs over NRC like a dark cloud.

CL-10/3 My direct experience is limited to having heard an eyewitness account of the decommissioning of Yankee Rowe This person reported a whole list of unfortunate incidents that released contamination into the air and groundwater, contaminating workers on site who were not wearing protective clothing, and possibly contaminating people along the rail and truck routes where parts of the plant were being transported.

CL-10/4 In addition, many reports of lost shipments of nuclear waste and materials, including fuel rods, in various parts of the country come to light, another hazard of transporting radioactive materials.

CL-10/5 Wherever human beings are involved, there are bound to be errors and accidents. The human element cannot be removed, as we found out at Three Mile Island and Chernobyl.

CL-10/6 Therefore, the safest alternative would be, first, to consider each reactor site individually rather than making a blanket policy to cover every site. Second, the lowest possibility of releasing contamination

CL-10/7 into the environment requires entombing radioactive structures, systems and components in a long-lived substance, maintaining and monitoring it, until the radioactive level is reduced to a safe level, which would take many years.

CL-10/8 This method would be the most likely to reduce exposure to workers and the public, and would not require workers familiar with the original construction

CL-10/9 Any of the methods proposed would require long time maintenance and monitoring, but keeping it in its original location would mean that the community would be familiar with it, it would be visible, and the community would be likely to care about its monitoring. In fact, involving the community in the whole process could utilize their experience and encourage their help.

CL-10/10 Allowing the licensee to choose the decommissioning method is not recommended, due to the usual pressures to cut costs despite the obvious dangers.

CL-09/11 ALARA is not a sufficient basis for judging proper methods.

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

CL-10/12 Thank you for holding these meetings in four locations around the country, and for encouraging public participation.

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Letter 11, page 1

11/9/01
66 FR 65721
(11)

From: Debbie Musiker <dmusiker@lakemichigan.org>
To: "dgeis@nrc.gov " <dgeis@nrc gov>
Date: 12/31/01 11:10AM
Subject: Comments on DGEIS on Decommissioning of Nuclear Facilities

On behalf of the Lake Michigan Federation and the Environmental Law & Policy Center of the Midwest, please accept the attached comments regarding the Draft Supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586.

Please contact Debbie Musiker if you have any difficulty opening the attached document or have any other questions. Thank you for your consideration.

Best regards,

Debbie Musiker
Lake Michigan Federation
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312-939-0838

Paul Gaynor
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CC: "pgaynor@elpc org " <pgaynor@elpc.org>

Letter 11, page 2

December 31, 2001

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
U S. Nuclear Regulatory Commission
Washington, D C. 20555-0001

Re: Comments on Draft Supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG–0586.

Dear Rules and Directives Branch Chief:

Please accept the following comments on behalf of the Lake Michigan Federation and the Environmental Law & Policy Center of the Midwest. The Lake Michigan Federation is a not-for-profit environmental organization that works to restore fish and wildlife habitat, conserve land and water, and eliminate pollution in the watershed of America's largest lake.

The Environmental Law & Policy Center is a Midwest public interest environmental advocacy organization, working, among other things to achieve cleaner energy resources and implement sustainable energy strategies.

CL-11/1 As a preliminary matter, we support the prompt decommissioning of nuclear power plants and urge the United States Nuclear Regulatory Commission ("NRC") to ensure that decommissioning goes forward in the safest, most environmentally sound manner.

In reviewing the Draft Supplement to the Final Generic Environmental Impact Statement (hereinafter, "Draft GEIS"), NUREG – 0586, we have several concerns.

CL-11/2 CL-11/3 CL-11/4

1. Considering the importance of the Great Lakes, which represent 20% of the world's freshwater supply, the NRC should prepare a site-specific impact analysis for the 18 nuclear facilities located on the United States side of the Great Lakes. The potential threat of a release along the shoreline or into the lake of radioactive material during decommissioning or storage of spent fuel requires special consideration. The Draft GEIS does not adequately consider the effects on aquatic ecology caused by an accidental, radioactive release.

Template - ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

CL-11/5
CL-11/6 Other aquatic environmental impacts also merit site-specific review. The location of intake and outfall structures in the lake alone requires site-specific analysis. As written, the Draft GEIS does not make clear whether an intake/outfall structure on the facility1 is considered part of a previously disturbed area If deemed part of the previously disturbed area, any work on the intake/outfall structure will be deemed generic and the impact small.

CL-11/7 Any work on or removal of an intake/outfall structure should trigger site-specific analysis. Indeed, the Draft GEIS explains that the removal of near-shore or in-water structures could result in the establishment of non-indigenous species to the exclusion of native species. DGEIS, 4-17. It also explains that in some cases wetlands will develop in areas where the construction of the facility alters surface drainage patterns. DGEIS, 4-18. The Draft GEIS suggests that site-specific analysis is appropriate in certain circumstances when the impact is beyond the previously disturbed area and when there is a potential to impact the aquatic environment. DGEIS, 4-19. The above examples of establishment of non-indigenous species or wetlands are exactly the types of impacts that require site-specific analysis. Yet, the site-specific analysis recommended may not cover these examples because they may occur within the previously disturbed area.

CL-11/8 Removal of intake/outfall structures may be the most beneficial action to the aquatic ecology, but it should not go forward without site-specific study of the environmental impacts.

CL-11/9 2. Sixty years is an arbitrary and inappropriate time period to allow a nuclear reactor to remain in SAFSTOR, where the contaminated facility will largely remain intact and spent fuel may remain on-site. According to NRC staff, **no technical basis** exists for this 60-year timeframe.2 See Transcript, December 6, 2001 Public Meeting, Drake Hotel, Chicago. First, if a company waits too long to decommission, it will lose its institutional memory and familiarity with the facility's structures because current workers may be deceased or otherwise unavailable. Such intricate knowledge of the facility is critical to avoiding radioactive releases during decommissioning.

CL-11/10 Second, we are concerned that over the course of 60 years, the ownership of nuclear plants, financial status of licensees, and decommissioning obligations for many plants could change; if companies have not operated the facility long enough to accrue sufficient funds for decommissioning, and then go into an extended SAFSTOR period, bankruptcy of the facility owner could jeopardize clean up at the site. The extended time of storage combined with reduced staffing associated with SAFSTOR could mean that these sites are more likely to be subject to accident, theft of equipment, or attack.

CL-11/11 Third, the Draft GEIS does not explain at what point in time radioactive decay of the material will make it sufficiently safe to proceed with any further dismantling. NRC should shorten the acceptable time period for SAFSTOR and link it to the timeframe that would make the material safer. NRC should encourage licensees to go forward with dismantling the facility under DECON as soon as appropriate, even if they start with placing the facility in SAFSTOR.

CL-11/12 3. The terrorist attacks of September 11, 2001 have raised many issues concerning the currently, inadequate security of our nation's nuclear reactors. Because decommissioning creates opportunities for release of spent fuel and structures contaminated with radioactive material, the Final GEIS should revisit the appropriate security needed during decommissioning. Indeed, under
CL-11/13 the current plan, facilities under SAFSTOR will have fewer personnel at the site even though the

1 If the intake/outfall structure is located off the facility, it is excluded from the Draft GEIS analysis and may not be given appropriate consideration.

2 Moreover, the 60-year period may be inconsistent with the explanation on page 1-6 of the Draft GEIS that spent fuel may be stored safely on-site for approximately 30 years after the licensed life of the facility.

radioactivity of the material will still be high. With less security, these facilities are at greater risk for attack.

CL-11/14 5. The NRC should be required to expressly approve a post-shutdown decommissioning activities report ("PSDAR") before a licensee initiates decommissioning activities Otherwise, the licensees have little incentive to perform a rigorous analysis of whether their decommissioning activities fit within the envelope of environmental impacts set forth in the GEIS Instead, they will likely assume they fit within the guidelines when they prepare their PSDAR. Moreover, a formal approval process should incorporate more opportunity for public input.

CL-11/15 6. The Final GEIS should directly indicate that licensees must obtain all necessary environmental permits prior to beginning the decommissioning process. Omitting this information may imply that the compliance with the requirements of this GEIS is adequate.

The Lake Michigan Federation and the Environmental Law & Policy Center of the Midwest urge the NRC to do more to protect the Great Lakes from the risks associated with decommissioning as it prepares the Final GEIS.

Respectfully submitted,

Debbie Musiker
Assistant Director, Special Initiatives
Lake Michigan Federation

Paul Gaynor
Staff Attorney
Environmental Law & Policy Center
of the Midwest

11/9/01

66 FR 65721

(12)

From: "Ed Martin" <edmartin@law com>
To: <dgels@nrc.gov>
Date: 12/31/01 2:29PM
Subject: Draft Supplement 1 to NUREG-0586

I attach hereto my supplemental comments on the above.

Thank you for your kind attention to this submission. Please do not hesitate to contact me if you have any questions. I look forward to hearing from you.

Sincerely,

Ed Martin

Sent by Law Mail

Ed Martin
ATTORNEY AT LAW

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December 31, 2001

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

By Electronic Mail

Re: Draft Supplement 1 to NUREG-0586

Ladies and Gentlemen:

CL-12/1 This will supplement my comments at the December 12 public meeting in Atlanta. As I noted at the time, I am concerned about the silence of the draft supplement on public participation in the decommissioning process. Commenters raised these concerns 18 months ago, but the draft supplement does not seem to address them.

CL-12/2 As I read the supplement, its effect will be to predetermine a number of issues about decommissioning of all public-utility power reactors. This will remove those issues from examination in trial-type proceedings, where licensees' evidence or the NRC's assumptions and conclusions could be tested and exposed to public scrutiny.

CL-12/3 Unless the public is allowed to intervene in decommissioning proceedings and participate fully in those proceedings, it cannot be certain that trustworthy decisions will result. Your 1996 brochure Public Involvement in the Nuclear Regulatory Process, NUREG/BR-0215, assures us that "the public has an opportunity to participate in NRC's decisionmaking process to . . . decommission a facility."

Public participation short of party-intervener status and review of less than all issues relevant to each plant seems to me a recipe for inadequate decisionmaking. If your agency restricts review, I believe you will be reneging on your promises to the public, as well as violating NRC's laws and regulations and the Administrative Procedure Act.

Thank you for the opportunity to supplement my earlier comments. I look forward to your response.

Yours very truly,

Template = ADM-013

E-RIDS = ADM-03
Add = H. Masnik (MTM2)

11/9/01
66 FR 65721
(13)

From: shadis@prexar.com
To: <dgeis@nrc gov>
Date: 12/31/01 5.31PM
Subject. COMMENTS on DECOM GEIS

Attached as Ms WORD FILE. Please aknowledge receipt. Thank You and Happy New Year. Ray

New England Coalition on Nuclear Pollution
VT . NH . ME . MA RI CT . NY
POST OFFICE BOX 545, BRATTLEBORO, VERMONT o5302

December 31, 2001

Chief, Rules and Directives Branch
Division of Administrative Services
Mail Stop T 6 D 59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: NUREG – 0586 Draft Supplement 1, Generic Environmental Impact Statement on Decommissioning Nuclear Facilities, Draft Supplement Dealing With Decommissioning of Nuclear Power Reactors

Written Comments Prepared by Raymond Shadis on Behalf of the New England Coalition on Nuclear Pollution

CL-13/1 1. **Not Risk-Informed** - The U.S. Nuclear Regulatory Commission (NRC) has applied extraordinary effort to risk-inform reactor oversight but, save for Appendix G of this report, has avoided translation of environmental impacts from dose based-language to

CL-13/2 risk-based language. The US Environmental Protection Agency (EPA) and most state agencies that set radiation exposure standards employ measures, limits, or goals expressed in terms of risk. NRC Radiological Site Release Criteria appear to yield a higher risk to the public than those risk levels acceptable to EPA under CERCLA. If this is so, then the GEIS should contain the comparisons (risk to risk, nuclear to chemical, one in ten thousand to one in a million) in plain language. The presentation of risk in Appendix G is unnecessarily obtuse and murky. It appears not to contain a comparison to permissible or target risks from non-radiological pollutants, which in all fairness, it should.

CL-13/3 Appendix 1, Summary of Accidents For PWR and BWR Plants Undergoing Decommissioning Operations, Table 1-3 lists accidents considered in various individual plant evaluations but lists no potential consequences and no probabilities. So what good is this list except to show the random and will-nilly cafeteria approach to individual plants picking out and designing bounding accident scenarios? At one plant the limiting scenario is fuel handling accident; at another it is a fire in the low level waste storage building. Case in Point: No fire scenarios are listed for Maine Yankee under Table 1-3, yet recently a fire occurred in a low-level waste dewatering unit and burned a several hundred degrees for more than an hour. A local volunteer fire company approached the fire without respirators and without advice from radiation protection personnel. A GEIS should contain a comprehensive generic list of potential accidents (scenarios) together with probabilities and potential consequences.

CL-13/4 Presenting licensee estimates of consequences without comment or qualification as in

E-REDS = ADM-03
Template = ADM-013 Add = M. Masnik (MJM2)

Table 1-4, Highest Offsite Doses Calculated for Postulated Accidents in Licensing Basis Documents, provides an incomplete picture of real potential consequences. For example, Maine Yankee asserts that loss of spent fuel pool heat sink will result in the same offsite dose as a liquid waste spill, that of .23 REM. Other than a reference to another study, NRC does not bother to explain what sort of dose spent fuel pool drain down might result in if remedial action is not taken. As dose consequences can be rather large, the actual figures should be included in the GEIS.

CL-13/5 **2. Impact of Closure** -The draft supplement attempts to reflect the impact of plant closure on jobs, community tax revenues, and population. The impact of reactor shutdown a must be considered apart from decommissioning. The decision to shutdown, to lay-off workers, to devalue the plant for tax purposes and so on, is not automatically a decision to decommission the plant. It may be a shutdown for a long-term repair or upgrade period. Or it may be intended to mothball the facility with the decision to decommission or not delayed a decade or more. In any case, if workforce reduction at shutdown is a part of decommissioning, then workforce replenishment because of fuel storage or enforcement of administrative site release conditions should also be considered.

CL-13/6 If decommissioning is to be risk-informed and the impacts of shut down are to be considered, then the cost and environmental and risk impacts of continued operation should also be compared. Maine Yankee shutdown rather than face the costs of steam generator replacement and correction of a host of safety defects, including system-wide cable separation issues, inadequate high energy line break protection, inadequate containment volume, marginal emergency diesel generator capacity, 95 percent of fire seals defective, undersized atmospheric steam dump valves, and on and on. Haddam Neck had similar problems. Just prior t the closure of Yankee Rowe, NRC staff was arguing internally about the sanity of permitting the plant to run one more fuel cycle with a badly embrittled reactor vessel.

CL-13/7 If the costs of the decision to shutdown are included, then the cost of the immediate alternative, repair and continued operation, ought to be included as well as comparative environmental impact and comparative risk.

CL-13/8 Table J-1 Impact of Plant Closure and Decommissioning at Nuclear Power Plants Currently Being Decommissioned includes three plants that have already passed from decommissioning to license termination. Maximum workforce and post termination workforce figures are scant, incorrect, misleading, and more or less, useless for the purpose of gaining usable information. Maine Yankee currently has more than 400 workers on site; not 295 as listed. Without a reference date, maximum workforce numbers mean what? During outages? During major repairs and retrofits? Of twenty-two plants listed, workforce figures are given for only seven.

CL-13/9 Table J-2 Impact of Plant Closure and Decommissioning on Population Change shows no causal relationship between closure, decommissioning and population change. Of twenty-one plant locations listed, all save two show population increases in the host county following plant closure. Did Rainer County, Oregon increase its population by 16.5 percent as an impact of the Trojan Nuclear Plant shutdown? It is even harder to credit that the impact of the closure of 65 MWe Humbolt Bay is an increase in the population of

California of 25.8 percent. This may be the stupidest table ever presented in an NRC document.

CL-13/10 Table J-3 Impact of Plant Closure and Decommissioning on Local Tax Revenues does not show any impacts of decommissioning activities on tax revenues there fore the table is incorrectly titled. There could be some small near term impact of decommissioning on tax revenues, for example, taxes levied on capital equipment purchased by local vendors working on decommissioning and taxes on spent fuel storage facilities.

CL-13/11 No effort is made to determine if marketability of local homes is increased by nuclear plant close. Marketability would determine price and ultimately impact tax-base.

CL-13/12 At sites considered for re-powering, no consideration is given to the tax worth of the re-powered site. Haddam Neck, for example, has applied for early partial site release so that the construction of a gas-fired plant may begin even before decommissioning is completed. Fort St. Vrain hosts a gas-fired plant. If impact of closure is to be considered in a GEIS on decommissioning, so then should reuse be considered.

CL-13/13 In Maine, utility ratepayers are entitled to share in moneys recovered from the sale of plant components and commodities, such as pipe and cable, as well as real estate and unspent decommissioning funds. While not taxes, per se, these are funds or credits added to the general public revenue.

CL-13/14 **3. Environmental Impacts** Section 4.3.8.2, Potential Radiological Impacts from Decommissioning Activities, fails to adequately consider the potential for decommissioning activities to spread or hide radiological contamination. The presumption is that accidents or mistakes will not take place, when experience at decommissioning plants shows that they do. The report fails to draw from this experience. For example, early in the decommissioning of one site and prior to complete radiological survey, a trench was dug across an impacted area to lay an electrical cable to power equipment no longer serviced through the plant. The trench was left open to the weather for a few days, then backfilled with loose material and thus could permit rainwater to carry contamination deeper and spread it further. Individually, such activities may not provide what are termed significant doses, but they have the potential to add incremental to the dose of future site occupants and overall risk and may violate ALARA principles. The potential environmental impacts of such activities should be evaluated. Incidents have occurred in which workers left the site with contaminated clothing and in which train car loads of class A waste were permitted to languish for weeks on a siding in a residential community. Although radiation levels in these instances were extremely low, the potential for greater exposures existed. Such scenarios should be considered, worst case, in preparing the GEIS.

CL-13/15 Section 4.3.11.2 Potential Impacts of Decommissioning Activities on Cost correctly points out that there are many variables in decommissioning that affect cost; among them are the size and type of reactor, the extent of contamination, property taxes and so on. However the GEIS does no more than list these variables without any attempt to assign the weight which any of them contribute. The GEIS correctly points out that only three commercial power reactors have successfully completed decommissioning, but does not

say that they can hardly be considered typical of those plants under and entering decommissioning. Fort St. Vrain was a modest sized plant of oddball High Temperature Gas design and decommissioned on a fixed price, loss-leader price by a large manufacturing firm, Shoreham only ran the equivalent of one full power day, and Pathfinder was a 59MWe peanut of a plant. Thus it would be instructive to look at how costs are apportioned among today's more representative plants currently under decommissioning and from this base, knowing which are sensitive to scale and which are sensitive to choice, project final costs. These costs should be broken down and compared in the GEIS.

CL-13/16 Section 4.3.16.2 Potential Impacts of Noise from Decommissioning Activities seems to deal with noise as significant only at hearing-loss levels, however the admission is made that noise can be annoying. It can also degrade the general environment, and the aesthetic environment, lead to sleep loss, diminished creativity, and lost sales of goods and property. Where decommissioning schedules require night work, large pneumatic hammers can be heard miles distant from the site. The GEIS should also consider noise from explosive demolition.

CL-13/17 Table 4-6 Radiological Impacts of Transporting LLW to Offsite Disposal Facilities is something of a puzzle. Waste volumes and radiological impacts in the table are much greater for the SAFSTOR decommissioning option (45,000 cubic meters/ 78 person-rem) than for the DECON option (10,000 cubic meters/ 48 person-rem). Same plant, if you let the radiation dissipate with time, you wind up with more waste. With all due respect, this makes no readily apparent sense.

CL-13/18 3. **Spent Fuel Storage** The GEIS does not consider the impacts of spent fuel storage. We believe this to be based on artificial distinctions. Both Maine Yankee and Haddam Neck have identified establishing an Independent Spent Fuel Storage Facility as a " critical pathway" in decommissioning. ISFSI construction has been regulated under the very same Part 50 license that will be terminated upon successful decommissioning. Only then will a Part 72 license be issued. The ISFSI is in the middle of a decommissioning site and physically inseparable from decommissioning. Its impacts should be considered among the impacts of decommissioning in the GEIS.

CL-13/19 4. **Exported Impacts** The on site disposal of radiological demolition debris (rubblization) is considered in the GEIS. With rubblization abandoned at Maine Yankee, the cumulative effect of disposal of the debris at a licensed facility elsewhere is not considered. This makes no sense. Nor does it make sense to "lose" impacts when contaminated materials are shipped to handling facilities for recycling. Different choices made at the decommissioning site will result in different impacts to workers and other citizenry offsite and away. These effects should not be artificially separated from the environmental impacts of decommissioning simply because they are exported.

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From: Mark Oncavage <oncavage@bellsouth.net>
To: <dgeis@nrc.gov>
Date: 12/31/01 7:45PM
Subject: Decommissioning Comments

66 FR 65721

(14)

Dear Sir:

I am submitting the following comments to draft Supplement 1, NUREG-0586, Generic Environmental Impact Statement on Decommissioning Nuclear Facilities.

Sincerely, Mark P. Oncavage

Comments on NUREG-0586 Draft Supplement 1

by Mark P. Oncavage

CL-14/1 1. The evaluation of each nuclear plant site for radioactive contamination can only be done on a site-specific basis. Data of site contamination from Shoreham with zero years of operating experience cannot be compared with 33 years of operation at Big Rock Point and either of those sites can not be compared with a potential 120 years of Calvert Cliff operation or a potential 180 years of Oconee operation. Stating that, generically, all impacts of radioactive contamination from all sites are similar (P. 4-28), is simply wrong. The important concept underlying the Environmental Impact Statement for decommissioning nuclear plants is the health and safety of the public. The Nuclear Regulatory Commission Staff (NRC) is writing an EIS based on an unsupported assumption. The impacts of a nuclear plant site contaminated with radioactivity can be SMALL or MODERATE or LARGE, but the impacts are site-specific and are not similar nor generic.

CL-14/2 2. The evaluation of each nuclear plant plant site for radioactive contamination can only be done on a site-specific basis. The liquid low-level radioactive waste dump for St. Lucie 1 and 2 is the Atlantic Ocean, whereas the dump for liquid low-level radioactive wastes at Turkey Point 3 and 4 is a closed cooling canal system. The northern end of the canal system, Lake Warren, is the designated dump. If the sediments of Lake Warren and the cooling canals contain levels of radioactivity above those levels that are deemed safe for unrestricted human activity, then Lake Warren is one of the "safety-related structures, systems, and components" that needs to be decontaminated and dismantled. Lake Warren and the canals are also safety related as they function to mitigate the effects of a design basis accident by collecting and concentrating radioactive spills, dumped liquids, leachates, and site runoff. Other nuclear plants that dump their liquid radioactive wastes into closed waters will also require site-specific evaluations.

Template = ADM-013 E-RIDS = ADM-03
Add = M. Masnik (MTM2)

CL-14/3 3. The evaluation of each nuclear plant site for radioactive contamination can only be done on a site-specific basis. In NUREG-0743, page 4-11, Turkey Point units 3 and 4 averaged 340 curies of radioactive solid waste per year. Twenty two years later NUREG-1437, Supplement 5, page 2-12 states that in 1999, units 3 and 4 shipped solid waste containing 834.3 curies per year, an increase of 145 %, yet Turkey Point is only 47 % through its potential operational life. Projections concerning the amounts of radioactivity in solid waste, gaseous waste, liquid waste, and site contamination appear to be pure guesswork with a potential operational life of 60 years per unit. For the NRC Staff to conclude that site contamination for all nuclear plant sites is generically similar and that the impacts to the human environment are SMALL, has no basis in fact. The NRC Staff needs to present the reasoning behind its projections to the scientific community for scientific scrutiny.

CL-14/4 4. Rubblization (p. 4-14), the breaking of contaminated concrete structures into gravels and blocks cannot be considered an option where:

A. the leachate plume could contaminate potable water,

B. the leachate plume could contaminate water used for food production such as farming, fishing, seafood harvest, or dairy,

C. the leachate plume could contaminate closed bodies of water such as cooling canals or cooling ponds, and

D. airborne particles could contaminate food crops, fishing waters, seafood harvesting waters, or dairy areas.

All contaminated building materials must be removed from the nuclear plant site.

CL-14/5 5. The Generic Environmental Impact Statement needs to specify inappropriate uses of decommissioning funds.

A. Using funds for temporary procedures, such as SAFSTOR, is inappropriate.

B. Using funds for the maintenance and monitoring of temporary procedures, such as SAFSTOR, is inappropriate.

C. Transferring funds from PSC/PUC control to licensee control is inappropriate.

D. Using funds for the temporary storage of spent fuel, such as ISFSI or PFS, is inappropriate.

E. Using funds for the settlement of bankruptcy claims is inappropriate.

F. Using funds as collateral is inappropriate.

G. All other uses of funds that do not directly result in the permanent cleanup of contaminated nuclear plant sites, is inappropriate.

Since the funds were obtained as an extra fee from ratepayers for the purpose of safely decommissioning nuclear plants, all of the funds need to be used for that purpose.

CL-14/6 6. The massive destruction of September 11th accomplished by the Al Qaeda terrorists has rendered the Waste Confidence Policy ineffective and obsolete. No reasonable person can be assured that high-level nuclear waste can be safely stored at plant sites under present conditions. The GEIS fails to consider the consequences of acts of terrorism and acts of war perpetrated by suicidal zealots against spent fuel facilities at decommissioned nuclear plant sites. This failure of the GEIS needs to be remedied.

CL-14/7 7. The GEIS needs to create a chronological list of all the decommissioning activities that accept public participation. All public participation opportunities such as meetings, hearings, oral comments, written comments, petitions, and

interventions need to be listed. At later times when specific dates are known, this list needs to be advertised locally in the affected area. The licensee should also solicit public input on the formulation of decommissioning plans well before the decisions are made.

Submitted
December 31, 2001

Letter 15, page 1

11/9/01
66 FR 65721

(15)

From: "Sokolsky, David" <DDS2@pge.com>
To: "dgeis@nrc.gov" <dgeis@nrc.gov>
Date: 1/2/02 5:29PM
Subject: FW: GEIS COMMENTS

<<FGEIS_comments1.doc>>
The above file represents Pacific Gas & Electric Company's revised comments to the draft Gerenic Envnonmental Impact Satement on Decommissioning of Nuclear Facilities, NUREG-0586, Supplement 1. The comments in the above file are identical to the comments previously sent to you on December 21; however, the previous comment on Section 4.3.4.2, page 4-13, is withdrawn because the FGEIS Scope states "... activities perfomed before permanent cessation of operations or impacts that are related to the decision to cease operations (for example, the impact from the loss of generation capacity) are outside the scope of the FGEIS." In this case the air impact of replacement power would/should have been addressed in the original EIR for SAFSTOR.

David Sokolsky
Supervisor of Licensing
Humboldt Bay Power Plant
Phone 707-444-0801
Internal 8-375-0801

> -----Original Message-----
> From: Sokolsky, David
> Sent: Friday, December 21, 2001 4:38 PM
> To: 'dgeis@nrc.gov'
> Cc: Moulia, Thomas; Nugent, Patrick
> Subject: GEIS COMMENTS
>
> <<FGEIS_comments.doc>>
>
> The attached WORD file contains Pacific Gas & Electric Company comments on
> the draft Gerenic Envnonmental Impact Satement on Decommissioning of
> Nuclear Facilities, NUREG-0586, Supplement 1. If you have any questions
> on these comments, please contact me.
>
> David Sokolsky
> Supervisor of Licensing
> Humboldt Bay Power Plant
> Phone 707-444-0801
> Internal 8-375-0801
>
>

original comment ie #7

CC: "Moulia, Thomas" <TAM1@pge com>, "Nugent, Patrick" <PxN2@pge com>, "Williams, Terry" <TJW3@pge.com>

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

Letter 15, page 2

PG&E COMMENTS TO FGEIS

DECEMBER 20, 2001

CL-15/1 • The last paragraph in the Conclusions section of the Executive Summary, and page 2-3 of Section 2.2.1, state that a licensee would have to submit a license amendment request if environmental assessments are outside the bounds of the GEIS or if the environmental impacts of a decommissioning activity have not been previously reviewed . What is the licensing document that should be modified in the license amendment request? Section 2.2.1 states the Environmental Report should be revised, but the PSDAR may be a more appropriate document.

CL-15/2 • Section 4.3.9.1, page 4-33, refers to the licensee's FSAR. Suggest adding the words "or equivalent" after "FSAR" since some licensees have a defueled safety analysis report (DSAR) instead of a FSAR.

CL-15/3 • Section 4.3.12.1, page 4-47, second line – Add a period after the word "effects" and begin the next sentence with the word "Socioeconomic."

CL-15/4 • The following Conclusions sections discuss environmental impacts that may have small, moderate or large impacts:

- 4.3.1.4 (Onsite/Offsite Land Use)
- 4.3.5.4 (Aquatic Ecology)
- 4.3.6.4 (Terrestrial Ecology)
- 4.3.9.4 (Radiological Accidents)
- 4.3.10.3 (Occupational Issues)
- 4.3.12.4 (Socioeconomics)

The FGEIS is not clear what, if any, actions a licensee should take depending on if the impacts are small, moderate or large?

CL-15/6 • Section 3.1.4, page 3-15, does not reflect that alpha-emitting Transuranic radioactivity is significant at some plants. This radioactivity is formed after failed fuel releases small amounts of Uranium (as well as fission products) to the reactor coolant. Subsequent activation of the Uranium results in the formation of Transuranic isotopes of Plutonium, Americium and Curium, most of which decay with alpha radiations. For the plants where this issue is significant, the production of airborne alpha radioactivity during decommisioning activities must be carefully controlled to avoid radiation exposure from inhaled alpha radioactivity.

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[illegible]ives

December 21, 2001

11/9/01
66FR 55721
16

Chief, Rules and Directives Branch
Division of Administrative Services
Mail Stop T 6 D 59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

U.S. EPA Comments on Draft Supplement to Generic EIS for Decommissioning of Nuclear Power Reactors

Dear Sir/Madam:

In accordance with the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and the Council on Environmental Quality's implementing regulations (40 CFR 1500-1508), the Environmental Protection Agency (EPA) is providing you comments on the Draft Supplement (the Supplement) to the Generic Environmental Impact Statement (GEIS) for Decommissioning of Nuclear Power Reactors, dated October 2001 (NUREG-0586, Draft Supplement 1, CEQ #010416).

The Supplement updates the 1988 GEIS to reflect technological and regulatory changes and NRC's and licensees' experience with decommissioning nuclear power reactors. The environmental impacts described in the Supplement supersede those described in the 1988 GEIS. The Supplement may be used as a stand-alone document without need to refer to the 1988 GEIS.

CL-16/1 EPA supports the approach NRC has taken in the Supplement of establishing an *envelope* of environmental impacts resulting from decommissioning activities and identifying those activities which can be bounded by a generic evaluation and those which require a site-specific analysis. This approach concentrates the environmental analysis on those activities with the greatest likelihood of having an environmental impact. EPA also commends NRC for drafting a Supplement which facilitates public understanding in its use of plain English and explanation of technical terms.

As indicated below and in the enclosed detailed comments, EPA is requesting that NRC provide clarifications, supplementary information and explanations of certain conclusions found in the draft Supplement. EPA is therefore rating this Supplement as "EC-2", Environmental Concerns - Insufficient Information. A summary of the rating definitions is enclosed.

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

CL-16/2 EPA's major comments on the Supplement are: (1) it is not always clear when a particular decommissioning activity or site/operating condition falls within the envelope of environmental impacts described in Section 4 and when that activity or condition would require
CL-16/3 further analysis; (2) the Supplement should distinguish better among certain of the small, moderate and large impact levels and better explain certain assumptions used in setting these
CL-16/4 levels; (3) the Supplement should address how the environmental analysis of decommissioning activities takes into account changes in the environmental parameters of the site during plant
CL-16/5 operation; and, (4) the Supplement should provide a more robust discussion of ground water impacts. Further detail on EPA's concerns is found in the enclosed "Detailed Comments."

Thank you for the opportunity to review this document. If you have any questions or would like to meet to discuss our concerns, please contact Susan Absher of my staff. She may be reached at (202) 564-7151.

Sincerely,

/s/

Anne Norton Miller
Director
Office of Federal Activities

Enclosures: 2
Summary of Rating Definitions
Detailed EPA Comments on the Draft Supplement to the GEIS

11/9/01
66 FR 56721
16

Summary of EPA Rating Definitions

EPA's rating system was developed as a means to summarize EPA's level of concern with a proposed action The ratings are a combination of alphabetical categories that signify EPA's evaluation of the environmental impacts of the proposal and numerical categories that signify an evaluation of the adequacy of the EIS

Environmental Impact of the Action

"LO" (Lack of Objections) The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal

"EC" (Environmental Concerns). The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts

"EO" (Environmental Objections). The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative. EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory) The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality EPA intends to work with the lead agency to reduce these impacts If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ

Adequacy of the Impact Statement

"Category 1" (Adequate) EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information) The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate) EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

1

Detailed EPA Comments on
Draft Supplement to Generic EIS for Decommissioning of Nuclear Power Reactors
(NRC NUREG-0586, Draft Supplement 1, October 2001)

General Comments

CL-16/6 1. The Supplement should provide more specific guidance to licensees regarding the level of a particular decommissioning activity, or the site conditions in which an activity is occurring, which would trigger a site-specific NEPA analysis of the activity by the licensee. For example, with regard to levels of activity that would require a site-specific analysis, the Supplement should more specifically define what constitutes a major transportation upgrade. With regard to site conditions, it should define how much time may pass after the previous disturbance of an aquatic or terrestrial ecosystem before a site-specific analysis is necessary, or how recent the ecological assessment of that ecosystem must be to rely on the Supplement instead of a site-specific analysis. This will facilitate both licensees' evaluation of environmental impacts in required submissions such as the Post Shutdown Decommissioning Activities Report (PSDAR) and the License Termination Plan (LTP), and NRC's development of site-specific NEPA documents.

CL-16/7 2. In order to provide a complete and up-to-date environmental profile of the site, the Supplement should direct licensees to summarize the following in their site-specific NEPA analyses (and as appropriate in the PSDAR and LTP) (a) pre-plant construction environmental reports (for plants constructed before the enactment of NEPA) and environmental impact statements (EISs) regarding the impacts of plant construction and operation, (b) environmental reports and/or assessments that were prepared during the period the plant was in operation regarding the impacts of plant operation, (c) significant requirements and changes in the licensee's environmental permits, and (d) changes in the environmental parameters of a facility site during operation and the impacts of any such changes (see also Response to Comment #6-A, page A-11).

CL-16/8 3. Response to Comment No. 6-C, page A-13, indicates that impacts from potentially contaminated sediment are addressed in the Supplement, but we did not find this information.

CL-16/9 4. While EPA did not identify security issues during the GEIS scoping process, the events of Sept. 11 have brought them to the forefront of public concern. EPA suggests that NRC include in the final Supplement a general discussion on how the Commission is addressing security from terrorism at plants undergoing decommissioning.

CL-16/10 5. The Supplement (page 3-16) indicates that ENTOMB is still considered a viable option for decommissioning. Section 3 2.3 notes that the Supplement includes a bounding analysis, but that any environmental issues arising from a subsequent rulemaking on ENTOMB will be addressed in that rulemaking and its supporting environmental documentation. EPA urges NRC to consider in any subsequent analysis of EMTOMB the issue of residual dose and the potential need for state approval of any de facto disposal.

Executive Summary

2

CL-16/11 6 Page xv, Lines 37-38. The document identifies certain issues that are "site-specific for activities occurring outside the disturbed areas in which there is no recent environmental assessment." "Recent" should be defined by, for example, specifying a time frame or "shelf life" for environmental assessments, so that licensees have clear notice of when they must prepare or update such a document for the disturbed area(s) in question. This same problem arises in Table ES-1, which refers to "current" and "recent" ecological assessments.

Introduction

CL-16/12 7. Page 1-5, Section 1.3. This section states that except for decommissioning planning activities, the Supplement only considers activities following removal of the fuel from the reactor. The exclusions include "impacts that result directly and immediately from the act of permanently ceasing operations" such as the environmental impacts of ceasing thermal discharges to receiving waters which the Supplement states "is essentially a restoration of existing conditions." This ignores the potentially adverse effects that the thermal discharges may have had on the ecosystem while the plant was operating; and, while the affected ecosystem may recover from the thermal discharges, such recovery may not be the equivalent of restoration to the originally existing conditions. Also, a species may have become established and dependent upon the thermal discharge.

CL-16/13 8. Page 1-7, Section 1.3, Lines 30-33. The document needs to explain the grounds for the determination that the environmental impacts of concrete leaching into site groundwater as the result of rubblization can be evaluated generically. See also groundwater comments below.

CL-16/14 9. Page 1-8, Lines 10-13 EPA agrees that inadvertent releases resulting from an accident should be handled on a site-specific basis. We would like to see an explanation of how the analysis of impacts from an accident would be handled.

CL-16/15 10. Page 1-8, Section 1.4. EPA encourages NRC wherever possible to make the Levels of Significance (small, moderate and large) used in the Supplement more definitive by including risk ranges, referencing the appropriate NRC regulations or providing examples of impacts. We note that in several cases the qualitative analysis is given in units of person-rem with no regulatory limit provided.

CL-16/16 11. Page 2-5, Section 2.2, Line 10. This section should note that state or local requirements may be more restrictive than NRC's.

Description of the NRC Licensed Reactor Facilities and the Decommissioning Process

CL-16/17 12. Page 3-5, Section 3.1.2, Lines 31-33 and Page 3-8, Lines 13-16. The document states on page 3-5 that "the impacts of dismantling all SSCs (structures, systems and components) that were built or installed at the site to support power production are considered in this Supplement." It then states on page 3-8 that the Supplement does not evaluate switchyards which "may remain on the site". If they are dismantled, would they be evaluated?

CL-16/18 13. Page 3-10, Section 3.1.3, Lines 32-25. The supplement states that "the amount of liquid and gaseous radioactive waste generated is usually lower for decommissioning plants". Must the plant's waste remain within the limits established during operations to be bounded by this GEIS?

3

CL-16/19 14. Page 3-11, Section 3.1.3, Lines 17-18. Please revise the document to clarify that Resource Conservation and Recovery Act hazardous waste disposal permits and Clean Water Act NPDES permits are administered either by EPA or, where EPA has authorized the state RCRA program or the state has assumed the NPDES program, by the state. (See NUREG 1628, Question 4.2.2) Also, the text should briefly discuss the management of PCBs and PCB-containing materials under the Toxic Substances Control Act.

CL-16/20 15. Page 3-16, Section 3.1.4, Line 1. This line notes that spent fuel comprises the largest amount of radioactive material at a shutdown facility. It would be informative to include here a summary of or reference to the data in Appendix G on the amount of radioactive material at various types of power plants.

CL-16/21 16. Page 3-17, Section 3.2.1, Lines 32-33. Please revise the document to clarify that while the evaluation of ISFSIs is outside the scope of the GEIS, it should be noted that the DECON alternative does not necessarily completely eliminate the need for long-term security and surveillance of a facility; an ISFSI at a decommissioned facility will require long-term security and surveillance.

CL-16/22 17. Page 3-29, Lines 29-39 repeat lines 11-21.

Environmental Impacts

Land Use

CL-16/23 18. Page 4-6, Section 4.3.1.2, Lines 15-16. This section defines a previously disturbed area as an area where land disturbance occurred "during construction or operation of the site." This definition may allow licensees to undertake decommissioning activities resulting in adverse environmental impacts without first performing a site-specific analysis of those impacts. For example, it might allow a licensee to disturb an area that was disturbed several decades ago during plant construction even if that area was not used during plant operation and has essentially returned to its original condition, i.e., native species have fully returned. The Supplement should define what constitutes a "previous" disturbance, e.g., by specifying a time frame, so such adverse impacts are not permitted to occur.

CL-16/24 19. Page 4-6, Section 4.3.1.2, Lines 25-29. The following terms are too broad or too vague to provide licensees sufficient guidance about when a site-specific analysis is necessary: with regard to SMALL impacts, "very little new development" and "minimal changes"; with regard to MODERATE impacts, "considerable new development" and "some changes"; and with regard to LARGE impacts, "large-scale new development" and "major change." Providing specific examples from decommissioning or decommissioned facilities would be very useful.

CL-16/25 20. Page 4-6, Section 4.3.1.3, Lines 33-41. Using NUREG-1437's estimate that ~1 to ~4 ha (~2.5 to 10 ac) of land is needed for steam generator replacement activities, the document assumes that the land use impacts of major component removal during decommissioning "should be similar or less," and that the land used during major component removal "[g]enerally ... has been previously disturbed during construction of the facility." Does this mean that a licensee must perform a site-specific analysis of impacts if the land use impacts of major component removal may or will

be greater than the estimated impacts of steam generator replacement, or if the land used during major component removal has not been previously disturbed during construction of the facility?

CL-16/26 21. Page 4-7, Section 4 3 1.3, Lines 1-2. The Supplement notes that "almost all of the sites" will use land previously disturbed during construction; should one assume that a facility using land not previously disturbed will need to conduct a site-specific analysis? Similarly, under "Conclusions" on that page, it states that impacts for "offsite land use" are considered small unless "major transportation upgrades are necessary." The examples given are establishing water, rail or road transportation links. Is one to assume that any establishment of offsite transportation would require a site-specific analysis? Would impacts only be to off-site land uses or to on-site as well? Specific examples would help here.

CL-16/27 22. Page 4-7, Section 4.3.1.3, Lines 10-12. Please explain the basis for the assumption that where previously disturbed areas are not large enough to support decommissioning activities, "it is likely" that the impact of disturbing previously undisturbed areas would be "temporary and SMALL."

Water Use

CL-16/28 23. Page 4-9, Section 4.3 2.2, Lines 12-14. The Supplement should briefly describe the "common engineering practices to limit water use impacts." When describing how water impacts were evaluated (sec. 4.3.2.3.), it would be helpful to include the average and maximum water usage pre- and post-operation of those plants that have ceased operation.

Water Quality

CL-16/29 24. Pages 4-10 through 4-12, Section 4.3.3. This section focuses primarily on the water quality impacts of nonradiological discharges from point sources to surface water (and the regulation of such discharges under the NPDES program). It should more fully discuss the water quality impacts of both nonradiological discharges to groundwater (and their possible regulation under state programs) and non-point source pollution, and if necessary should indicate that one or both of these types of impacts require site-specific analysis. All of these types of discharges have potential water quality impacts that need to be evaluated.

CL-16/30 25. Pages 4-10 to 4-11, Section 4 3.3 1. This subsection on water quality regulations should distinguish between "intentional" and "unintentional" nonradiological discharges to both surface water and groundwater. As currently drafted, the section blurs these distinct types of discharges, and the regulatory schemes relevant to each.

CL-16/31 26. Page 4-10, Section 4 3 3.1, Line 42. The Supplement refers to a "permitting authority" before it identifies what type of permit is at issue. As a result, the reader does not know who the permitting authority is. It would be helpful to note that "intentional releases of non-radiological discharges" to surface waters are regulated under EPA or state wastewater discharge permitting programs, and such discharges to groundwater may be regulated under state programs.

CL-16/32 27. Page 4-10, Section 4 3 3 1, Lines 41-44 and Page 4-11, Lines 1-2. This paragraph is confusing in light of the statement on Page 4-12 "that the issue of surface or groundwater quality for all decommissioning activities is generic and that the environmental impacts for these activities will

be SMALL." As currently written, it suggests that NRC will obtain a permitting authority's "environmental assessment of aquatic impacts" and "consider the assessment in its determination of the magnitude of the environmental impacts" of decommissioning activities at individual sites. It also suggests that NRC will "establish its own impact determination[s]" on a site-specific basis in the absence of such environmental assessments. Please clarify.

CL-16/33 28. Page 4-11, Section 4.3 3.1, Lines 4-5. Please revise the Supplement to indicate that the NPDES program only regulates point source discharges to surface waters, not discharges to groundwater or non-point source pollution. (See also section 4.3.3.4) As noted above, the document should note that point source discharges to surface waters also may be regulated under state wastewater discharge permitting programs, and discharges to groundwater may be regulated under state programs.

CL-16/34 29. Page 4-11, Section 4.3 3.1, Lines 7-9 and Section 4.3.3.2, Line 16. The document assumes that facilities' NPDES permit limits during decommissioning "are generally the same limits that are enforced for an operating plant," that facilities' permits "may require a monitoring program," and that "these monitoring programs are usually continued through the decommissioning period." Should the reader assume that a licensee must perform a site-specific analysis of water quality impacts if any one of these conditions is not met? If not, why not? (See also section 4.3.3 4: is a site-specific analysis required where discharges to surface water may or will exceed the NPDES-permitted levels? Again, if not, why not?)

CL-16/35 30. Page 4-11, Section 4.3.3.2, Lines 17-18, 21-23. This language could be interpreted erroneously to indicate that discharges to groundwater are monitored under NPDES permits. The Supplement should address the water quality impacts of decommissioning activities on groundwater separately from the impacts on surface water. In lines 34-35, the Supplement should describe the conditions in which nonradiological impacts to groundwater and from non-point source pollution may be considered SMALL, MODERATE or LARGE.

CL-16/36 31. Pages 4-11 to 4-12, Section 4.3.3.3.
The discussion in this section could support a requirement for licensees to perform site-specific analyses of the potential water quality impacts of their decommissioning activities under certain circumstances; notably, language such as performing these activities in different orders can have a "significantly different impact on water quality," that the SAFSTOR option "may exacerbate water quality issues," and that certain activities "may result in changes in local water chemistry" implies the potential need for site-specific analysis.

In particular, the statement that rubblization may affect groundwater pH and thereby "affect the transport properties of radioactive and nonradioactive chemicals in the subsurface" appears to require a site-specific analysis. The document notes in other places (e.g., Page 1-7, Lines 26-33) that the nonradiological impacts of rubblization, including concrete leaching into groundwater, can be evaluated generically. Section 4.3.3.3 does not support this conclusion.

CL-16/37 32. Page 4-12, Section 4.3.3.3, Lines16-17. The Supplement states that unintentional releases of hazardous substances historically have been infrequent at decommissioning facilities, and that except for a few substances, hazardous substances spills are "localized, quickly detected, and relatively easy to remediate." Does this mean that a licensee must perform a site-specific analysis of potential water quality impacts if a hazardous substance is spilled or otherwise

released to the environment during decommissioning. How is "hazardous substance" defined? Examples or a better definition of "localized", "quickly detected" and "ease of remediation" should also be provided.

CL-16/38 33. Page 4.12, Section 4.3.3 4. As noted above, the NPDES program only regulates nonradiological discharges to surface waters from point sources, not discharges to groundwater. This subsection should also draw conclusions about the potential water quality impacts of nonradiological discharges to groundwater and non-point source pollution during decommissioning.

CL-16/39 34. Page 4-14, Section 4.3.4.2, Lines 6-8. The Supplement states that emissions from workers' vehicles "should be lower" during decommissioning than during plant construction or outages and are "usually lower" than during plant operation. Is there any data from decommissioned plants to support these statements? Also, does one assume that a site-specific analysis of potential air quality impacts is required if such emissions may or will be higher than during plant construction, outages or operation?

CL-16/40 35. Page 4-14, Section 4.3.4.2, Lines 10-24. The Supplement states that most decommissioning activities are conducted in facility buildings with systems that are "typically maintained and periodically operated" during decommissioning to minimize airborne contamination. As a result, "materials released when systems are dismantled and equipment is removed are not likely to be released to the environment in significant quantities." Again, does the reader assume that a licensee must perform a site-specific analysis of potential air quality impacts if a certain level (definition?) of decommissioning activity may or will not be conducted in facility buildings, or if the systems used to minimize airborne contamination may or will not be maintained and/or operated according to a certain level of effort? How is "significant quantity" defined?

CL-16/41 36. Page 4-14, Section 4.3 4.2, Lines 26-33. The Supplement states that fugitive dust emissions during movement of equipment outside of facility buildings are "likely ... to be confined to the immediate vicinity of the equipment," "in general ... limited to a small number of events" and "of relatively short duration." Again, is the reader to assume that a licensee must perform a site-specific analysis of potential air quality impacts where one of these conditions is not met? Also, how are "immediate", "small number of events" and "relatively short duration" defined? Further, must the facility employ mitigation measures to minimize dust; if so, where are these specified?

CL-16/42 37. Page 4-14, Section 4.3.4 2, Lines 40-43 and Page 4-15, Section 4 3.4.2, Lines 1-2. The Supplement states that there is an average of less than one shipment per day of low-level waste (LLW) from a decommissioning plant; that, "in most cases, the number of shipments of other materials to and from a decommissioning facility will be less than that for LLW;" and that therefore emissions associated with the transportation of materials from such a plant "are not expected to have a significant impact on air quality." Again, is the reader to assume that a licensee must perform a site-specific analysis of potential air quality impacts if the number of shipments of materials to or from its decommissioning facility will exceed the level of less than one shipment per day?

CL-16/43 38. Page 4-15, Section 4.3 4 2, Lines 4-7. The definition of what constitutes SMALL, MODERATE and LARGE air quality impacts would be helped by providing specific examples from decommissioning or decommissioned facilities.

CL-16/44 39. Page 4-15, Section 4.3.4.3, Lines 21-23. This section states that "[n]o anticipated new methods of conducting decommissioning and no peculiarities of operating plant sites are anticipated to affect this pattern" of managing fugitive dust. Is the reader to assume that a licensee who proposes using a new decommissioning method must perform a site-specific analysis of potential impacts?

Aquatic Ecology

CL-16/45 40. Page 4-16, Section 4.3.5, Lines 25-29. This section's discussion of impacts to aquatic resources following plant shutdown seems to contradict the example given on page 1-5, lines 6-7, of plant discharges post-shutdown being outside the scope of this document. Similarly, the discussion at Page 4-19, Section 4 3.6, Lines 26-29 seems to contradict page 1-5. Note also the comment above on the page 1-5 language.

CL-16/46 41. Page 4-17, Section 4.3.5.2, Line 38 and page 4-18, Section 4 3 5 2, Lines 4 and 14. The term "previously disturbed" needs definition.

CL-16/47 42. Page 4-18, Section 4.3.5.2, Lines 14-17. The Supplement should provide specific guidance on how to weigh the primary factors to be considered in evaluating the adverse impacts of decommissioning activities in "previously disturbed" areas. How much habitat can be disturbed before a site-specific analysis is required? How much time can have passed since the initial disturbance? How is a licensee to evaluate the successional patterns of the aquatic communities?

CL-16/48 43. Page 4-18, Section 4.3.5 2, Lines 17-23. The Supplement states that the potential impact of disturbing areas beyond the original construction area is SMALL and can be characterized generically if "the aquatic environment has been characterized," and that a site-specific analysis is needed if "decommissioning activities occur in aquatic environments have not been characterized." What must this characterization consist of, and when and how recently must it have been performed, to allow a licensee to conclude that it is sufficient and can properly support the conclusion that potential impacts are SMALL?

CL-16/49 44. Page 4-19, Section 4.3 5 4, Lines 4-6. This subsection appears to define a "previously disturbed area" as "within the security fences or surrounding paved, graveled, or otherwise developed areas without removal of near-shore or in-water structures." Does this definition also apply to land use activities on page 4-6, Section 4.3.1.2, Lines 15-16? Does the definition mean that a licensee who plans to remove near-shore or in-water structures in "previously disturbed areas" must perform a site-specific analysis of the potential aquatic ecology impacts?

CL-16/50 45. Page 4-19, Section 4.3.5.2, Lines 8-11. How is "previous" defined? What is the relationship between these "previous ecological surveys that indicate a low probability of adversely affecting ecological resources" and the aquatic environment characterizations referred to on Page 4-18, Lines 17-23? This subsection suggests that the aquatic ecology impacts of decommissioning activities conducted in areas that were not "previously disturbed" will be SMALL if a previous survey has demonstrated a low probability of adverse effects on the ecosystem, while Section 4.3 4 2 suggests that the aquatic ecology impacts of decommissioning activities in such areas will be SMALL if a characterization has demonstrated the possibility of some adverse effects to "sensitive resources," but the facility will manage those resources for their protection during

decommissioning activities.

CL-16/51 46. Page 4-19, Section 4.3.5.2, Lines 11-16. The Supplement should define more precisely the circumstances under which a site-specific analysis of potential aquatic ecology impacts in previously undisturbed areas is required. How is the licensee to determine whether an activity has the potential to impact the environment? How should the magnitude of potential impacts be determined? Also, can a licensee avoid doing a site-specific analysis by implementing a protection plan to protect the aquatic environment?

Terrestrial Ecology

CL-16/52 47. Page 4-21, Section 4 3 6.2, Lines 1, 15 and 24. The term "previously disturbed" should be defined or examples provided.

CL-16/53 48. Page 4-21, Section 4.3.6 2, Lines 15-17. The Supplement should provide specific guidance on how to weigh the primary factors to be considered in evaluating the adverse impacts of decommissioning activities in "previously disturbed" areas. How much habitat can be disturbed before a site-specific analysis is required? How much time can have passed since the initial disturbance? How is a licensee to evaluate the successional patterns of the native communities?

CL-16/54 49. Page 4-21, Section 4.3.6 2, Lines 23-25. What is a "significant" terrestrial resource? What does "potentially" affected mean? These terms need to be defined or examples provided so that licensees understand when they are required to perform a site-specific analysis.

CL-16/55 50. Page 4-21, Section 4.3.6 2, Lines 25-29. The document states that the potential impact of disturbing areas beyond the original construction area is SMALL and can be characterized generically if "the terrestrial environment has been characterized." Moreover, a site-specific analysis is needed if "decommissioning activities occur in terrestrial environments that have not been characterized." What must this characterization consist of, and when/how recently must it have been performed, to allow a licensee to conclude that it is sufficient and can properly support the conclusion that potential impacts are SMALL?

CL-16/56 51. Pages 4-21 to 4-22, Section 4.3.6.3. The document assumes that "[i]n most cases, the amount of land required to support the decommissioning process is relatively small and is normally a very small portion of the overall plant site." It also states that "licensees typically anticipate utilizing an area of between 0.4 ha (1 ac) to approximately 10.5 ha (26 ac) to support the decommissioning process." EPA assumes this means that a licensee must perform a site-specific analysis of impacts if the terrestrial ecology impacts of decommissioning activities may or will be greater than 10.5 ha (26 ac). If this assumption is incorrect, when is a site-specific analysis is required and why?

CL-16/57 52. Page 4-22, Section 4.3 6 3, Lines 27-29. The document assumes that the "activity of rubblization of construction material should not have significant nonradiological impacts beyond other decommissioning activities except for potential short-term noise and dust effects." However, on Page 4-12, the document states that rubblization may affect groundwater pH and thereby "affect the transport properties of radioactive and nonradioactive chemicals in the subsurface." Any radioactive or nonradioactive chemicals in the subsurface that are mobilized as a result of concrete leaching from rubblized material could have an adverse effect on the terrestrial ecology

of a facility. For this reason, EPA recommends that the Supplement require a site-specific analysis of all of the potential environmental impacts of rubblization, both nonradiological and radiological.

CL-16/58 53. Page 4-22, Section 4.3.6.4, Lines 37-39. This subsection appears to define a "previously disturbed area" as "within the security fences or surrounding paved, graveled, or otherwise developed areas." How does this definition relate to the definition provided on Page 4-6, Section 4.3.1.2, lines 15-16?

CL-16/59 54. Page 4-22, Section 4.3.6 4, Lines 40-43. This subsection suggests that the terrestrial ecology impacts of decommissioning activities conducted in areas that were not previously disturbed will be SMALL if a "previous" survey has demonstrated a low probability of adverse effects on the ecosystem. How recent must the "previous" survey have been?

CL-16/60 55. Page 4-22, Section 4.3.6.2, Line 43 and Page 4-23, Section 4.3.6.2, Lines 1-5 The Supplement should better define or provide examples of circumstances under which a site-specific analysis of potential terrestrial ecology impacts in previously undisturbed areas is required. What constitutes a "potential of adverse impact to important terrestrial resources"? What is an "important" terrestrial resource? The document should provide criteria by which a licensee can determine whether an activity has this "potential," as opposed to merely a "low probability of adversely affecting ecological resources." The Supplement should also clarify whether a licensee can avoid doing a site-specific analysis by implementing a protection plan to protect the terrestrial environment.

Threatened and Endangered Species

CL-16/61 56. Page 4-23, Section 4 3 7, Lines 10-12. The supplement should elaborate on the basis for the statement that "the potential impacts of nuclear power facility decommissioning efforts on threatened or endangered species will normally be no greater and likely less than the effects of plant operations."

CL-16/62 57. Page 4-25, Section 4.3.7.2, Lines 3-7. The Supplement should provide guidance on determining the amount of habitat that can be disturbed beyond previously disturbed areas.

Radiological

CL-16/63 58. Page 4-27, section 4 3 8, lines 17-21. The Supplement should clarify the statement about the "relatively lower sensitivity of non-human species to radiation." Is this statement based on scientific studies or is the impact to non-humans not known? Why were decommissioning's radiological impacts on ecological receptors defined as outside the scope of the Supplement?

CL-16/64 59. Page 4-28, Section 4.3.8.3. This discussion in this section indicates that public and occupational dose comparisons were made with the facility's EIS for normal operations and with the 1988 GEIS. This statement appears to contradict earlier statements about the assessment of impacts being based on NRC regulatory limits for worker protection. Please clarify how the comparisons were made.

CL-16/65 60. Page 4-29, Section 4.3.8 3. Line 14 indicates that the data used in the evaluation are those

presented in Appendix G Appendix G uses units of collective dose equivalent; however, as also outlined in the appendix, the radiation protection standards are in units of annual individual dose. The Supplement should use consistent units and provide data on population densities for nuclear power plants.

Appendix G.2 (page G-19) provides the average public dose within a 50 miles radius of a facility The Supplement should clarify if facilities which fall outside this analysis (e g , have denser populations yielding more person-rem than indicated in the appendix) must complete a site-specific analysis.

CL-16/66 61. Page 4-31, Section 4.3.8.4. While the overall worker health impact is SMALL, Appendix G shows data from some decommissioning facilities where worker exposure is higher during decommissioning than during operations. The Supplement should clarify how these higher exposure levels compare with the radiation protection standards. Also, this section should clarify whether an analysis was done of the normal wastewater streams produced during decommissioning that are contaminated with radiation.

CL-16/67 62. Pages 4-30, 4-12 and xii. The Supplement should clarify the circumstances under which rubblization is permitted. It is EPA's understanding that, to date, rubblization has only been permitted after site decontamination. Does the term "rubblization" on page 4-30 refer to the treatment of concrete or structures that have not been decontaminated? Note that page xii indicates that the continued dismantlement of structures that have been radiologically decontaminated falls outside the scope of the Supplement.

Environmental Justice

CL-16/68 63. Page 4-57, Section 4.3.13.4, Lines 36-38. The environmental sections of some PSDARs submitted to date have not provided detailed information. The Supplement should elaborate on the "appropriate information" that licensees should provide relating to environmental justice in the environmental section of their PSDARs to enable NRC to obtain sufficient information on potential environmental justice issues at decommissioning facilities.

Cultural, Historical and Archeological Resources

CL-16/69 64. Page 4-58, Section 4.3.14. EPA appreciates that, on the whole, decommissioning is not likely to affect previously undisturbed archeological resources potentially located near the facilities, but is concerned about the potential loss of these facilities as a body of engineering work. The Supplement mentions that a few facilities may be eligible for listing on the National Register of Historic Places individually and that those facilities would then be the subject of mitigation based upon consultation with the SHPO. Eventually, however, a substantial number of facilities may be decommissioned. While the facilities themselves may not be fifty years old nor require physical in situ preservation, the processes and engineering they employed may merit inclusion in the Historic American Engineering Record (HAER) The HAER is designed to provide uniform documentation standards so future scholars can look back at our achievements and study them for a multitude of purposes. Rather than make this determination on a case-by-case basis, the NRC may want to consider working with the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers to achieve a programmatic agreement or other programmatic treatment for these facilities

Transportation

CL-16/70 65. Page 4-68, Section 4 3 17.1. This section should address regulations governing the transportation of hazardous and mixed wastes as well as of low level waste.

CL-16/71 66. Page 4-69, Section 4.3.17 2, Line 5. What is meant by "not large enough to destabilize the important attributes of the system?"

CL-16/72 67. Pages 4-72 to 4-73, Section 4.3.18. The discussion of irretrievable resources more properly belongs in a section that summarizes environmental consequences. The Supplement could benefit from having such a section as was done with the recently issued draft NMSS guidance document on NRC preparation of NEPA documents.

CL-16/73 68. Page 4-72, Section 4.3.18, Line 9. It seems inappropriate to include concrete as an irretrievable resource.

CL-16/74 69. Page 4-72, Section 4 3.18 1, Line 14. The Supplement states that there "are no regulations that deal specifically with the concept of irretrievable resources." It is unclear what is meant by this statement. The following statutory and regulatory provisions pertain to irreversible and irretrievable resources in the NEPA context:
-- NEPA § 102(2)(C)(v), 42 U S C. § 4332(2)(C)(v);
-- 40 C.F.R. § 1502.16 (CEQ regulations); and,
-- 10 C F.R. Part 51, Subpart A, Appendix A (NRC regulations).

11/9/01
66FR56721 (17)

STATE OF ILLINOIS
DEPARTMENT OF NUCLEAR SAFETY

1035 OUTER PARK DRIVE • SPRINGFIELD, ILLINOIS 62704
217-785-9900 • 217-782-6133 (TDD)

George H. Ryan
Governor

Thomas W. Ortciger
Director

RECEIVED
Rules and Directives Branch
USNRC

January 7, 2002

TO: USNRC

FROM: Gordon Appel
Deputy Director
Illinois Dept. of Nuclear Safety
217/524-4723

Response to Comments on NUREG-0586

We mailed the response on December 28, 2001. Due to the mail, we are faxing this letter to you.

PAGES... 4
(including transmittal sheet)

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

STATE OF ILLINOIS
DEPARTMENT OF NUCLEAR SAFETY

1035 OUTER PARK DRIVE • SPRINGFIELD, ILLINOIS 62704
217-785-9900 • 217-782-6133 (TDD)

George H. Ryan
Governor

Thomas W. Ortciger
Director

December 28, 2001

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Chief, Rules and Directives Branch:

The NRC published a Notice of Availability of the Draft Supplement 1 to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (NUREG-0586) on November 9, 2001 and invited comments from interested parties. In addition, the NRC hosted a series of public meetings to solicit comments from the public. The Department of Nuclear Safety was represented at one of these meetings and would like to offer these additional comments on the Draft Supplement.

CL-17/1 As mentioned at the December 6, 2001 public meeting in Chicago, the scope of the Draft Supplement is inadequate in its evaluation of the long-term radiological exposure to the public for the reactor entombment decommissioning method. The scope of the radiological impact studies in the supplement appear to focus solely on the actual decommissioning process, not the resultant site conditions remaining after the decommissioning is completed. Specifically, section 4.3.8 Radiological on page 4-26 states:

> "The NRC considers radiological doses to workers and members of the public when evaluating the potential consequence of decommissioning activities. Radioactive materials are present in the reactor and support facilities after operations cease and the fuel has been removed from the reactor core. Exposure to these radioactive materials during decommissioning may have consequences for workers. Members of the public may also be exposed to radioactive materials that are released to the environment during the decommissioning process. All decommissioning activities were assessed to determine their potential for radiation exposures that may result in health effects to workers and the public. This section

Chief, Rules and Directives Branch
Page 2
December 28, 2001

considers the impacts to workers and the public during decommission activities performed up to the time of the termination of the license. Any potential radiological impacts following license termination are not considered in this Supplement. Such impacts are covered by the *Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities*, NUREG-1496."

CL-17/2 For purposes of this GEIS, the NRC is only focussing on the environmental impact of the actual decommissioning activities between the cessation of operations and license termination. This approach completely and inappropriately ignores the environmental impact associated with any radioactive material remaining following license termination.

CL-17/3 For a site decommissioning that results in a license termination for unrestricted use, the long-term radiological impacts to the public may well be within acceptable limits. However, for a decommissioning that results in a license termination with restricted site use the potential exists for long-term radiological impacts to the public to be far above acceptable limits. The draft Supplement does not consider this potential. While narrowly focussing the radiological studies to the decommissioning process, the NRC does not consider those potential long-term impacts to the public.

When the original GEIS was issued in 1988, the NRC viewed entombment as an unlikely decommissioning method. The issue of entombment was not publicly discussed in the 1997 timeframe that NUREG-1496 was published. It is unlikely that NUREG-1496 addresses the long-term radiological impacts associated with entombment. In 1999, the NRC began to consider entombment as possible decommissioning options or methods and conducted a workshop in
CL-17/4 December 1999 to gain input from the public. On October 16, 2001, the NRC published an advance notice of proposed rulemaking regarding entombment options for power reactors. Even with that notice and this draft Supplement, the NRC has yet to evaluate the long-term environmental impacts associated with
CL-17/5 entombment of power reactors. In this Supplement, the NRC fails to consider whether it has the statutory or regulatory authority to terminate a license that allows for unrestricted site use with residual contamination present on site or to
CL-17/6 terminate the license with restricted site use in an Agreement State. Residual contamination left at a site whose license was terminated for unrestricted use could
CL-17/7 be perceived as disposal of low-level radioactive waste. By definition

Chief, Rules and Directives Branch
Page 3
December 28, 2001

entombment is disposal of low-level radioactive waste in the containment
CL-17/8 structure. The Atomic Energy Act allows states to assume regulatory authority over the disposal of low-level radioactive waste in their state. In an Agreement State it is the Agreement State not the NRC that has the jurisdiction over disposal of low-level radioactive waste at reactor sites.

The federal government has established policies regarding the disposal of low-level radioactive waste. The federal Low-Level Radioactive Waste Policy Act of 1980 and the Amendments Act of 1985 require the states to provide for the disposal of low-level radioactive waste generated within their borders. States were encouraged to form regional compacts to limit the number of disposal facilities developed. As an incentive to form compacts, compacts were given certain rights to control the import and export of low-level radioactive waste into or out of their region as well as to establish policies regarding the management of waste within their region. To date, 10 such compacts have been formed and ratified by Congress. Most compacts envision having one regional disposal facility that
CL-17/9 would accept and safely dispose of their region's waste. Allowing NRC to determine whether waste can or will remain after a reactor license is terminated is contrary to the policy of the respective compacts and in direct disregard of the federal low-level radioactive waste framework established by Congress.

CL-17/10 As the NRC evaluates the comments received on the GEIS, it should look beyond the actual decommissioning process and focus on what condition the site
CL-17/11 would be in following license termination. If the possibility exists that radioactive material will remain on site under an unrestricted or restricted use condition, the GEIS should consider the associated long-term environmental impacts. In
CL-17/12 addition, the NRC should reevaluated their legal standing in deciding what radioactive material would remain at a reactor site located in an Agreement State and whether their proposed action would be contrary to the waste management policies of the applicable compact.

Any question you may have regarding this letter may be directed to me at 217/785-9868.

Sincerely,

Thomas W. Ortciger
Director

TWO:bac

11/09/01
66FR56721
(18)

From: "Hickey, Eva E" <eva.hickey@pnl gov>
To: "mtm2@nrc.gov" <mtm2@nrc.gov>, "sxf@nrc gov" <sxf@nrc.gov>
Date: 1/15/02 6 25PM
Subject: FW: Comments on NUREG-0586 Draft Supplement 1

-----Original Message-----
From: Jerry Delezenski [mailto:JDeleze@smud org]
Sent: Tuesday, November 20, 2001 11:12 AM
To: 'dgeis@nrc.gov'
Subject: Comments on NUREG-0586 Draft Supplement 1

Cynthia Carpenter, Chief
Rules and Directives Branch
Division of Administrative Services
U.S. Nuclear Regulatory Commission

Re: Comments on NUREG-0586 Draft Supplement 1

Ms. Carpenter:

CL-18/1 We would like to comment on the draft NUREG to correct an error in Table 4-3, line 21 regarding the Cost Impacts of Decommissioning for Rancho Seco. Line 21 should read:

Rancho Seco 913MWe PWR DECON $394

Please refer to our letter submitted to the NRC Document Control Desk dated 3/26/01 entitled Rancho Seco Report on Decommissioning Funding Status. On page 2 of the letter we stated:

"...Their [TLG] estimate was $495.4 million in 2000 dollars. The portion of this total that is non NRC-defined decommissioning activities related to non-radiological dismantlement and management and storage of spent fuel is $101 million, most of which is related to fuel storage costs..."

...TABLE 2...
2000 $495 Million.....

SMUD, when it first established its decommissioning fund, included radiological dismantlement costs and costs related to storing spent fuel. Therefore, $495m -$101m leaves $394 million for equivalent cost discussed in Table 4-3 of the NUREG.

CL-18/2 Since 1999, Rancho Seco has embarked on an extended DECON process scheduled for completion in 2008 (including license termination). After license termination, SMUD will, depending on its business needs, embark on sit restoration currently estimated at ~$45-80 million. This approximate estimate dollar figure was never a part of the decommissioning trust fund. (We assume your number in Table 4-3 includes all the costs of dismantlement, fuel storage and non-radiological site restoration.)

CL-18/3 Also, based on information presented in various industry forums, several

Template = ADM-013 E-RIDS = ADM-03
Add = M. Masnik (MTM2)

numbers quoted for some of the other plants may be inaccurate. Each plant should verify the numbers for accuracy.

Thank You,

Respectfully,

Jerry Delezenski,
Supt. QA/Licensing/Admin
Rancho Seco

Stephen A Byrne
Senior Vice President, Nuclear Operations
803 345 4622

SCE&G
A SCANA COMPANY

December 20, 2001
RC-01-0204

11/7/01
66 FR 56721
19

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Gentlemen:

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
COMMENTS ON THE DRAFT SUPPLEMENT TO THE FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON DECOMMISSIONING OF NUCLEAR FACILITIES

Reference: Draft Supplement 1 to NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" November 9, 2001, Federal Register, 66-FR-56721

South Carolina Electric & Gas (SCE&G) company offers the following comments on the above-mentioned document.

CL-19/1 Page 3-24 mentions the containment ceiling being lowered to the top of the pressurizer for a PWR under the ENTOMB2 option. Appendix E, page 9 lists this action as optional. This action needs to clearly be listed as optional on pages 3-24, 3-25, and 3-31. SCE&G believes this action should be optional as listed in Appendix E due to the extreme effort to lower the ceiling of a massive building such as the reactor building and yet maintain it intact for entombment purposes.

CL-19/2 Also, on page 3-24 "low density concrete grout" is mentioned. Grout is not lightweight, but concrete can make use of lightweight large aggregate to lower the weight per volume. Therefore, SCE&G recommends concrete be used in place of grout on pages 3-24, 3-25, 3-31, and 3-33.

Template = ADM

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

If you have any questions, please call Chris Crowley of my staff at (803) 345-4409.

Very truly yours,

Stephen A. Byrne

CAC/SAB/mb

c: N. O. Lorick
N. S. Carns
T. G. Eppink
R. J. White
L. A. Reyes
R. R. Assa
NRC Resident Inspector
K. M. Sutton
W. R. Higgins
RTS (0-L-99-0290 #4)
File (811.10)
DMS (RC-01-0204)

21 PAGES TOTAL · COPY

PAMELA BLOCKEY-O'BRIEN, D23 Golden Valley
7631 Dallas Hwy, Douglasville, GA 30134

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(20)

Chief, Rules and Directives Branch,
Division of Administrative Services,
Mailstop T 6 D 59,
US Nuclear Regulatory Commission,
Washington, D.C. 20555-0001

Dec. 26th, 2001

RE: Comments for the record on "Draft Supplement 1 to Nureg-0586, Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (GEIS), Draft Supplement Dealing with Nuclear Power Reactors".

What a way to spend the day after Christmas—what a way to spend many hours of December and November—having to plow through this document – a monument to mans' arrogance, stupidity, lack of foresight and greed, if there ever was one. However, CL-20/3

CL-20/1 the document can be condensed into three words, namely : "DUMP AND COVER", if one wants a basic overview of what NRC put in it, as that seems to be part of the main CL-20/4 desire of the nuclear industry/NRC (and D.O.E !), concerning what to do with the horrendous nuclear legacy of the atomic age . At the height of the Cold War, in the U.S., defense against the atomic bomb and the hydrogen bomb (which in essence, uses a fission – atomic– device/bomb/reaction to trigger the fusion reaction/bomb/ CL-20/5 device which triggers etc. etc. etc.) was an incredible defense which was called "DUCK AND COVER". They actually had the population believing that if you ducked under a door jamb, or under a desk at school, or under a table in the kitchen, you would survive nuclear war.. While this side of the Atlantic dutifully behaved like a bunch of sheep going over a precipice following the leader, the other side of the Atlantic, thousands upon thousands demonstrated against the insanity of the arms race and nuclear weapons in general. Why was there a difference in behavior ? Because, just like today with this issue of nuclear waste and "decommissioning", (a word everyone swallows it seems – must be a new made up word as it is not in my huge old dictionary) – there was/is almost no discussion of the issues in the press, and no education on the issues, and this is purposeful. There is, and has been, press interference on the issues – by both industry and governments.

CL-20/2 The nuclear issue is the most important issue facing humanity and has been since the atom was first split. The nuclear issue is the Sword of Damocles over the planet and all future generations should we survive the next decade, (as I write India and Pakistan are once again on the verge of war, only they now have nuclear

Template = ADM-013

E-RIDS = ADM-03
Add = H. Hossain (HTM2)

weapons, thanks to the fact that they got both nuclear power plants and research reactors, get those, and with enough money and infrastructure and a government willing to squander billions, just like the Soviets, the British, the US, the French, the Chinese, the Israelis, the South Africans under apartheid, did, and sooner or later you've got yourself a bomb– THE BOMB – (that old nuclear power/atomic bomb connection no one wants to mention.) You mean NRC thought no one realized the nuclear power route was just a diversion so the public wouldn't realize they were running plants to produce extra plutonium for weapons if needed ? Oppenheimer SAID so. Besides, anyone with common sense could figure that out. Just as anyone with common sense can tell this Draft Supplement 1 to Nureg-0586 will have dire consequences if implemented in its current form. It always amazes me how the Nuclear Regulatory Commission INVENTS its own laws and standards – its own regulations, its own definitions (such as "decommissioning" see p.xii) and most of the public doesn't realize (if they did, it is safe to assume they would probably horsewhip the Commission out of town) what a sham it all is and how industry writes its own ticket. For example, p. xii, the Commission has concluded (says the Commission) that <u>impacts that do not exceed permissible levels in the Commission's regulations are considered small.</u> In other words, using made up regulations based a great deal on that appalling, criminally negligent outfit the ICRP, (one of the dumping grounds for Manhatten Project scientists post WWII – for anyone reading this from the younger generations, the Manhatten Project was the name of the project that built the atomic bombs dumped on Hiroshima and Nagasaki) and its the ICRP's early determinations that they would set allowable levels of exposure that were at levels that would allow the emerging atomic energy industry, and everything that went with it, to operate with all the releases which they knew and admitted would cause genetic damage, but they decided it would be acceptable to damage sperm and ovum . To damage countless generations (until they die out) to cause countless birth defects, countless miscarriages, countless cases of spina bifida – look at South Carolina, nuclear power plants and the Death of the Earth squad's Savannah River Nuclear Site and the highest spina bifida rate in the US. CL-20/6 NRC has absolutely no basis to say whether impacts will be small etc. based on that

3

CL-20/7 sort of garbage. The great R.M. Sievert (after whom the unit the Sievert is named) pointed out that there was no level below which radiation did not cause damage, no threshold that must be exceeded for damage to occurr, yet NRC says a threshold must be exceeded for effect to occur, I believe Sievert. The ICRP standard of 5Rem per year is based on a principle called risk/benefit that allows a one in five thousand chance of contracting cancer. In other words, the death or cancer risk is the workers and the publics' , the benefits are the dollars flowing to the industry and the NRC (from the industry in return for NRC services and licenses etc) The NCRP also pushes the 5 Rem standard - this is the same bunch of bozos who in trying to refute the world renowned findings of Dr. Alice Stewart and the famous Oxford Study accepted worldwide, that showed x-raying a developing fetus caused a major increase in childhood cancer - claimed obstetricians had x-rayed those fetuses which they somehow KNEW would get cancer, which explained why the x-rayed fetuses went on to get childhood cancer!! (See "The Woman Who Knew Too Much - Dr. Alice Stewart and the Secrets of Radiation" by Gayle Greene. Read it and learn all about the Commission and its buddies. Read it and weep for humanity, then , if you have something called a concience at the NRC, go do something about this Draft so it is no longer an industy wish list.) The ALARA principle that NRC uses which basically says that doses must only be kept As Low As Reasonably Achievable (ALARA) based on the state of the technology and the amount of money spent by the industry - what Dr. Gofman calls "planned deaths" as NRC knows -

CL-20/8 is referenced by NRC many times, and the Draft even says during licensing the applicants commit to implement ALARA programs. The combination of ICRP, NRC, NCRP and ALARA standards is, and has been a recipe for premeditated murder and/or illness,

CL-20/9 genetic damage and great suffering as it is, NRC saying that it has not established standards to biota other than humans on the basis that limits established (by the aforementioned) for the public would provide adequate protection for other species is outrageous and contrary to what has been established for decades. Plus, to

4

then cite the bozos at NCRP again, saying that the "fate of individual non-human organisms is of less concern than the maintainance of endemic population," shows A COMPLETE LACK OF UNDERSTANDING OR COMPREHENSION OF THE WEB OF LIFE AND THE NATURAL WORLD. The effects of ionizing radiation exposure on ALL life forms includes sterility and genetic damage which can lead to extinction. (Think fruit flies and Herman Muellers experiments which gave him a Nobel Prize. Think the

CL-20/10 effects to fish, proved years ago.) When thinking about exposure to plants and animals and fish, one needs to take the effects to an infant and to a child in the womb to better approximate the effects to wildlife, the smaller the non-human entity (e.g. a bird, a frog) the child in utero down to embryonic level would be appropriate. We all know what happens when an embryo is exposed - namely death or or severe damage. The same happens to birds eggs. The International Atomic Energy Agency is about as trustworthy on the radiation dose issue as Attila the Hun would have been on the gentleness issue - the IAEA has a charter that states its sole purpose in life is to push all things nuclear. Just what does NRC expect them to say ?

Almost 50 years ago, the Georgia ecologist Eugene Odum, who did a lot of work for the Atomic Energy Commission/DOE (a fact that is not now widely known) under contract, wrote of the need to "accelerate the study of the function of intact biotic communities in order that the total radiation effects can be evaluated" of the need for "an understanding on the long term influences of low level radiations on aquatic and terrestrial environments into which the by-products may be released," and that it was concievable "that every large atomic power plant of the future will need a radiation ecologist to work with environmental problems outside of the plant" and that there was a need to train "young men simultaneously in the fundamentals of modern ecology and radiation biology in order that this inevitable need can be met." How terribly sad - the NRC has one doctor for the entire NRC. Radiation biologists ? Stop me before I scream. It is obvious that an inventory of all life forms on a site should be made and that they be screened for chromosome aberrations and radioactive contamination, then

5

a similar comparison be done at a site as similar as possible to the plant site about twenty miles away upstream and out of the predominant windpath on a thirty year wind rose. It would not be half as good as one would want, but it would be better than nothing and establish some differences and give a better idea of the contamination problems, even though a site twenty miles away will have recieved some airborne deposition from the plant. In terms of aquatic species, the record from State sources and the licensee on tests run on fish/mussels etc. can be used and compared to the fact, repeat FACT, that contaminants such as Cobalt-60, Sr-90 Cs-137, H-3 above the minute natural burden, plutonium etc. are not natural and should never be found in fish, mollusks etc. and one can look for chromosome aberrations. Diatoms can be examined for bioaccumulation of the uraniums from the plant. Centuries hence - in some cases decades - a measure of aquatic health would be the decrease in levels of contaminants found in species and decrease in aberrations etc. It is vital, that contaminated sediment found downstream (and also some upstream due to airborne deposition on water sinking down) be removed for many miles downstream. This should be done by perhaps sucking it up via vacuum type hoses as opposed to dredging which could dislodge and spread the contamination further.

With regard to plant life, microorganisms etc. one could compare plant seed production of say twenty species on site, with production twenty miles away, and number and type etc. of microorganisms likewise. as well as radioactive contaminat -

CL-20/11 ion. I don't really know why I am bothering to write all this, as the NRC will ignore it anyway, but hope springs eternal as they say. If we don't have comparisons, we can't have at least some idea of what constitutes the start of a return to a more unpollutted site, and we can't establish what needs bulldozing and taken to a radioactive waste national sacrifice area.

CL-20/12 THERE SHOULD BE ABSOLUTELY NO UNRESTRICTED USE OF THE PROPERTY EVER. THE ADDITIONAL EXPOSURE IS TOTALLY INSANE. WHEN DR. KARL MORGAN WAS ALIVE * THE FATHER OF RADIOLOGIWAL HEALTH PHYSICS, FORMERLY WITH OAK RIDGE FOR DECADES, HE SAID LESS THAN ONE

CL-20/13 MILLIREM PER YEAR ONLY WOULD BE PERHAPS ACCEPTABLE FROM ALL PATHWAYS. THERE NEVER

6

SHOULD BE A LACK OF INSTITUTIONAL CONTROL EITHER.

CL-20/14 The Technical Specifications and what the facility was allowed to dump under the license are outdated and bear no resemblance to current knowledge and should

CL-20/15 be junked and the whole thing done over. Furthermore, the way the environmentall and water issues were looked at during the time of plant licensing were often equally awful. It all needs reconsidering.

What is ridiculous, is the worry about messing up the environment while decommissioning the dump. For crying out loud, every second the plants are runniing they are contributing to ecological ruin, at the microscopic level, and impacting human health to a distance of approximately 100 miles.

CL-20/17 This Draft 1 references MARSSIM (Multi-Agency Radiation Survey and Site Investogation Manual.) I commented on the Draft, never saw the final, never heard from anyone again on it. It was mindnumbingly awful. Put together by some people from NRC, DOE, Dept. of Defense, and EPA. Industry was represented big time. In it the DOD said how committed it was to protecting the environment - this from an entity that had left thousands of contaminated sites on and off bases, themselves requiring an estimated (govt. estimate) $100 BILLION to $200 Billion to cleanup worldwide. In its introduction, Draft "Marssim" did not address all sorts of things - from contamination on vicinity properties through contaminated subsurface soil, water, construction materials and on and on. All of which must be cleanad up/have the contamination removed. They showed a lack of understanding of the groundwater cycle, and groundwater issues JUST LIKE THIS DRAFT DOES (in fact I'm still looking

CL-20/18 for it to be addressed), Groundwater is used by countless communities, groundwater is eventually released to surface and other water bodies and, as groundwater onsite is usually radioactively contaminated, (At Plant Hatch they contaminated it by 1979 and that was just for starters) it is is a SERIOUS issue that MUST be dealt with, groundwater that is contaminated MUST be pumped out etc. (Refers to what I said in earlier comments) THIS GROUNDWATER CONTAMINATION ISSUE IS ANOTHER REASON

CL-20/19 WHY "RUBELIZATION" MUST BE FORBIDDEN. THE CONTAMINATION IN WHAT THEY WANT TO RUBELIZE AND BURY WILL LEACH TO THE GROUNDWATER AND DIRECTLY IRRADIATE SOIL AND MICROORGANISMS. The industry just wants to save money and "dump and cover".

7

CL-20/20 The fact that the Staff and the Commission have even considered rubblization.
shows an utter disregard for the health and welfare and safety of the public
CL-20/21 and the ecosystem upon which life depends. Anything dumped or buried from the past
practices on site must also be dug up and removed.
CL-20/22 To find out the extent of past problems, and contamination levels, IT IS VITAL
THAT THE NRC, THE LICENSEE (as some are new owners/licensees), AND THE CONTRAC-
TORS AND SUB-CONTRACTORS, GET ALL Reports of ACCIDENTS, LICENSEE EVENT REPORTS, VIOLATIONS,
INSPECTION REPORTS, SPILLS AND CONTAMINATION EVENTS FROM THE DOCKET FOR THE
REACTOR AND SITE IN QUESTION, AND BLOODY WELL GET OFF THEIR REAR ENDS AND EARN
THEIR MONEY AND READ THEM. THEY NEED THE WHOLE LOT, SINCE START-UP, EVEN IF IT
TAKES TWO MONTHS TO READ THEM. I AM SICK AND TIRED OF EVERYONE, NRC INCLUDED,
REFUSING TO READ THOSE REPORTS FROM THE DOCKET AND IN THE PUBLIC DOCUMENT ROOM. CL-20/28
THEN, AS THE LICENSEES USUALLY PUT A GOOD SPIN ON IT, PEOPLE SHOULD REALIZE THE
PROBLEMS LISTED WERE PROBABLY WORSE. Another issue, which I touched on in my
comments on MARSSIM, was the fact that in the real world, many people can not
read or write very well, and if things are contracted out, this could have
CL-20/23 serious consequences. NRC must stipulate, that ALL CONTRACTORS AND SUB-CONTRAC-
TORS RIGHT DOWN TO THE BACK-HOE OPERATORS MUST BE HIGH SCHOOL GRADUATES. Cleanup
cannot just be dished out to any contractor, all involved should not only have a
stirling track record, but experience in nuclear fields. There should be a radiation
biologist on site, plus a health physicist, plus a wildlife biologist with a CL-20/29
knowledge of radiation effects, plus there must be federal and state oversight CL-20/30
CL-20/24 ON THE SITE at all times. I noticed that the Draft blabbers on about OSHA standards-
YET FAILS TO MENTION THAT OSHA DOES NOT COME ON SITE AND IS NOT ALLOWED TO ACCORDING CL-20/31
TO OSHA, EVERYTHING IS UNDER NRC. So let's print the truth shall we ?
CL-20/25 The Draft says, p.1-6, that the NRC and the Commission are not considering the issue CL-20/32
of spent fuel storage (in a pool or in one of those ridiculous casks outside in CL-20/33
plain view for every terrorist to see) as part of decommissioning. The excuse is
CL-20/26 that it's dealt with under other license aspects. It also says that the Commission
has made a finding that the DEADLY, RADIOACTIVE SPENT FUEL CAN BE STORED SAFELY

8

AND WITHOUT SIGNIFICANT ENVIRONMENTAL IMPACTS FOR AT LEAST THRITY YEARS BEYOND
THE LIFE FOR OPERATION ETC. ETC. IS THE COMMISSION OUT OF ITS COTTON-PICKING MIND?
CL-20/27 Those issues are of grave concern. What happens , if during decommissioning (i.e.
during "dump and cover", amidst much licensee laughter about how they stuck it to
the rate payers and taxpayers and local community yet again) terrorists take out
three spent fuel casks blasting them to kingdom come (the Milan anti-tank weapon
would do that, as I wrote NRC before) OR two casks had a major problem and needed to
be opened under shielding inside the spent fuel pool and there was either no room
in the spent fuel pool or the cask came apart while trying to move it due to em-
brittlement of the cask from the radioactive decay heat coming off the spent fuel ?
Whatt will NRC do, what will the licensee do , send for Ghostbusters ?
Under Water Quality p.4-10,4-11 The NRC must stop giving the impression that
it is a sheer chance that nuclear reactors are located on water, when in fact they
require millions of gallons of water a day to operate and that water source is con-
sidered the ultimate heat sink in the case of a meltdown - it'll ooze on down the
river, hissing and sputtering like a volcano hitting water. NRC assumes compliance
with NPDES discharge permits for non-radioactive contaminants (NPDES and the Clean
Water Act do not cover most radioactive contaminants, this was purposeful, so industry
and the armaments crowd could do what they liked,) however, NPDES permits are
often violated or bypassed - just look at the NPDES situation in Georgia as one
example. Discharges should never have been allowed without prior cleanup and should
not be now. Surface and groundwater quality, p. 4-12, should NOT be considered a ge-
neric decommissioning issue - climate zone can also create unique problems, terrain
likewise, it should be site specific. Air quality issues, p. 4-12 etc., do not address
the fact that HEPA filters are about as good as useless for radioactive particulate
holdup and sand filters should be added as well. All workers must have self-contained
breathing systems (moon-suits) . The area being worked in should be covered to con-
tain dust if it means covering the whole site with a tent with an adhesive inner
surface to capter particulates - after all if flypaper is good enough for the DOE
when it, like the NRC was called the AEC, to capture particulates on, a tent with

9.

some sort of a sticky undersurface is a step up! The point I'm getting
CL-20/34 at, is, one does not want radioactive and chemical particulate matter getting
CL-20/35 offsite if possible. If such a tent system were used, afterwards it would be disposed of as rad waste. Also, workers and the public MUST understand the fact that one can not clean up radioactive contamination, only contain it to some extent and remove contaminated materials to better sites where they can be better contained - in other words to national sacrifice areas remote from all human habitation and far from water sources, where wild life is fenced out.
CL-20/36 Regarding aquatic ecology p.4-16, as touched on earlier, the environmental impact statements originally written for the plants were often very poor, and did not mention that the discharge water would be radioactively contaminated nor that sediment would be contaminated for miles etc. In the long term, if the contaminated sediment is removed and no further radioactive and chemical releases
CL-20/37 are made to water and air, the aquatic ecology can only improve. Water quality should continue to be tested for radioactive contaminants for at least 600 years which is the full radioactive hazardous life approximately for cesium-137 which is a contaminant of concern in fish and shellfish as it migrates to muscle in
CL-20/38 particular. The aquatic ecology issue should also be site specific, for example, Plant Hatch in Southern Georgia had a massive spent fuel pool spill which contaminated not only the river and sediment but also a huge wetland area which has many creatures feeding in it and becoming contaminated, including threatened and endangered birds. And on the endangered bird subject, let me address the
CL-20/40 Migratory Bird Treaty Act of 1918 - (p. 4-20) It is a proven fact - proven by the old Atomic Energy Commission and its contractors, - that migratory birds become contaminated eating seeds, drinking water and so on at radioactively contaminated sites, wetlands areas etc. and the birds carry this contamination in their bodies worldwide. NRC, DOE and licensees violate the MBT by not protecting birds from such contamination, and by spewing radioactive noble gases out that impact passing birds. No wonder birds are declining. This is one of the reasons I suggest that netting or similar should be placed over the sites in

10.

question, fine wire mesh set at an angle that can have leaves and other debris hosed off it, it must be small enough to keep birds out down to the size of hummingbirds. Enclosed, such an obscene site poses slightly less of a threat to birds and other wildlife, the utilities can pay for it all, it can come out of the salaries of the top management and company owners. NRC better set it up now, before they all pull an "Enron" - i. e., an "end run" round everyone.
CL-20/41 I notice that the General Accounting Office has slammed the NRC for its lack of oversight of transfers and mergers in the nuclear industry and had not verified that new owners would have guaranteed acess to the decommissioning charges that their affiliated utilities would collect, in some cases, plus, a host of other safety and other issues were raised, all of which are troubling. The NRC must immediately address problems, and should demand that companies provide enough money for oversight - to include security staff, maintainance staff, nuclear engin-
CL-20/42 eers, radiation safety officers etc. - essentially forever. Even after all fuel is removed from the site and the entire structure is removed, the site will still be radioactive forever and still need a security person, basic maintainance person (for upkeep of fences, gates, runoff detention ponds etc.) and regular visits from
CL-20/43 a radiation safety officer. It is absurd that NRC states that "decommissioning activities do not include the maintainance, storage or disposal of spent nuclear fuel, or the removal and disposal of nonradioactive structures and materials beyond that necessary to terminate the NRC license.....they are not considered as a cost impact because the licensees are not required to accumulate funds for these activities." (See p. 4-42) Why not ? This is an outrage! The NRC must pass a Rule at once requiring such money be set aside, some of it perhaps in form of gold and silver bullion at bank deposit in case of financial collapse. The fact of the matter is this: the licensees must be held responsible and accountable for everything about and on the site and generated by the site past, present and future. As NRC states (p.43) local jurisdictions may impose stricter "cleanup" or waste
CL-20/44 or contamination containement and this will cost more. The NRC should add a 10% surcharge to any calculated fees for decommissioning to help cover those costs

11.

CL-20/45-46 that are unforseen which may arise. And of course they must pay for the "spent" deadly radioactive fuel storage at the sites, whether in pools or casks at ISFSI's and the maintainance and upkeep and security and waste handling and fire prevention and similar. This MUST be addressed as part of this decommissioning, it must be

CL-20/47 incorporated. THE COSTS MUST NOT BE PASSED ON TO THE RATEPAYERS as NRC says they

CL-20/48 are currently. Furthermore, the most expensive estimate should always be assumed for everything as a wise precaution. NRC lists the decommissioning costs in MILLIONS as estimated by the utilities - however, NRC WELL KNOWS THE COSTS ARE IN THE BILLIONS WHEN EVERYTHING FROM SPENT FUEL ON DOWN IS FACTORED IN, AND THAT MUST BE REFLECTED, PLUS THE NRC INSPECTOR GENERALS OFFICE SHOULD GO OVER ALL ESTIMATES

CL-20/49 MADE BY UTILITIES TO SEE HOW TRUSTWORTHY AND ACCURATE THEY ARE. Inflation must also be added to costs.

CL-20/50 Regarding the loss of local tax revenues due to "decommissioning". The utility must be required to notify the local government as far in advance as possible that they will lose taxes. The fact that the local government should never have allowed such nuclear dumps, posing as power plants, into their communities is another issue. They need to understand that they better diversify their tax base in a hurry.

CL-20/51 HOWEVER, the nuclear industry - the entire industry - (from nuclear plant owners to uranium enrichment plants to users of radiation for medical experiments posing as "therapy" etc) should have a tax levied on it by NRC to be paid into a special account to go towards compensating the communities. An additional tax can be levied on them yearly in the form of a small, flat fee which would help pay for the NRC and the EPA to do quarterly inspections at facilities, in perpetuity.

CL-20/52 Before I forget : NRC MUST MAKE LICENSEES, CONTRACTORS, SUBCONTRACTORS AND ANYONE WHO WORKS ON DECOMMISSIONING TAKE THE EFFECTS OF RADIOACTIVE "DAUGHTER" PRODUCTS INTO CONSIDERATION AS THEY MAY HAVE VERY DIFFERENT PHYSICAL, CHEMICAL AND RADIO-ACTIVE PROPERTIES THAN THE RADIOACTIVE "PARENT". THIS MUST BE PART OF DECOMMISSION-

CL-20/53 ING STANDARDS. MARSSIM basically ignored that, another reason their Draft was so awful. NRC seems to have ignored it in this Draft also. This is an important health and also environmental issue that cannot be ignored.

12.

CL-20/54 Regarding Occupational Dose and nuclear power plant exposure data (p.G 12, etc) The regulatory limits for exposure were not set based on medical reasons but were set in order to enable the industry to operate - that is historic FACT - because what people are being exposed to is either not found in nature (i.e.

CL-20/55 it is man-made) or found in nature at far, far lower levels. The exposure allowed by regulation is, in fact, slow death, and furthermore, worker doses can't always be trusted because of faulty measuring equipment, horror stories of workers being told not to wear their dosimeters periodically, and so on. The dose recieved also has a different effect on each person depending on age, sex, current and past health status and many other factors, plus each organ is affected differently. The fact that the ICRP, DOE, NRC etc. didn't know what on earth they were doing -other than guesswork - regarding exposure levels set, is shown by the fact that they had to keep adjusting the "allowable" regulatory limits down-ward. A sort of continuous "Oops, we screwed up ! But don't worry, this time we've got it right." All the blather on "Risks" from radiation exposure can't hide the fact that it kills - not just cells here and there such as cells about to form the septum of a babys heart so the child is born with a hole in it's heart, because a bunch of murderers at the ICRP decided the risk was acceptable - but it kills people. To KNOWINGLY ALLOW PEOPLE TO BE EXPOSED TO SOMETHING THAT WILL KILL A CERTAIN PERCENTAGE OF THEM, HAS A NAME, PREMEDITATED MURDER * JUST BECAUSE A REGULATION WAS WRITTEN SAYING ITS OK, DOES NOT CHANGE IT. Further, the ICRP does not consider effects manifested after the second gen-eration in assessing the genetic risks to workers offspring (p.G 5) again showing they don't give a damn about the workers and their families and whether or not workers great grandchildren are born deaf, or with learning disabilities, or

CL-20/56 unable to reproduce. For the Draft to take the attitude of "well, the doses at plants being decommissioned are generally only a small fraction of doses at operating plants " p. G.13 is no comfort, and all the charts show, concerning Occupational doses(page G 14 and on), is thousands upon thousands of contaminated workers . It is obvious that this contamination of workers (and the environment)

13.

must be massively reduced.

CL-20/57 I noticed that it said cutting methods included abrasive water G-17, but in any case where there is plutonium contamination or depleted uranium metal, that all is meant to be cut under heavy oils and mushh else besides, Since many of the components will have been contaminated with plutonium, or were made of depleted uranium (when is the NRC going to tell the public that DU is NOT radioactive

CL-20/58 waste?) it is obvious that the reactor vessel should NEVER be cut up, but do what was done with the Trojan vessel (p. G-18, Remove the whole thing offsite)

CL-20/59 However, the vessel should have additional shielding placed around it prior to placement on the heavy haul trailer, and upon arrival at the disposal site it

CL-20/60 should be further encased in what would amount to a giant burial cask. Removing the vessel offsite massively reduces worker doses, water contamination and the contamination to the local community and the environment. Obviously, the spent fuel is /has been removed from the reactor vessel and all liquid radwaste etc.

CL-20/61 too ! UNDER NO CIRCUMSTANCES SHOULD A FACILITY BE ALLOWED THE OPTION OF CHOOSING

CL-20/62 THE METHOD OF DECOMMISSIONING IT WANTS, AS IS THE CURRENT CASE. Combinations of DECON and SAFSTOR would be the best, however, under no circumstances should SAFSTOR continue past five years (the regulation should be changed, as to expect that oversight will continue for 60 years at such sites is ridiculous) that would enable workers familiar with the plant to be still available, but at the same time allow for the decay of some of the radioactive contaminants which have shorter full hazardous radioactive lives prior to removal, thus lowering

CL-20/63 worker exposure etc. NO WAY THIS SIDE OF HELL SHOULD ENTOMB I OR ENTOMB II BE ALLOWED. BOTH STAFF AND THE INDIVIDUAL COMMISSIONERS SHOULD BE CHARGED WITH CRIMINAL NEGLIGENCE – ALONG WITH THE LICENSEE – IF THEY PUSH THAT THROUGH, AND I AM CONFIDANT THAT MANY WOULD ENSURE SUCH CHARGES ARE FILED. THERE IS INDIVIDUAL RESPONSIBILITY CONCERNING THESE MATTERS, AND IF NRC CANNOT UNDERSTAND WHY THE ENTOMB OPTIONS ARE AN ABSOLUTE NO-NO, THOSE WHO CAN'T GRASP THE "WHY" PART SHOULD RESIGN AND STICK TO SOME EMPLOYMENT WHERE THE USE OF THE BRAIN IS NOT HIGH ON THE

14.

LIST OF JOB REQUIREMENTS.

CL-20/64 It appears that the nuclear industry has written its own ticket , as usual, on the issues in the Draft. P. E-5 notes the help from the Nuclear Energy

CL-20/65 Institute in gathering information. HOW ABOUT THE NRC ACTUALLY READING THE INSPECTION REPORTS AND VIOLATIONS ETC. ON THE DOCKETS OF EACH FACILITY AS I

CL-20/66 SAID EARLIER . HOW ABOUT TESTS BEING RUN BY THE NRC ON THE SITE .HOW ABOUT INTERVIEWS WITH LONG TIME STAFF CONCERNING PAST PROBLEMS THAT COULD BE EN-

CL-20/67 COUNTERED? NRC should take its own independant samples of offsite water and sediment and soils, as well as onsite.

The NRC must not go by the original Offsite Dose Calculation Manuals as what was allowed in them, went out with the ARK – i.e. the levels were terrible, a recipe

CL-20/68 for radioactive pollution. I cannot stress enough that the groundwater issues

CL-20/69 are not adequately addressed. The use of high pressure water sprays is obscene.

CL-20/70 WHAT IS WRONG WITH THE NRC ? DOESN'T NRC UNDERSTAND THAT ONE CANNOT DECONTAMINATE SOMETHING RADIOACTIVELY CONTAMINATED IN THE TRADITIONAL SENSE, UNLIKE WITH A CHEMICAL OR OTHER CONTAMINANT, WHATEVER IS DONE TO SOMETHING RADIOACTIVE DOES NOT CHANGE THE CHARACTER OF THE RADIATION, IT CONTINUES TO EMIT ITS DEADLY ALPHA, BETA, GAMMA , NEUTRON ETC. RADIATION THROUGH THE FULL RADIOACTIVE HAZARDOUS

CL-20/71 LIFE. YOU CAN'T BURN IT/ INCINERATE IT, IT GOES OUT THE STACK AND POLLUTES THE STACK, YOU CAN'T WASH IT, IT WINDS UP ALL OVER THE PLACE AND IN THE WATER, IT IS ALWAYS THERE, THE DEADLY, INVISIBLE KILLER . AT MOST YOU CAN TRY AND CONTAIN IT. The Tritium can't even be contained.

CL-20/72 The original site maps and drawings and photos made during construction should be consulted (some building techniques may have changed) all modifications and revisions should be tracked down. All vent systems should go through both HEPA (for the chemicals) and sand filters. Additional containment should be added around spent fuel pools including over the top and beneath it, extra supports, new liners. They will suffer serious embrittlement and activation,

CL-20/73 same goes for the casks. Such issues must be addressed. Again THERE MUST NEVER BE A PARTIAL OR FULL SITE RELEASE. ALL PROPERTY DEEDS MUST STATE THE SITES ARE

15

NOT ONLY RADIOACTIVE, BUT SUPERFUND SITES, AS THAT IS WHAT THEY ARE. THE RIVER, LAKE, OCEAN BEACH STRETCH OR WHATEVER IS NEXT TO THE SITE SHOULD BE POSTED AS RADIOACTIVE ALSO, EVEN IF THE SEDIMENT IS REMOVED, AS IT IS IMPOSSIBLE TO GET EVERYTHING.

CL-20/74 Security must be upgraded, not downgraded.

CL-20/75 No structural remains should be sent to local landfills - the landfill will be
CL-20/76 radioactively contaminated more than at present. As all landfills leak, it will
CL-20/77 go to the groundwater and migrate offsite. None of the mixed waste should be dealt with as mixed waste (i.e. a combination of chemical/hazardous and radioactive) because MIXED WASTE FALLS THROUGH ALL REGULATORY CRACKS, BUT IT SHOULD BE TREATED
CL-20/78 AS RADIOACTIVE WASTE. WASTE OILS SHOULD NOT BE SENT TO VENDORS FOR INCINERATION OR RECYCLING OR RE-USE AS THEY ARE CONTAMINATED.

CL-20/79 EVERY SITE, OPERATING OR NOT OPERATING, IS A PRIME TERRORIST TARGET AS I HAVE
CL-20/80 SAID FOR DECADES. THE SPENT FUEL IS THE ULTIMATE IN TERRORIST TARGETS.
CL-20/81 Years ago, when people spoke of some type of monitored, retrievable spent fuel storage, they meant monitored, so repairs could be made by remote control if needed, and retrievable so problems could be addressed - no one in their worst nightmares with any sense, ever imagined that a bunch of nuclear bozos would be allowed to stick the most deadly stuff known to humanity in a cement and metal barrel and stick it outside in plain view. Spent fuel is the stuff (ALL TOGETHER NOW...) that the Department of Energy has been charged with trying to contain for approx. 10,000 years removed from the biosphere, after which it becomes the radioactive blob from hell under whatever piece of dry land they stick it. That assumes they can contain it for 10,000 years, which I doubt. I have many concerns with the Yucca Mountain site. I will not elaborate on here, but will mention that the "dump it on the Native Americans" idea is odious and immoral in the extreme. Yucca Mountain is sacred to them. That having been said, the site is already contaminated due to fallout from the weapons tests, and Nevadas belated concern about radioactive issues is hypocritical and distasteful, as this is the state that did not give a damn that hundreds of nuclear tests were conducted on Indian

16

CL-20/82 land (The Western Shoshone Nation, AKA the Nevada Nuclear Test Site) that blew radioactive fallout across the nation causing serious illness, birth defects and cancers, besides doing the same to some nearer the site in Nevada. The only thing Las Vegas worried about, was if the tests shook their gambling tables according to press reports. When the wind blew towards Las Vegas they tried not to test. For Nevada to now whine that they don't see why they should get the spent nuclear fuel as they have no reactors - power reactors - is obscene, considering that a huge Curie quantity of the spent fuel was generated making/creating the plutonium and the tritium for the nuclear weapons most of them supported and didn't care that the fallout dumped on their fellow planetary citizens. The fact that there were, and are, some small groups who were, and are, against the weapons and the testing and the horrors of nuclear power does not alter the fact that the State didn't protest. The State's current protests, even if valid for other reasons, ring hollow against that history of nuclear collaboration when they use the "no power reactor" excuse to keep the waste out. It is time history was set straight.

CL-20/83 The NRC in this Draft says p. D-2 that the temporary storage or future permanent disposal of spent fuel at a site other than the reactor site is not within the scope of this Supplement. Why the hell not ? It MUST BE, OTHERWISE THIS DRAFT IS

CL-20/84 EVEN MORE MEANINGLESS. THE SPENT FUEL IS THE MOST SERIOUS ISSUE THERE IS. ANYONE WHO DOES NOT UNDERSTAND THAT SPENT FUEL CANNOT BE LEFT WHERE IT IS ON SITE, IN POOLS OR ISFSI'S BEYOND A VERY LIMITED NUMBER OF YEARS, BUT MUST BE PLACED DEEP UNDERGROUND, IN A DRY LOCATION, GEOLOGICALLY AS SOUND AS POSSIBLE, MONITORED FOR ETERNITY, DOES NOT UNDERSTAND RADIATION OR THE NUCLEAR ISSUE AND SHOULD NOT BE WORKING FOR THE NRC. NRC MUST BITE THE PROVERBIAL BULLET AND SET THE TIME WHEN THE SPENT FUEL SHOULD ALL BE REMOVED OFFSITE AS NO LATER THAN TWO YEARS AFTER THE LAST CORE OFFLOAD HAS SPENT TEN YEARS IN THE SPENT FUEL POOL, I.E. FROM SPENT FUEL REMOVED FROM THE REACTOR INTO THE SPENT FUEL POOL AND THEN THE TEN YEAR "COOL DOWN" PLUS TWO YEARS, (A SAFETY MARGIN), AFTER WHICH IT MUST BE MOVED. IF SUCH A DEADLINE IS NOT DECIDED, AND SET, COMMUNITIES ARE GOING TO BE STUCK WITH

17.

IT , WITH AWFUL CONSEQUENCES.

The "Mobile Chernobyl" issue - the dangerous moving of the spent fuel to a REPOSITORY , can be somewhat alleviated by addressing the concerns people

CL-20/85 have, instead of ignoring them, as follows : The Draft shows the awful DOT and NRC regulations for transport and radiation levels allowed p. 3-14, these should be changed to be massively lower, this can be done by better shielding and more shielding and the transport of fewer assemblies per cask or fewer rods per cask, and shielding that is thick enough that anti-tank weapons would not penetrate through to the fuel. Disguising the shipments is not an option due to the size of the casks, therefore far stricter security i.e. military escorts and the sealing off of roads ahead of transports would be a

CL-20/86 must. The NRC needs to pass rules on these issues, and put out orders for more and better transport casks and vehicles. All shipments of LLW should also fall under these better packaging and shielding standards. If the NRC does not address all these issues as part of decommissioning, future generations (that means YOUR children and grandchildren) are going to die due to NRC's lack of

CL-20/87 actions today. It is murderous that potential radiological impacts following licensing/license termination that are related to activities performed during decommissioning are not in the Supplement - this allows the licensee to slowly murder a community as the radiological criteria for license termination

CL-20/88 by NRC was woefully inadequate anyway. The NRC must continue to monitor sites FOREVER after license termination in case of sudden increases in radiation levels from a source on the site no one had either considered or knew was

CL-20/89 there. All sites should have audible(sirens) alarms that are triggered during decommissioning , and after decommissioning, when monitors exceed the EPA levels EPA allows, but reduced below what EPA allows to give an advance warning.

Such audible alarm systems are absolutely vital also during the the time radioactive spent fuel is still on the site, these alarms should be at various locations onsite, including next to the spent fuel pool and one above it, and next to an ISFSI/cask area and suspended on a wire or pole above it. The alarms should be audible miles offsite via relay loudspeakers.

18.

CL-20/90 Under "Dose to members of the public" p. G-19, and following pages, the doses to the public are listed in the usual deceptive and innacurate manner.

CL-20/91 The radioactive material releases is not released in stringently controlled conditions, technical specifications are often violated, monitoring is only

CL-20/92 done at select locations and frequently monitors don't work, emissions are allowed to be averaged out to make them appear less, and there is no independant

CL-20/93 monitoring and utilities do and say whatever they please. Tritium can't be

CL-20/94 contained. The direct gamma radiation coming off the plants to the public is the equivalent of a continuous X-ray emanating from their midst. No X-ray is "negligable". (This sort of garbage was probably written by someone who is

CL-20/95 not a medical proffessional) . Often the plants DO NOT HAVE TO REPORT THEIR RELEASES UNTIL THOSE RELEASES REACH A CERTAIN LEVEL, IT DEPENDS WHAT THEIR

CL-20/96 LICENSE STATES. FOR THE NRC TO HAVE USED DATA FOR SOUTHERN COMPANY'S PLANT HATCH IS SICKENING - WHEN HATCH HAD THEIR DISASTROUS SPENT FUEL POOL SPILL, DID ANYONE ADD THE EXTRA DOSES AND CONTAMINATION IN ? THIS IS THE SAME HATCH

CL-20/97 WITH OVER 1200 WORKER CONTAMINATION EVENTS IN ONE YEAR. WHEN YOU CALCULATED THE RADIO-IODINES, DID YOU ADD IN THE HUGE RADIO-IODINE RELEASE OFF PLANT FARLEY THAT WENT OVER GEORGIA ?

CL-20/98 The point is, that no one asked to be exposed to ANY dose of radiation, and most people in surrounding communities don't even know they are being exposed, or if they know, they think they are being protected because they think there

CL-20/99 is a safe level of radiation, when of course even the NRC admitted back in the late '70's that there was no safe level.

CL-20/100 Perhaps most disgusting is that under "Consequence of Potential Accidents" p. I-16 the impression given is that spent fuel pool accident risks are low, when in fact NRC's own cited document shows, hundreds upon hundreds would die and also many spent fuel pools were highly vulnerable to catastrophic accident due to earthquakes and a lot more besides - spent fuel pool accidents would have terrible consequences. The fact that licensees determined that basically even if the damned site was hit by a meteor and a nuclear bomb and a

and a hurricane all at the same time (obviously I am being sarcastic) nothing would happen and there would be "no dose consequence" is to be expected as the licensee analyses are a bad joke.

CL-20/102 THE NRC SHOULD READ ITS OWN DOCUMENTS AND THE FAMOUS "CRAC-2 " REPORT DONE BY SANDIA LABS, THE NRC AND THEN CONGRESSIONAL OVERSIGHT BECAUSE TO PRESENT DATA TAKEN FROM LICENSING-BASIS DOCUMENTS WHICH HISTORICALLY HAVE DOWN-PLAYED ANYTHING THAT COULD HAPPEN IS OUTRAGEOUS, AND IF THERE IS STILL FUEL IN THE REACTOR AND A LOSS OF WATER COOLANT HAPPENS, EVEN IF THE REACTOR HAS BEEN SHUTDOWN RECENTLY, THERE WILL BE A MELTDOWN.

CL-20/101 I challenge any licensee and any NRC staffer, to walk into the area where the spent fuel pool is after the water has drained from the spent fuel pool, and try and refill the spent fuel pool with a garden hose (that is what they thought they'd do at the Georgia Institute of Technology Reactor) and see how well they can "mitigate" the situation before "offsite dose consequences could occur" -- they'd be dead before they could pick up the hose. To say that such an accident could be mitigated is the height of deception.

CL-20/103 On p. M-2 it says., under the glossary , under Background Radiation, that "the typically quoted US average individual exposure from background radiation is 360 mrem per year" It may be typically quoted, but it is a blatant LIE. For example, typical background radiation in Georgia is 42 mrem year according to the State (which recently upped it a notch probably due to the radioactive fallout on the State from nuclear power plants and the Savannah River Nuclear Site on its borders.) The definition of CONTAMINATION is also a LIE, in that

CL-20/104 it states that something is contaminated if it's in excess of "acceptable

CL-20/105 levels". There are no "acceptable levels" - the public does not accept any level of radioactive contamination -- plutonium, cobalt-60, Strontium-90 etc. or

CL-20/106 tritium ,radioactive iodine and so on and on - Contamination means : that some thing/someone etc. has been brought into contact with something that defiles or pollutes it etc. -- go look the word up - NRC must stop redefining words and lying about their meaning.

CL-20/107 What the NRC decides to do concerning decommissioning, is what the following

generations of children, wome, men, plants, animals, insects, birds, fish - all life, is going to suffer from, and die by. A small bunch of (mainly) men in an office complex in Washington, along with a few cohorts elsewhere, plus an immoral multinational polluting industry (in the business for money only) are seemingly se tting a set of criteria that will impact the whole world to no

CL-20/108 good end and cause great misery , in this Draft. Have you all no shame ?

CL-20/109 The radioactive components, parts, liquids i.e. anything part of or to do with or emanating from the structures and the site MUST NEVER BE RE-CYCLED, OR RE-USED.

CL-20/110 NRC MUST IMMEDIATELY CEASE ALLOWING , OR THINKING OF ALLOWING, RADIOACTIVELY

CL-20/111 CONTAMINATED SOIL TO BE RE-USED FOR ANYTHING. IT MUST FORBID THE MELTING, SMELTING OR RE-USE OF RADIOACTIVELY CONTAMINATED METALS, PIPING, PLASTICS, WOOD, (INCLUDING

CL-20/112 FORBIDDING THE BURNING OF WOOD) , ASPHALT, AND SO ON. IF NRC, EPA, THE DOE AND OTHERS DO NOT STOP THIS INSANE RUSH TO RE-USE, RECYCLE, DUMP AND COVER ETC. NUCLEAR MATERIALS, RADIOACTIVE MATERIALS, ACTIVATED MATERIALS ETC. , WITHIN FIFTY YEARS NO LIVING BEING WILL BE BORN WITHOUT SOME TYPE OF DEFORMITY, GENETIC ABNORMALITY, CHROMOSOME ABERRATION ETC. AND THE IMMUNE SYSTEMS OF EVERY LIVING BEING WILL BE SERIOUSLY COMPROMISED DUE TO RADIATION SUPPRESSING THE IMMUNE SYSTEM RESPONSE, AND ALL BECAUSE WE WILL BE COMPLETELY ENGULFED IN A MIASMA OF MAN-MADE, OR MAN ENHANCED, RADIOACTIVE CONTAMINATION..

I have written this on and off over a series of days after finding out

CL-20/113 the comment period had been extended. I recognize that it has probably been a waste of my time and will be ignored, as usual, therefore I am not bothering to write it again with every paragraph in the right place.. In any event I speak, read and write three languages and the grammar and spelling in all of them suffers somewhat -

CL-20/114 but it is the content that matters. The fact is, wherever this radioactively contaminated refuse winds up - from spent fuel to contaminated rags - it can't be contained forever and will reach the environment, which is why it must go to a remote location, below ground. (none of this idiot parking lot out in Utah or Nevada cask storage either) in dry, geologically sound (as far as possible in a moving planet) location where monitoring could alleviate problems that arise prior to reaching the public and wildlife. NRC must recognize that this "solution" -

while not a perfect solution, as there is no perfect solution to the nuclear waste issue, - is the solution that has been gone back to repeatedly over the decades, after thousands of studies contemplating what to do with the waste failed to identify anything better, or safer. What NRC and industry are proposing in this Draft, flies in the face of the thousands of prior studies by some of the worlds most renowned people who understand the horror of the dilema, and the ir conclusions. Leaving all this contamination on sites around the nation to contaminate and kill hundreds of communities is simply barbaric

CL-20/115 and must be stopped at all costs. Furthermore, no new nuclear plants should be allowed or built as they will just add to the existing contamination, and all operating plants should be shutdown to stop further "waste" - such as plutonium-

CL-20/116 generation. None should be re-licensed - the NRC should be ashamed of relicensing. This Draft is an absolute horror - for future generations who will suffer if

CL-20/117 this goes through as proposed, I would point out that on pages C-1 and C-2 are the names of those responsible for this abomination for reference in case of future lawsuits, so the public should make a note of that (this is, after all public record, what I have written). Plus the Utility in question and the ever helpful nuclear pushers at the NEI, should be remembered too, for their contribution to the nuclear nightmare.

CL-20/118 There is still time to correct all the serious problems in the Draft, still time for the NRC to turn from the path of wickedness and ruin the Draft Supplement and Gais will lead to if passed as is. Remember the Creator. Do not allow the further desecration of the world, the NRC will also be accountable to God one day for what it allows to be done to God's Creation. Think on that, and correct this Draft to the better.

Pamela Blockey-O'Brien.

Pamela Blockey-O'Brien.

Copies to: EPA, GEORGIA DNR/EPD, USFWS, GEORGIANS FOR CLEAN ENERGY, U.S. ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE, CENTERS FOR DISEASE CONTROL, AND OTHERS.

11/9/01
66 FR 56721
21

From: "Sharon Guynup" <sguy@cybernex net>
To: <dgeis@nrc.gov>
Date: 1/19/02 4:37PM
Subject: comments on Decommissioning US Nuclear Power plants

CL-21/1 I am violently opposed to the Nuclear Regulatory Commission's proposal to further relax its decommissioning requirements for nuclear power reactors. This is nothing but a sellout to the nuclear industry-- which puts citizens at risk--with no recourse in case of liabilities.

This is wrong and dangerous.

Thank you for your time.

Sharon Guynup
Hoboken, NJ

RECEIVED
2002 JAN 22 PM 12:12
RULEMAKINGS AND ADJUDICATIONS STAFF

Template = ADM-013

E-RIDS = ADM-03
Add = M. Hasmik (MTHA)

Letter 22, page 1

11/9/01
66FR56721
22

From: <sublimation@webtv.net>
To: <dgeis@nrc.gov>
Date: 1/19/02 10.57PM
Subject: decomissioning reactors: environmental impact supplement 1

CL-22/1 This is ridiculous!

http://community.webtv net/sublimation/DisregardAllAdsHere

Template = ADM-013

E-RIDS = 03
Add = M. Masnik (MTM2)

11/9/01
66 FR 56721
23

From: "Fred Long" <ajlong999@earthlink net>
To: <dgeis@nrc gov>
Date: 1/20/02 8 59AM
Subject: DECOMMISSIONING NECLEAR FACILITIES

CL-23/1 Has the NRC no common sense at all?
Releasing radioactively contaminated materials into daily consumer use and commerce and unregulated disposal is a direct assault on humanity.
Don't let this happen.
AJ Long
20550 Earl St
Torrance CA 90503

Template = ADM-013

E- RIDS = ADM-03
Add- M. Hasnik (MTH2)

11/9/01
66 FR 56782
(24)

From: "rsja" <rsja@email msn com>
To: <dgeis@nrc gov>
Date: 1/20/02 2 03PM
Subject: Public comment on USNRC Decommissioning US Nuclear Power Reactors

To. Chief,
Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
US Nuclear Regulatory Commission
Washington DC 20555-001

CL-24/1 I am appalled at the NRC's draft of decommissioning requirements for nuclear power reactors. The requirements should be made stricter not more relaxed!!!!!!!!!!!! I oppose the use of "Generic" listing of
CL-24/2 issues. I support "Site Specific" listing so that local communities can still raise issues they have.
CL-24/3 I support the designation of environmental justice and endangered species issues as site-specific, NOT generic.
CL-24/4 I oppose Rubblization but support its designation as site-specific.
CL-24/5 I Firmly oppose the "release" of radioactively contaminated materials into daily consumer use and commerce and unregulated disposal.

CL-24/6 This is common sense people. You need to start doing what is safest and in the best interest of the people of the United States and its land, NOT what is going to relieve the nuclear power companies of their responsibility to what they have created and profited off.

Citizen of the United States of America
Rachel Griffiths
2022 West Chicago Avenue
Chicago, IL 60622

Template = ADM-013

E-RIDS = ADM-03
Add = M. Hasnik (MTM2)

11/9/01
66 FR 56721
25

From: <EdRussel@aol com>
To: <dgeis@nrc gov>
Date: 1/20/02 9 34PM
Subject: Decommissioning rule changes

Law Offices of
Edward T. Russell
725 Long Pond Road
Plymouth, MA 02360
508-224-2007

January 20, 2002

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Decommissioning Nuclear Power Reactors
Environmental Impact Statement Supplement 1

Dear Sirs:

I am a resident of, and practice law in, Plymouth MA. For years I have lived at peace with the neighboring Pilgrim nuclear plant. However, Sept 11 was an awakening for me and for many others in eastern Massachusetts.

CL-25/1 I strongly object to the proposed changes to the decommissioning rules. We have recently become more sensitive to the rules governing nuclear power plants, even their decommissioning Since these proposals were begun before September 11, I hope and expect that they will be dead on arrival at the Commission.

CL-25/2 The only rules changes that I want to see until spent rods are removed to Yucca Mountain are to stricter rules.

CL-25/3 Utility deregulation has put the ownership of these plants in hands that are not as responsible as they once were. Plymouth MA suffers financially because of the loss of tax revenue from the Pilgrim Plant - we cannot assume the

CL-25/4 additional risk these rules would place on us. Until the spent rods are removed from local nuclear power plants the decommissioning rules should be tightened, not loosened. Your proposal may have seemed reasonable earlier this year but we live in a very different world now It can no longer be business as usual at the NRC

CL-25/5 Many key issues that local communities face as reactors close and owners leave (liability-free) will be unchallengeable, because they are being listed

CL-25/6 as "generic" issues. I support the designation of environmental justice and endangered species issues as site-specific (not generic) and designation of Rubblization as site-specific.

CL-25/7 The proposed rules ignore radiation dangers after decommissioning The NRC

CL-25/8

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTN2)

CL-25/9 must incorporate offsite contamination in all evaluations of environmental impacts. The National Environmental Policy Act was written for a purpose, your proposed rules side step that purpose.

CL-25/10 You must not remove license amendment requirements when changing from an operating license to a nuclear materials possession-only license. I stand

CL-25/11 firmly against the "release" of contaminated materials into daily consumer contact and commerce or unregulated disposal.

CL-25/12 Deregulation has already had serious negative impact on local municipalities this will be just another blow

Sincerely,

Edward T. Russell

Letter 26, page 1

11/9/01

66 FR 56721

(26)

From: Dave Matthews <david matthews@sun.com>
To: <dgeis@nrc.gov>
Date: 1/21/02 10.52AM
Subject: Decommissioning Nuclear Power Reactors EIS Supp1

Dear Sirs,
I am writing to comment on the EIS supplement 1.

CL-26/1 In general, I am strongly opposed to the attempts to designate many issues as generic instead of site specific and thus to remove these issues form public review and comment.

CL-26/2 Specifically , I am opposed to the following proposals in the EIS:

NRC allows "rubblization" (crumbling the concrete reactor building) of nuclear reactors, without opportunity for public intervention until the action is completed.

CL-26/3 NRC allows portions of sites to be "released" from regulatory control before the whole site it released.

CL-26/4 NRC opens up two "entombment" options.

CL-26/5 NRC ignores radiation dangers after decommissioning is done and utility is relieved of liability.

CL-26/6 NRC ignores radiation exposures to children and other vulnerable members of the population and creates a fictitious highest exposed "critical group" based on unsubstantiated assumptions.

CL-26/7-9 NRC ignores radiation offsite and permits utilities to ignore it in decommissioning planning. I ask that the NRC incorporate offsite contamination into all evaluations of environmental impacts.

CL-26/10 NRC prevents the National Environmental Policy Act from applying to most of the decommissioning process.

CL-26/11 NRC redefines terms to avoid local, site specific opportunity to question, challenge and prevent unsafe decommissioning decisions.

CL-26/12 NRC sets arbitrary and unsubstantiated (low, medium and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now and to prevent their inclusion in site-specific analysis.

CL-26/13 NRC is removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license. (With no license amendment, there is no opportunity for public challenge or adjudicatory processes)

CL-26/14 NRC is attempting, with this supplement, to legally justify the removal of the existing opportunities for community involvement and for legal public intervention until after the bulk of the decommissioning has been completed. This includes such activities as flushing, cutting, hauling and possibly rubblizing of the reactor.

Template=ADM-013

E-RIDS=ADM-03
Add=M. Masnik (MTM2)

Letter 26, page 2

NRC states that the portion of the decommissioning regulations (10 CFR 20 section E and its Environmental Impact Statement, NUREG 1496) that set the 25, 100 and 500 millirems per year allowable public dose levels from closed, decommissioned nuclear power sites, are not part of the scope of this Supplement

NRC defines decommissioning, in part, to include the "release of property for unrestricted use. .." and the "release of property under restricted conditions..."

CL-26/15 I stand firmly against the "release" of radioactively contaminated materials into daily consumer use and commerce or unregulated disposal.

Thank you
David Matthews

11/9/01
66 FR 56721
27

From: "Klaus Schumann" <jayklaus@email msn com>
To: <dgeis@nrc.gov>
Date: 1/21/02 12 52PM
Subject: comment to nureg 5086

Dear NRC,

CL-27/1 I do not support any attempt of your agency to narrow the scope of site-specific issues by declaring them to be generic.

CL-27/2 While the 9/11 events may call for some more secrecy, in most cases it's a matter of "closing the gates long after the horses are gone".
Instead you should adopt a policy of allowing more public participation to ensure public confidence in your process!

CL-27/3 Re 9/11: I direct you to a quote from a recently published German report concerning the vulnerability of the Castor containers to terrorism: "the fact that all the technical data used in the report can ve accessed by terrorists does not imply that a more restrictive policy towards information is required. Rather, it should be regarded as an argument against the use of a technology which is, at the time, hazardous and complex to a large degree, creating a conflict between the necessary societal discussion on the one hand and the protection of society from terrorist attacks on the other."
Compare: www bund.net/themen/energgiepolitik/StudieCASTORTerror rtf If we eliminate the necessary public discussion the terrorists will have won!
KLaus Schumann

Template = ADM-013

E-RIDS = ADM-03
Add = M. Hasnik (MTH2)

Letter 28, page 1

11/9/01
66FR56721
28

From: Dennis Larson <larsondf@yahoo.com>
To: <dgeis@nrc.gov>
Date: 1/21/02 1:36PM
Subject: reactor decommissioning

Re: decommissioning nuclear reactors

CL-28/1 Issues common to the process of decommissioning nuclear reactors should be raised with every reactor being decommissioned, not excluded from every specific reactor being decommissioned.

These common issues have not been resolved.

Dennis Larson

Do You Yahoo!?
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http://promo.yahoo.com/videomail/

Template=ADM-013

E-RIDS=ADM-03
Add= M. Masnik (MTH2)

11/9/01
66FR56P21
(29)

From: <Tilkel@aol com>
To: <dgeis@nrc.gov>
Date: 1/21/02 7.32PM
Subject: Decommissioning

Dear Mr. Geis:

CL-29/1
CL-29/2
CL-29/3

There are still radioactive dangers after decommissioning. I oppose the concept of rubblization as it is very dangerous; I oppose the release of radioactive contaminated materials into daily consumer or commercial uses. That is an idea that is insanely dangerous. Would you eat off a fork that contains radioactive mataerial? Why would anyone?

Sincerely,

Martin Kellerman

Template = ADM-013

E-RIDS = ADM-03
Add. = M. Masnik (MTM2)

Letter 30, page 1

YANKEE ATOMIC ELECTRIC COMPANY
19 Midstate Drive, Auburn, Massachusetts 01501

CONNECTICUT YANKEE ATOMIC POWER COMPANY
362 Injun Hollow Road, East Hampton, Connecticut 06424-3099

December 26, 2001

BYR 2001-084
CY-01-199

11/9/01
66 FR 56721

30

Chief, Rules and Directives branch
Division of Administrative Services
Mailstop T 6 D 59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Haddam Neck and Yankee Rowe Plant
Comments on Draft Supplement to GEIS

Yankee Atomic Electric Company (YAEC) and Connecticut Yankee Atomic Power Company (CYAPCO) appreciate the opportunity to provide comments on the draft supplement 1 to NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities".

In a letter dated April 25, 2001[1], CYAPCO submitted a response to a Nuclear Regulatory Commission (NRC) request for additional information to support development of the Generic Environmental Impact Statement (GEIS) supplement. Many of these comments were incorporated in the draft
CL-30/1 supplement. In general the draft supplement meets the goal of updating the GEIS to current decommissioning practices and dismantlement options. We have reviewed the draft supplement and offer specific comments contained in the attachment.

If you have any questions regarding this submittal, please contact Gerry van Noordennen at (860) 267-3938.

[1] CYAPCO letter CY-01-076 to U.S. Nuclear Regulatory Commission, "Response to NRC Request for Additional Information to Support GEIS Supplement", dated April 25, 2001.

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

Letter 30, page 2

Sincerely,

Kenneth J. Heider
Vice President of Operations & Decommissioning

cc. H. J. Miller, NRC Region I Administrator
J. E. Donoghue, Senior Project Manager, Haddam Neck Plant
R. R. Bellamy, Chief, Decommissioning and Laboratory Branch, NRC Region I
Document Control Desk, U.S. Nuclear Regulatory Commission
D. C. Scalletti, U.S. Nuclear Regulatory Commission
Paul H. Genoa, Nuclear Energy Institute
E. L. Wilds, Jr., Director, CT DEP Monitoring and Radiation Division

YAEC & CYAPCO Comments on the draft supplement to the GEIS

CL-30/2 1. The Figure 1-1, "Decommissioning Timeline" should also reflect the 60 year window, mentioned in 10CFR50.82(a)(3), that starts from the permanent cessation of operation.

CL-30/3 2. Revise the first part of the last sentence on page 1-5 to read:

> If a licensee chose to operate the ISFSI under a Part 50 license, they could choose to continue under the Part 50 license, or by way of license amendment request, ...

CL-30/4 3. Delete the discussion of "Rubblization" on page 1-7 and delete the term "Rubblization" in the Glossary (Appendix M). Maine Yankee first utilized this term in a January 13, 2000 letter which served to submit their License Termination Plan (LTP). On June 1, 2001, Maine Yankee filed revision 1 to their LTP. On August 13, 2001, Maine Yankee filed revision 2 to their LTP. In their current LTP, Maine Yankee does not propose to use "Rubblization" and no longer utilizes the term. No licensee is currently pursuing the "Rubblization" concept as described in Maine Yankee's original LTP submittal.

The term which most accurately describes the approach which licensees are currently pursuing is "concrete backfill". Connecticut Yankee described the process as follows in section 4.3.1 of our LTP submitted on July 7, 2000:

> Concrete from contaminated structures will be remediated to a level meeting the radiological criteria for unrestricted release of the site. After completion of final status surveys and absent any findings during NRC inspections, concrete building debris from decontaminated structures may be used as backfill and placed into the remaining subsurface building foundations.

CL-30/5 4. Under the description of the Turbine building (on page 3-6) revise the last two sentences to read:

> Primary coolant is not circulated through the turbine building systems in PWRs. However, it is not unusual for the turbine building to become mildly contaminated during power generation at PWRs.

CL-30/6 5. Add the following sentence to the first paragraph in section 3.1.4:

> Most of the contamination in the reactor coolant system is from the activation of corrosion products and not fuel.

CL-30/7 6. Revise the second to last sentence on page 3-15 to read:

> The entire structure (or portions) must be removed.....

CL-30/8 7. The last sentence on page 3-15 is only true if corrosion products are included. The sentence should be revised to read:

> If corrosion products are included, the radioactive decay.....

CL-30/9 8. The last two paragraphs on page 3-15 need to be rewritten. The discussion of contamination and activation needs to be clarified. If requested, CYAPCO will work with the Commission to rewrite this text.

CL-30/10 9. Yankee Rowe should be added to the list of plants mentioned in the second to last paragraph of page 3-26. The Yankee Nuclear Power Station was one of the plants in the AEC's Demonstration's Program. Yankee Rowe's license number is DPR-3.

CL-30/11 10. The second to last paragraph on page 3-32 discusses the creation of nuclear islands. Nuclear islands are not primarily created because of security reasons. The real benefit in creating nuclear islands is to not interfere with spent fuel storage. The purpose for creating a nuclear island is to provide a facility for the safe long-term storage of spent fuel, which is independent of the remainder or the rest of the facility. The purpose of the modifications is to divorce the spent fuel cooling function from dependence on systems which must be dismantled as part of the overall decommissioning process.

CL-30/12 11. Expand the discussion about Stage 4 of the decommissioning process. This discussion should contain as much description as the descriptions under stages 1 through 3.

CL-30/13 12. Delete "groundwater" from the first sentence in section 4.3.3.4. Releases are not made to groundwater under NPDES permits. NPDES discharge points discharge to surface water locations.

Exelon Nuclear

Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

www.exeloncorp.com

11/9/01
66 FR 56721
(31)

December 28, 2001

Secretary
U.S. Nuclear Regulatory Commission
Attn: Rulemakings and Adjudications Staff
Washington, DC 20555-0001

Subject: Comments Concerning Draft Supplement 1 to NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (66FR56712, dated November 9, 2001)

Dear Sir or Madam:

This letter is being submitted in response to the NRC's request for comments concerning Draft Supplement 1 to NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" which was published in the Federal Register (i.e., 66FR56712, dated November 9, 2001). The NRC is proposing that this Supplement updates information in the existing 1988 GEIS relating to pressurized water reactors, boiling water reactors, and multiple reactor stations. Additionally, this Supplement goes beyond the 1988 GEIS by considering high-temperature gas-cooled reactors and fast breeder reactors. The NRC's intent is that this Supplement be used to consider, in a comprehensive and generic manner to the extent practicable, the environmental impacts of radiological decommissioning of nuclear reactor facilities by incorporating updated information, regulations, and analyses.

Exelon Generation Company, LLC (Exelon) appreciates the opportunity to comment. Generic and specific comments follow in Attachments 1 and 2, respectively. If you have any questions, please do not hesitate to contact us.

Very truly yours,

for

Michael P. Gallagher
Director, Licensing and Regulatory Affairs
Mid-Atlantic Regional Operating Group

Attachments

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

ATTACHMENT 1
Generic Comments on NUREG-0586 Draft Supplement 1

CL-31/1 1. Exelon believes the proposed Draft Supplement correctly concludes that most of the environmental issues assessed result in impacts that are generic and SMALL for all plants. We reach this conclusion based upon our experience decommissioning one BWR (Dresden 1), two PWR's (Zion Station), one HTGR (Peach Bottom 1), and our observation of other industry decommissioning projects We have not seen to date – and currently do not expect to find – environmental impacts different from those addressed and bounded by this Supplement to the GEIS.

CL-31/2 2. Exelon continues to maintain that providing guidance, which addresses environmental issues generically, provides the highest standard the public at large can use effectively to challenge industry to return power plant sites to beneficial use upon facility retirement.

CL-31/3 3. The Supplement properly addresses the ENTOMB decommissioning option Issues related to the ENTOMB option after the facility has terminated its NRC license and entered the entombment period are outside the scope of this GEIS. Power reactor entombment is not construction of a LLW disposal facility – it is properly classified as a decommissioning scenario, which creates an assured storage facility for radioactive material to decay in place, until it no longer represents a hazard considering future public use of the site. The clear distinction between entombment as a decommissioning scenario and a LLW disposal facility may be found in the ability to reuse the site in the future for other purposes. Regulation governing LLW disposal facilities does not contemplate future use of the site, restricted or unrestricted. Future use of an entombed site will be dictated by the dose-based performance criteria found in 10 CFR Part 20, Subpart E.

CL-31/4 4. The Supplement improperly addresses rubblization by stating it will require a site-specific analysis at the time the license termination plan is submitted Rubblization should be addressed generically as a part of the decommissioning process. The NRC should continue to maintain that to the extent that 10 CFR Part 20, Subpart E dose performance criteria are met – and that decommissioning has been performed using the ALARA principal, rubblization has a SMALL environmental impact.

CL-31/5 5. The Supplement incorrectly addresses the impact on the SAFSTOR scenario due to the time gap between cessation of operations and decommissioning activities. The Supplement expects the time gap will result in a shortage of personnel familiar with the facility when decommissioning activities commence. Our own experiences have shown us that both DECON and SAFSTOR decommissioning scenarios can be conducted in a safe and efficient manner. Regarding the familiarity of the facility at the end of licensed life, whether the plant begins decommissioning immediately or waits for some defined period – the most difficult aspect is retrieving records from the earliest days of operation. Recently retired facilities have taken the appropriate step of preparing a site historical assessment – documenting the operating years of the facility. This historical assessment will guide the decommissioning process whether it begins immediately upon retirement or 50 years later.

ATTACHMENT 2
Specific Comments on NUREG-0586 Draft Supplement 1

CL-31/6 1. On Pg 3-17 there is a discussion of the advantages of the DECON alternative for decommissioning. One advantage of DECON is not discussed and should be Generally speaking the shorted lived nuclides are easier to detect because of their beta/gamma emissions, versus the alpha emissions of longer lived nuclides. The difficulty of detecting the alpha emitters will increase analysis costs and increase the difficulty of performing surveys. Ultimately the cost of providing RP coverage and of performing the Site Characterization and Final Status Survey will also be increased.

CL-31/7 2. On Pg 3-19 the discussion of the SAFESTOR option assumes that there is a savings associated with less Solid RW disposal costs. However they do not consider that the current NRC guidance for release of material includes a no detectable criteria. In order for the reduction of Solid RW to be achieved, significant quantities of plant materials would need to be released from the site. The current regulations do not support this assumption.

CL-31/8 3 On Pg 4-9 the NUREG concludes (Sec 4 3 2.4) that the environmental impact of water usage will be small. In the evaluation they consider the anticipated reduction in water usage for cooling in the condenser. This conclusion appears reasonable, however the analysis should also consider the environmental effects of the loss of heat provided by cooling water discharged to a closed lake or pond system that is a habitat for aquatic animals and vegetation. Many nuclear facilities are on natural or man-made bodies of water making this environmental effect generic in nature.

CL-31/9 4 On Pg 4-16 the NUREG concludes (Sec 4.3 4 4) the environmental impact of air emissions will be small In the evaluation they did not consider that many sites use extraction steam to provide plant heat in the winter months The shutdown of the reactor means that Aux Boilers will be operated for longer periods to provide heating steam. This needs to be considered in the NUREG or many facilities will need to address this issue in their PSDAR

CL-31/10 5 On Pg 4 –29 the NUREG (section 4.3 8.3) concludes that it is not necessary to update estimates for collective dose due to decommissioning activities. This is an important conclusion that is supported by the current range in collective dose that decommissioning plants have experienced. Any change to this conclusion needs to be well supported by actual data and needs to be thoroughly studied to identify all potential impacts.

CL-31/11 6 Table 4 –1 on page 4 –30 is misleading The totals given include 100 rem of transportation dose that is not tracked by the facility undergoing decommissioning. It also does not include dose incurred during construction of a Spent Fuel Pool Island or in support of a dry cask storage campaign. A footnote should be added explaining these differences

CL-31/12 7. Table 4-3 lists the decommissioning cost of Peach Bottom Unit 1 to be 54 million dollars (in January 2001 dollars) In our letter submitted on March 30, 2001, in accordance with

10CFR50.75 the decommissioning cost estimate for Peach Bottom Unit 1 reported in beginning of year 2001 dollars is 65 4 million dollars Table 4-3 should be changed to reflect the latest cost estimate.

CL-31/13 8. Table 4-4 lists the decommissioning cost of the high-temperature gas-cooled reactor in SAFSTOR (Peach Bottom Unit 1) to be 54 million dollars (in January 2001 dollars). In our letter submitted on March 30, 2001, in accordance with 10CFR50.75 the decommissioning cost estimate for Peach Bottom, Unit 1 reported in beginning of year 2001 dollars is 65 4 million dollars. Table 4-4 should be changed to reflect the latest cost estimate.

CL-31/14 9. Table F-1 lists the total site area for Peach Bottom Unit 1 to be 620 acres. 620 acres is the total site area reported in the Peach Bottom Unit 2 and 3 Updated Final Safety Analysis Report However, Table F-2 reports the total site area for Peach Bottom Units 2 and 3 to be 618 acres. Table F-2 should be changed to reflect the total site area for Peach Bottom Units 2 and 3 to be 620 acres.

CL-31/15 10 Table I-3 incorrectly lists site flooding as the only accident analyzed for Peach Bottom Unit 1 in the documents referenced in Appendix I for Peach Bottom Unit 1. The additional accidents analyzed for Peach Bottom Unit 1 that should be added to Table I-3 are:

- Release of helium coolant under containment breach (open penetration to containment) for accidents involving radioactive materials (non-fuel-related) on page I-9
- Fire inside reactor vessel under fire for accidents involving radioactive materials (non-fuel –related) on page I-10.

CL-31/16 11. On page L-6 of Appendix L, line 4 refers to criticality accident monitoring requirements described in 10CFR7.24 Criticality accident monitoring requirements are described in 10CFR70 24. This typographical error should be corrected.

CL-31/17 12. On page L-6 of Appendix L, line 17 refers to 10CFR50 73 as requiring a licensee event report within 30 days 10CFR50 73 was recently revised to require a licensee event report within 60 days This change should be made to Appendix L.

CL-31/18 13 While the Supplement addresses two entombment options stating they have prepared as extreme cases to envelop a wide range of potential options, there should be additional language early in Section 3 2.3 ENTOMB clarifying that utilities are likely to develop entombment scenarios based upon their site specific needs.

CL-31/19 14. All spent fuel at Dresden Unit 1 will be moved to dry storage on site by the end of the first quarter of 2002. This change needs to be reflected in Table 3-2.

Letter 32, page 1

11/9/01
66FR56721
32

From: <GEORGNBAY@aol.com>
To: <dgeis@nrc.gov>
Date: 1/24/02 9.17AM
Subject: relaxing standards

Dear Sir/Madame,

CL-32/1 I urge you to stop any further relaxing of nuclear power reactor decommissioning requirements. Enough is enough. The suggestions you are making toward relaxing further standards will create massive public health
CL-32/2 and economic problems. Just one example is letting the concrete reactors
CL-32/3 erode naturally which is extremely unsafe. And to ignore radation concerns to the unsuspecting public health is criminal.
It is out rageous to allow the reactors to be liability-free. That is like saying to the consumer " Your money AND your life". We have paid and paid for nuclear power and we all know it is the biggest welfare mother of all time.

Yours in concern

Susan Clark

Template=ADM-013

E-RIDS=ADM-03
Add= M. Masnik (MTHR)

From: Margaret Nagel <formargaretn@earthlink net>
To: <dgeis@nrc.gov>
Date: 1/24/02 1 51PM
Subject: Weakening Requirements for Decommissioning US Nuclear PowerReactors

11/9/01
66FR56721
33

From:

Margaret Nagel
631 Hinman Ave
Evanston, IL 60202-2514

To:

Chief, Rules and Directives Branch/Division of Administrative Services
Mailstop T 6 D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

January 24, 2002

CL-33/1 In setting requirements for decommissioning US nuclear power reactors, please bear in mind other things besides the needs of Richard (Enron) Cheney, Halliburton Inc., Brown & Root, and other powers that be. Long after these miserable "powers" have crumbled away, your children and grandchildren
CL-33/2 and mine, and their descendants, will have to live in this world. The nuclear power industry was a colossal mistake to begin with, as we all know.
CL-33/3 Most of us also realize that the immune systems of every living thing on this planet -- human systems included -- are becoming intolerably stressed by mounting (and synergistically interacting) levels of pollution of all
CL-33/4 sorts. To add to these levels by deliberately ignoring the dangers of radiation exposure is wantonly criminal. Those who do so will go down in history as villains of the worst sort: smug, obtuse, shrivel-hearted, deceiving, opportunistic, self-serving, cowardly, corrupt people who really
CL-33/5 ought to know better. I fail to see any moral difference between terrorists who fly planes into buildings, and bureacrats who are perfectly willing to
CL-33/6 expose whole populations to additional dangers from radiation. In the name of humanity and morality, you should all leave your jobs now in righteous protest at what you're being asked to do. Walk out. Say goodbye. Go work at Wal-Mart if you have to But don't recklessly endanger the health of this nation by acquiescing in these evil plans

I utterly oppose:

CL-33/7 1. "rubblization" with no opportunities for meaningful public intervention ahead of time

CL-33/8 2 allowing portions of sites to be released from regulatory control before the whole site is released.

CL-33/9 3 ignoring readiation dangers after decommissioning is done and utility is relieved of liability.

CL-33/10 4 ignoring radiation exposures to children and other vulnerable members of the population and creating a fictitious highest exposed "critical group" based on unsubstantiated assumptions.

Template - ADM-013

E-RIDS - ADM-03
Add - M. Mosnik (MTM 2)

CL-33/11 5. ignoring offsite radiation and permitting utilities to ignore it in
CL-33/12 decommission planning NRC should incorporate offsite contamination into all evaluations of environmental impacts

I also utterly oppose:

CL-33/13 1. Preventing the National Environmental Policy Act from applying to most of the decommissioning process.

CL-33/14 2. Making most aspects of decommissioning "generic" rather than site-specific, so they cannot be legally reviewed or challenged at individual sites

CL-33/15 3. Redefining terms to avoid local, site-specific opportunity to question, challenge, and prevent unsafe decommissioning decisions.

CL-33/16 4 setting "low, medium, and high" environmental impact categories for each of the steps in decommissioning, to give the appearance that some things have negligible effects that don't warrant further consideration.

CL-33/17 5. removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license, thereby eliminating the opportunity for public challenge or adjudicatory processes.

CL-33/18 6. attempting to legally justify the removal of the existing opportunities for community involvement and for legal public intervention until activities such as flushing, cutting, hauling and possibly rubblizing of the reactor are complete -- in other words, until the damage has irretrievably been done.

CL-33/19 7. stating that 10 CFR 20 section E and its Environmental Impact Statement, NUREG 1496, are not part of the scope of this Supplement.

CL-33/20 8 defining decommissioning, in part, to include the "release of property for unrestricted use" and the "release of property under restricted conditions" -- in other words, releasing radioactively contaminated materials into daily consumer use and commerce and unregulated disposal How can you contemplate such a thing!!!!!!!!!!!!!!

Sincerely,

Margaret Nagel

CC: Margaret Nagel <formargaretn@earthlink.net>, "Richard J Durbin" <dick@durbin senate gov>, "Peter G Fitzgerald" <senator_fitzgerald@fitzgerald senate gov>

Letter 34, page 1

Dons Mendiola - NUCLEAR POWER PLANTS Page 1

11/9/01
66FR56721
34

From: "Liane Casten" <lcasten@interaccess.com>
To: <dgeis@nrc.gov>
Date: 1/24/02 3.40PM
Subject: NUCLEAR POWER PLANTS

CL-34/1 To even think that decommissioning nuclear power plants' regulations via presidential fiat is acceptable is beyond logic and reason.
CL-34/2 You are insuring the further deterioration of health for innocent civilians and this planet.
CL-34/3 Bush is stripping us all of those safeguards we all need to protect citizens--and this includes you. He has
CL-34/4 only corporate interests--the nuclear power industry being one. To enforce no liabilty after they leave is
CL-34/5 simply criminal. You do not need to further endanger our lives while the polluters go scott free..
Enough.
Liane Casten

Template=ADM-013

E-RIDS=ADM-03
Add=N. Masnik (MTM2)

11/9/01
66 FR 56721
35

From: <little lamb@att net>
To: <dgeis@nrc.gov>
Date: 1/25/02 1 00PM
Subject: Public Comment=Shame on you!

Public Comment re: the U.S. Nuclear Regulatory Commission's (NRC) draft Decommissioning Nuclear Power Reactors Environmental Impact Statement Supplement 1.

Dear Nuclear Regulatory Commission,

CL-35/1 Please increase, rather than decrease, public participation in every single aspect of the planning, building, and running of Nuclear Power Plants. Please do this even if you don't want to.

The public, to you, may seem like a thorn in your side, something that gets in the way of your plans. But a democratic government should not seek to shut their people out of decisions that effect their lives. It is a very sad reflection on the state of our democracy that this seems to be precisely the aim of your draft regulations. -Don't you believe in democracy? Are you tired of playing by democratic rules if it means you can't win each and every time? Is democracy too inconvenient for you?

If you were busy doing the "right thing" you would be excited and proud to open your process to the public. If you were involved in an honest process, you would be eager to engage your opponents in debate about it. You would not have to stack the deck, hide your process, shut the people out. Shame on you! See if you have the courage to do the right thing! --- And have the courtesy not to send one of those dummy automatic replies!

Mary Kim
116 Pinehurst Avenue #C3
New York City 10033

212.923.7800 x 1303

RECEIVED
2002 JAN 25 PM 5:50
Rules & Directives Branch

Template = ADM-013

E-RIDS = ADM-03
Add = M. Hasnik (MTH2)

11/9/01
66 FR 56721
36

From: Donald Miller <d.w miller@csuohio.edu>
To: <dgeis@nrc gov>
Date: 1/25/02 5.56PM
Subject: NRC's supplement to NUREG-0586, re decommissioning

I have some questions.

CL-36/1 Why, in this same democracy that we hold up so proudly to the world, does the NRC seek to prevent public comment on the basic issue of public health in a nuclear world?

CL-36/2 If the NRC is confident--as its supplementary changes to NUREG-0586 suggest-- that onsite and offsite radioactive contamination during decommissioning and afterward will be minimal, why does it seek to remove all liability from the owner even before the process is complete? (If the NRC is wrong, who will pay?)

CL-36/3 It is my understanding that the purpose, and certainly the effect, of the proposed supplement to NUREG-0586 is to reclassify many decommissioning issues as "generic" in order to avoid a community's right of challenge and to allow owners to depart without liability. I understand that the NRC supplement seriously limits a community's ability to challenge even those issues that are considered "site-specific".

The designation of environmental justice issues and endangered species issues must remain viable SITE-SPECIFIC matters for public debate and legal challenge, as must the hazardous technology (I think of the continuing, poisonous twin-towers fallout) of rubblization.

CL-36/4 The NRC must retain regulatory control of the entire site. The NRC must require a LICENSE AMENDMENT when an owner is granted a change from an operating license to a materials-possession-only license.

CL-36/5 The owner must remain fully liable.

CL-36/6 The NRC must address the subject of radiation dangers after decommissioning HONESTLY, USING THE BEST INDEPENDENT RESEARCH, including
--exposure of children
--exposure of the weak, the ill, the elderly
--offsite contamination
--credible, not arbitrary, environmental impact categories
FOR EACH STEP OF A DECOMMISSIONING.

CL-36/7 The NRC must NOT permit "release of property for unrestricted use" or under "restricted conditions" To permit the release of radioactively contaminated materials into daily consumer use and commerce, or to allow unregulated disposal of such materials is abhorrent. Bin Laden might approve of such an interesting experiment; I trust that the NRC does not and will not.

CL-36/8 The NRC must resist the pressure of the nuclear industry If their profits are waning, they have had their turn. The citizens of the U.S., who pay everyone's way, have a right to expect a healthy environment, and a right to fight for it within the U S. legal system. (But what a shame that a fight is ever needed)

Sincerely yours,

Template = ADM-013

E-RIDS = ADM-03
Add = M. Hasdik (MTH2)

Suzanne Miller
3142 Yorkshire Road
Cleveland Hts , Ohio 44118

From: "James Nordlund" <reality@pld com>
To: <dgels@nrc gov>
Date: 1/26/02 7:32PM
Subject: Comments on the N R C draft, please add them :)

11/9/01
66 FR 56721
37

CL-37/1 Hello! As NIRS, I stand firmly against the "release" of radioactively contaminated materials into daily consumer use and commerce or unregulated disposal.

I hope you'll give these matters the serious attention they warrant. Viva la evolution, viva green party! reality Thanx for your attention, time, and efforts!

Matutinally Yours,

Name = james m nordlund

Preferred E-Mail Address = reality@pld com

Additional E-Mail Address = jamesmnordlund@yahoo.com

Web Site URL = www everythingforeeveryone org

Home Address = p o.b. 982, lakin, KS 67860-0982

Work Address = s a a.

Send Correspondence = Home

Home Telephone = [redacted]

Work Telephone = 209-844-3835

Fax = 209-844-3835

Work Sector = nonprofit, human services

Professional Field = psychology

Professional Field (others) = evolution

Specialization = mental health counseling

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTH2)
Home phone number removed per Mike Lesar.

Letter 38, page 1

Doris ıla - Mail Page 1

From: Roger Voelker <regor@scblackmedia.com>
To: <dgeis@nrc.gov>
Date: 1/27/02 8:01PM

11/9/01
66 FR 56721
38

Chief, Rules and Directives Branch
Division of Administrative Services
US Nuclear Regulatory Commission
Washington, DC 20555-0001

To Whom it May Concern:

The following constitutes my comments on NUREG¡V0586 Draft Supplement 1 Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities--Draft Supplement Dealing with Decommissioning of Nuclear Power Reactors:

Several years ago I attended a meeting between representatives of several investor-owned electric utility companies that were attempting to work out a common position on utility deregulation for the state of Indiana.

At one point in the discussion a representative of American Electric Power, owner of the D.C. Cook Nuclear Plant, made a most revealing statement. Concerned that nuclear power could not compete with other forms of electric generation, the AEP representative pointed out that, following decommissioning, they could not just come in with a wrecking ball, knock the plant down and haul the rubble off to the nearest landfill. Instead, he said, the closed plant would have to be indefinitely isolated from the environment. His exact words (delivered with great emphasis) were ¡§that means fences, guards and guard dogs FOREVER!¡□

CL-38/1 Now, with Supplement I to NUREG¡V0586, the NRC would appear to be paving the way for the very rubblization and possible release into the environment of ¡§slightly contaminated¡□ material that the AEP rep said could not happen.

The vehicle to allow this would appear to be the declaration of more decommissioning issues ¡§Generic¡□ rather than ¡§Site-Specific,¡□ thus preempting the right of local residents to raise concerns during the License Termination Plan review.

CL-38/2 Some of my concerns about NUREG¡V0586 include.

„h the use of generic proceedings to eliminate site-specific evaluation of concerns;

CL-38/3 „h the generic approval of rubblization of reactor buildings and leaving them on site,

CL-38/4 „h the vague and arbitrary use of ¡§Small, Moderate, and Large¡□ significance levels and the intent for use of these designations, which echoes previous attempted bogus designations such as ¡§below regulatory concern¡□;

CL-38/5 „h the extent to which radioactive contamination levels that are permitted to be ¡§released¡□ from regulatory control for decommissioning would result in the release of radioactive materials routinely;

CL-38/6 The draft GEIS says that ¡§low-level¡□ radioactive waste disposal is not part of the scope of this GEIS. However, this would appear to be contradicted by the definition of decommissioning (pg. xii), and by the scope, the release and removal of Sites, Systems and Components (SSCs).

CL-38/7 I specifically oppose any release of contaminated materials during decommissioning or other times/ procedures.

Template - ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2)

Letter 38, page2

Doris ıla - Mail Page 2

Roger Voelker
5849 E North St.,
Tucson, AZ 85712

Sign up for FREE email from SCBLACKMEDIA.com at http://www.scblackmedia.com

11/9/01
66 FR 56721
39

From: "Anne and Tom Moore" <c3moore@hotmail com>
To: <dgeis@nrc gov>
Date: 1/28/02 7:41AM
Subject: NUREG-0586

Chief, Rules and Directives Branch,

CL-39/1 I find the proposals in Supplement 1 to the Generic Environmental Impact Statement on Decommissioning unrealistic when it comes to the health of U.S. citizens at the time of decommissioning and to those living years later.

CL-39/2 To catergorize as "generic" "the release" from regulatory control portions of sites before they are completely decommissioned is not

CL-39/3 responsible. No radioactivity cotaminated parts should be allowed into consumer use, commerce, or unregulated disposal

CL-39/4 To allow utilities to have no liability after decommissioning is done when the proposals are seen as "generic" does not provide any protection to local citizens. Accountibility for our actions is important and utility companies should not be exempt from that.

CL-39/5 There should be a requirement for a license amendment when a utility changes from being a nuclear power operating license to a nuclear materials possession-only license.

CL-39/6 I know that I am not alone in asking you to protect our citizens from radioactivity on such a large scale and hope that you will live up to your responsibility by not lessening the requiremets that utility companies face when decommissioning takes place.

Sincerely,

Anne H. T. Moore

Join the world's largest e-mail service with MSN Hotmail.
http://www hotmail com

Template-ADM-013 E-RIDS=ADM-03
Add=M. Masnik (MTM2)

11/9/01
66 FR 56721
(40)

From: "john runkle" <jrunkle@mindspring.com>
To: <dgeis@nrc gov>
Date: 1/28/02 1:11PM
Subject: Decommissioning Nuclear Power Reactors EIS Supplement 1

VIA EMAIL & Mail

1/29/02

From: Conservation Council of North Carolina, Post Office Box 12671, Raleigh, North Carolina 27605; telephone: 919-839-0006

To: Chief, Rules Directives Branch; Division of Administrative Services,Mailstop T 6 D 59; U.S. Nuclear Regulatory Commission; Washington D.C. 20555-0001

Re: Draft Decommissioning Nuclear Power Reactors EIS Supplement 1 (Supplement to NUREG-0586)

Dear Sir:

The Conservation Council of North Carolina is a statewide environmental organization with a long history of involvement in nuclear plant licensing, waste storage and decommissioning. We offer the following comments on the NRC's Draft Decommissioning Nuclear Power Reactors EIS Supplement 1:

CL-40/1 1. We are deeply concerned about the NRC's proposal to treat almost all decommissioning issues in a generic EIS rather than in an individual EIS for each plant. As we have seen in many of the licensing proceedings, nuclear plants have a wide variety of dissimilarities, even with other plants owned by the same utility and constructed by the same companies. These differences are compounded when it comes to decommissioning as the different work plans for each plant may have considerably different impacts on workers on-site and the public off-site.

CL-40/2 2. All decommissioning activities need to consider the impacts of radiation exposure to workers and the public. Radiation exposures to children and other vulnerable members of the population should be separately and realistically addressed with all pathways to exposure closely examined. Assumptions about off-site exposure should be substantiated with full peer-review from neutral parties, i.e. not employees of the nuclear utilities. The risk to public health cannot be minimized or discounted.

CL-40/3 3. Decommissioning should never be deemed to be complete until the entire site is no longer radioactive. We understand that this means extremely long-term oversight of the reactor sites. Some of the decommissioning wastes, such as the nickel compounds, have extremely long half-lives and remain dangerous for millennia. Liability for the site needs to remain with the utilities and the NRC must retain regulatory control over the entire site.

CL-40/4 4. As we have previously commented in other dockets, there should be no release of radioactively contaminated material of any kind into consumer use or into general commerce. Disposal of all materials from decommissioning need to be regulated, regardless of whether they are radioactive or not.

Please notify me of any decision you make regarding this docket.

Sincerely,

John D. Runkle

General Counsel

Template = ADM-013

E-RIDS = ADM-03
Add = M. Hasnik (MTH2)

11/7/01
66 FR 56721
41

From: Benjamin Schlau <benitothecat@yahoo com>
To: <dgeis@nrc gov>
Date: 1/29/02 2 56PM
Subject: subtle deregulation

Chief, Rules and Directives Branch/ Division of Administrative
Services/ Mailstop T 6 D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

CL-41/1 It has come to my attention that the Nuclear Regulatory Commission is possibly compramising the security of our nations future by making way for further build up of nuclear waste that will theoreticly be safe in so many thousands of years

CL-41/2 I am opposed to any extensions on operating licenses for nuclear facilities of any sort and wish for a move to cleaner renewable energy.

Thank you.
U S. Voter
Benjamin Schlau
1163 Lazy Ln. Ct.
Mt. Pleasant, SC
29464

The Nuclear Regulatory Commission has already relaxed and is further
relaxing its decommissioning requirements for nuclear power reactors.
NRC is justifying these regulatory changes by "supplementing" the 1988
Generic Environmental Impact Statement on Decommissioning Nuclear
Facilities (NUREG-0586) with new, "updated" information on nuclear
power
reactor decommissioning If NRC succeeds, many key issues that local
communities face as reactors close and owners leave (liability-free)
will be unchallengeable, because they are being listed as "generic"
issues. "Generic" decommissioning issues are ones that NRC determines
apply to numerous reactors and which are supposedly being resolved with
this Supplement to the Generic Environmental Impact Statement. "Site
specific" issues are ones that can still be raised in local
communities,
but the opportunities to address even site-specific issues is being
curtailed dramatically. NIRS supports the designation

Template = ADM-013

E-RIDS = ADM-03
Add = H. Masnik (NTHR)

of environmental
justice and endangered species issues as site-specific
(not generic).
NIRS opposes Rubblization but supports its designation
as
site-specific

Do You Yahoo!?
Great stuff seeking new owners in Yahoo! Auctions!
http://auctions yahoo com

Letter 42, page 1

Dons Mendiola - comment (NRC) draft Decommissioning Nuclear Power Reactors EIS Page 1

11/9/01
66 FR 56721
(42)

From: Tom Ferguson <thinkspeak@earthlink.net>
To: <dgeis@nrc gov>
Date. 1/29/02 4.13PM
Subject: comment (NRC) draft Decommissioning Nuclear Power Reactors EIS

CL-42/1 One of the important and obvious things to be said about decommissioning nuclear power plants is that it is expensive, potentially dangerous and nearly unprecedented. We appreciate that entombment is now being considered.

CL-42/2 It ought to be equally obvious that

1.Since a satisfactory waste isolation solution evades us (we do not agree with Secretary Abraham that Yucca Mountain is a suitable repository based on science – the DOE itself admits that the site is not geologically suitable and the GAO raises serious questions about the selection process).

CL-42/3 2.That a serious accident or terrorist act in this industry could be catastrophic, leaving immense fatalities, injuries, future cancer victims and vast areas uninhabitable for years

CL-42/4 3 That without public subsidy (via Price-Anderson) nuclear power is economically untenable

CL-42/5 4.Given these factors the complete phase-out of nuclear power should be a high priority Alternative power sources such as wind, solar, hydrogen fuel cell [and conservation] should be vigorously pursued in its stead

Tom Ferguson
Cyndia Hunnicutt
Kallio Hunnicutt-Ferguson
372 Oakland ave se
Atlanta, GA 30312

Template = ADM-013

E-RIDS = ADM-03
Add = M. Hasdik (MTM2)

11/9/01
66 FR 56721
(49)

From: "Mary S Reed" <maryreed@localnet com>
To: <dgeis@nrc gov>
Date: 1/29/02 5 44PM
Subject: NUREF-0586 Comments

Chief, Rules and Directives Branch/ Division of Administrative Services/ Mailstop T 6 D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

CL-43/1 I am opposed to the following changes to NUREF-0586

In Supplement 1 to the Generic Environmental Impact Statement on Decommissioning:

NRC allows "rubblization" (crumbling the concrete reactor building) of nuclear reactors, without opportunity for public intervention until the action is completed

CL-43/2 NRC allows portions of sites to be "released" from regulatory control before the whole site it released

CL-43/3 NRC opens up two "entombment" options

CL-43/4 NRC ignores radiation dangers after decommissioning is done and utility is relieved of liability.

CL-43/5 NRC ignores radiation exposures to children and other vulnerable members of the population and creates a fictitious highest exposed "critical group" based on unsubstantiated assumptions.

CL-43/6 NRC ignores radiation offsite and permits utilities to ignore it in decommissioning planning NIRS calls on the NRC to incorporate offsite contamination into all evaluations of environmental impacts.

CL-43/7 NRC prevents the National Environmental Policy Act from applying to most of the decommissioning process (The claim appears to be that this proposed Supplement 1 satisfies the Environmental Policy Act for most of the decommissioning issues)

CL-43/8 NRC makes most aspects of decommissioning "generic" rather than site-specific, so they cannot be legally reviewed or challenged at individual sites.

CL-43/9 NRC redefines terms to avoid local, site specific opportunity to question, challenge and prevent unsafe decommissioning decisions

CL-43/10 NRC sets arbitrary and unsubstantiated (low, medium and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now and to prevent their inclusion in site specific analysis.

CL-43/11 NRC is removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license. (With no license amendment, there is no

Template = ADM-013

E-RIDS-ADM-03
add = H. Mysnik (HTM2)

opportunity for public challenge or adjudicatory processes)

CL-43/12 NRC is attempting, with this supplement, to legally justify the removal of the existing opportunities for community involvement and for legal public intervention until after the bulk of the decommissioning has been completed. This includes such activities as flushing, cutting, hauling and possibly rubblizing of the reactor.

CL-43/13 NRC states that the portion of the decommissioning regulations (10 CFR 20 section E and its Environmental Impact Statement, NUREG 1496) that set the 25, 100 and 500 millirems per year allowable public dose levels from closed, decommissioned nuclear power sites, are not part of the scope of this Supplement

CL-43/14 NRC defines decommissioning, in part, to include the "release of property for unrestricted use.." and the "release of property under restricted conditions."

CL-43/15 If the changes pass, many key issues that local communities face as reactors close and owners leave (liability-free) will be unchallengeable, because they are being listed as "generic" issues. "Generic" decommissioning issues are ones that NRC determines apply to numerous reactors and which are supposedly being resolved with this Supplement to the Generic Environmental Impact Statement. "Site specific" issues are ones that can still be raised in local communities, but the opportunities to address even site-specific issues is being curtailed dramatically I support the designation of environmental justice and endangered species issues as site-specific (not generic) I oppose Rubblization but supports its designation as site-specific.

CL-43/16 Please consider my opposition to many of the proposed Supplements. The public should not be further shut out of the decommissioning process. Nuclear waste is deadly and it's handling should not be downgraded in any way.

Sincerely,
Mary S. Reed
29 Sunnyside Road
Scotia, NY 12302

CC: "Senator Charles Schumer" <senator@schumer senate gov>, "Senator Hillary Clinton" <senator@clinton senate gov>, "Rep Mike McNulty" <mike mcnulty@mail house gov>

Letter 44, page 1

Donna Mendiola - Comments-NRC Rules on Decommissioning - EIS Supplement I Page 1

11/9/01
66FR56721
(44)

From: <Pdbsongs1@cs.com>
To: <dgeis@nrc.gov>
Date: 1/29/02 7.04PM
Subject: Comments-NRC Rules on Decommissioning - EIS Supplement I

D. Geis - NRC

I am forwarding Attachment (word document) letter to NRC, with my personal comments on proposed NRC Rules on Decommissioning.

Please confirm their receipt and acceptance by email.
Thank you in advance
Patricia Borchmann

Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTH2)

Letter 44, page 2

FROM : BE GOOD FAX NO. : 7609419625 Jan. 30 2002 11:16AM P1

Patricia Borchmann
176 Walker Way
Vista, Ca 92083
(760) 941-9625

January 30, 2002

Chief, Rules and Directives Branch
Division of Administrative Services / Mailstop T 6D 59
U.S. Nuclear Regulatory Commission
Washington DC 20555-0001

Email to: dgeis@nrc.gov

RE: U.S. Nuclear Regulatory Commission's Draft Decommissioning Nuclear Power Reactors E.I.S. Supplement 1

CL-44/1 I am very strongly opposed to the regulatory changes sought by NRC to further relax decommissioning requirements for nuclear power reactors, as proposed by the 1998 "Generic" E.I.S. on Decommissioning Nuclear Facilities (NUREG-0586), with new "updated" information on nuclear power reactor decommissioning. **The Proposed regulatory changes sought by N.R.C. are an insult to the public interest.**

CL-44/2 I also strongly opposed, and object to the proposed supplement to the "Generic" E.I.S., and the deliberate and insappropriate exclusion of "site specific" issues, which should be an imperative part of any analysis, for any form of an E.I.S. Supplement.

CL-44/3 "Site specific" issues are of vital importance, especially at San Onofre Nuclear Generating Station (SONGS) where Unit 1 is currently being decommissioned. It is imperative that N.R.C. evaluate and analyze SONGS Decommissioning on a "site specific" basis instead of a "Generic" basis, due to the very unique physical site characteristics at SONGS, which other existing nuclear plants in U.S. do not possess.

The distinctions, and physical characteristics which make conditions at SONGS so different and unique are vitally important, and are of utmost importance in any analysis of Decommissioning at SONGS, in order to ensure the level of public health and safety will be assured, and provided without compromise to citizens in communities surrounding SONGS. As SONGS Unit 1 is currently being Decommissioned, the site specific analysis must include both the short term and long term effects, and must also analyze effects of offsite contamination, effects of cumulative contamination and exposure, and must provide realistic mitigation measures..

A Summary of the "site specific" physical characteristics and conditions at SONGS, which should justify "site specific" analysis (as opposed to a Generic E.I.S. Supplement) include the following:

- SONGS is located in a highly populated area, with dense populations in both Orange County and San Diego County, where citizens may be exposed to potentially significant offsite effects.
- SONGS is located in a highly active seismic zone, where seismic activity is speculated by some geological experts to generate quakes up to 7 6 Magnitude on the Richter Scale (by new evidence of local off-shore blind thrust faults, which cause a greater extent of groundshaking and acceleration than the manner in which quakes are traditionally studied). SONGS was only designed and constructed to withstand a maximum quake of 7.0 Magnitude.
- SONGS is located in a area immediately on the southern California coastline, with most facilities elevated only to a level of 20' ft. above mean sea level. These facilities are highly exposed and vulnerable to effects of rising sea levels, and tsunamis, and are insufficiently protected.

CL-44/5 **I am opposed to NRC regulations pertaining to Decommissioning which would allow:**

- Rubbilization (crumbling the concrete reactor building) of nuclear reactors, without
- opportunity for public intervention until the action is completed.

CL-44/6
- Allows portions of sites to be "released" from regulatory control before the whole site is released.

CL-44/7
- Allows offsite radiation to be ignored, and permits utilities to ignore it in decommissioning planning. It is imperative to include offsite contamination into all aspects of decommissioning planning and evaluation of environmental impacts.

CL-44/8
- Allows NRC to make most aspects of decommissioning "generic" rather than site specific so NRC cannot be legally reviewed or challenged at individual sites.

CL-44/9
- Allows NRC to redefine terms to avoid local, site specific opportunity by public to question, challenge and prevent unsafe decommissioning decisions.

CL-44/10
- Allows NRC to set arbitrary and unsubstantiated (low, medium and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now, and to prevent their inclusion in site-specific analysis. This use of this piecemealing approach is unacceptable.

CL-44/11
- Would allow (with this supplement), NRC to legally justify removal of existing opportunities for community involvement and for legal public intervention until after the bulk of the decommissioning has been completed, including activities as flushing, cutting, hauling and possible rubbilization of reactor.

CL-44/12
- NRC asserts that the portion of decommissioning regulations (10 CFR 20 section E and its EIS, NUREG 1496) set the 25, 100 and 500 millirems per year allowable public dose levels from closed, decommissioned nuclear plants sites, and are not part of the scope of this Supplement. I disagree, and consider the inclusion of exposure from closed decommissioned plants a necessity to develop an accurate and realistic analysis of cumulative impacts.

CL-44/13
- Allows NRC to define decommissioning in part, to include "the release of property for unrestricted use" .. and the "release of property under restricted conditions." It is entirely inappropriate and scientifically ludicrous to allow "release" of highly radioactively contaminated materials into daily consumer use and commerce, or unregulated disposal, or the recycling of such materials into any form which causes public exposure with radioactively contaminated materials.

CL-44/14 In conclusion, it is with utmost disappointment to again observe with each and every new NRC Rulemaking, important components of the public's existing "right to know" and the public's right of active involvement in plant processes, decisions and their methodology, on all aspects of decommissioning activities routinely appears to be further diminished. As proposed, the EIS (Supplement I) would eliminate all opportunities for public intervention, and public oversight and/or intervention entirely with use of a "generic" EIS In such cases, the loss of public oversight and intervention on projects with a scope as large as decommissioning at SONGS, such losses may be unparalleled, or fully understood without a site specific issue analysis. **The citizens in local communities surrounding nuclear plants such as SONGS deserve this entitlement, and demand this entitlement.**

CL-44/15 The public has not only the "right to know", but NRC and the industry has the duty to fully disclose all related impacts, short and long term, on and offsite, direct and indirect, as well as cumulative effects resulting from decommissioning to citizens and members of the public living in local communities surrounding the nuclear plants.

CL-44/16 We are tired of being unknowingly treated as an entity from whom the industry can escape the obligation of full disclosure, and "used" as the entity upon whom the industry dumps the real long term costs, and as the entity who absorbs the costs.

Patricia Borchmann

01/30/2002 16:01 16126233354 CLEAN WATER ACTION PAGE 02

CLEAN WATER ACTION ALLIANCE

11/09/01
66FR56721
45

January 30, 2002

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

To Whom It May Concern:

Pursuant to the Federal Register Notice of November 9, 2001 on the availability of the draft supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (NUREG-0586), Clean Water Action Alliance (CWAA) provides the following comments under the extended comment period ending January 30, 2002. CWAA is a citizen-based environmental organization with over 55,000 members throughout Minnesota. As a member of the Sustainable Energy for Economic Development (SEED) coalition and the Minnesotans for an Energy-Efficient Economy (ME3) Coalition, CWAA has worked for the transition away from coal and nuclear generation towards cleaner, non-polluting sources of energy for nearly ten years.

CL-45/1 CWAA supports the comments of NIRS, Public Citizen and the Critical Mass Energy Project. We concur with these organizations that changes in the supplement designed to limit citizen's opportunities to review or challenge decommissioning projects are undemocratic and ill advised. It is imprudent to reduce public oversight of these projects, no matter how much more convenient it seems. Environmental and health risks from improper decommissioning are very high, particularly to neighboring communities. Labeling certain issues 'generic' and making them unchallengeable is a disservice to those communities and citizens around the country who may be exposed to radioactive waste during the transport and disposal process.

CL-45/2
CL-45/3

Thanks you for your consideration.

Sincerely,

Diana S. McKeown

Diana S. McKeown
Energy Program Coordinator

template - ADM-013

E-RIDS = ADM-03
Add = M Masnik (MTM2)

Midwest Regional Office • 326 Hennepin Avenue East • Minneapolis, MN 55414 • (612) 623-3666
Duluth • 394 Lake Ave. So. #312A, • Duluth, MN 55802 • (218) 722-8357
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01/30/2002 16:01 16126233354 CLEAN WATER ACTION PAGE 01

CLEAN WATER ACTION

FAX COVER

To: Chief, Rules & Directives Branch Pages 2

From: _____ Date 30 Jan 2002

(612) 623-3354

Notes

attn: Rules

Midwest Regional Office • 326 Hennepin Avenue East • Minneapolis, MN 55414 • (612) 623-3666

PHYSICIANS FOR SOCIAL RESPONSIBILITY / ATLANTA
P O. Box 95190, Atlanta, Georgia 30347 404-378-9078 PSRatlanta@aol.com

11/09/01
66 FR 56721
46

NRC
EMAIL: dgeis@nrc.gov
MAIL: Chief, Rules and Directives Branch/ Division of Administrative Services/ Mailstop T 6 D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Ladies and Gentlemen:

CL-46/1
CL-46/2 In keeping with appropriate medical and public policy principles, we urge total transparency. We urge that the Commission always lead it's interactions with the public at large by being fully open and informative about the potential dangers, the expense and the limited experience we as a nation have with the decommissioning of nuclear reactors United States citizens deserve nothing less than total transparency.

We believe that the following statements are true and belong in the public dialogue, as the issues associated with decommissioning are presented to citizens:

CL-46/3 1. **A satisfactory waste isolation site evades us.** Yucca Mountain is not a suitable geologic repository based on science – the DOE itself admits that the site is not geologically suitable; storage canisters will be required to protect the waste from exterior environmental contamination. Additionally, the GAO raises serious questions about the selection process.

CL-46/4 2. **A serious accident or terrorist act could be catastrophic.** Such an occurrence could result in large numbers of human fatalities, injuries and illnesses and vast areas of land uninhabitable for years.

CL-46/5 3 **The enterprise of electricity generation using nuclear fission requires public subsidy.** Without Price-Anderson protection, nuclear power would be economically untenable.

CL-46/6 4. **Consideration of these factors must be fully and publicly discussed before exposing our citizens to additional exposures through development of new nuclear generation facilities.** The complete phase-out of nuclear power should be considered based on objective analysis of health and economic effects including probability evaluation of all possible accidents and incidents, and comparison of all potential energy sources such as wind, solar, hydrogen fuel cell and including conservation.

Tom Ferguson, Physicians for Social Responsibility/Atlanta
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Atlanta, GA 30347
404 378-9078
PSRatlanta@mindspring.com

www.PSRatlanta.org

Template = ADM-013
E-RIDS = ADM-03
Add = H. Hasmik (HTM2)

Letter 47, page 1

Doris Mendiola - Decommissioning comments Page 1

From: "Dave Ritter" <dritter@citizen.org>
To: <dgeis@nrc gov>
Date: 1/30/02 4.22PM
Subject: Decommissioning comments

see below....

11/09/01
66 FR 56721
47

Letter 47, page 2

Doris Mendiola - 1-30-02 - PC Comments on NRC's Decomm GEIS Supplement - NUREG-0586 doc Page 1

January 30, 2002

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

To Whom It May Concern:

Please accept the following comments in regard to Draft Supplement 1 to NUREG-0586, "Draft Supplement Dealing With Decommissioning of Nuclear Power Reactors," and place them into the public record.

CL-47/1 Public Citizen is very concerned about several aspects of this supplement to NUREG-0586, specifically those that could pose risks to public health, the public's right to

CL-47/2 partucipate in decisions that affect them, and environmental quality. Additionally, Public Citizen is concerned that the provisions outlined in the Supplement might allow owners and operators of nuclear power reactors to reduce or completely evade their civic, environmental, economic and legal responsibilities.

CL-47/3 Having stated that, we would like to make it abundantly clear that we see decommissioning to be the most appropriate and responsible action to take with all

CL-47/4 nuclear reactors. Nonetheless, any and all decommissioning activities should be performed methodically and with great caution, ensuring that the public is appropriately

CL-47/5 involved in the processes and thoroughly protected from dangers every step of the way. Certainly, every reactor shut-down is another step away from further creation of radioactive waste, the ever-present possibility of nuclear terror (be it a reactor accident or

CL-47/6 terrorist attack) and the continuing irradiation of our everyday lives. Every shut-down reactor can take us a step closer to a sustainable energy future but, unfortunately, reactor shut-down is not the threshold of safety, where the public can be assured that no health or

CL-47/7 environmental dangers will originate from the site. There still remains a mountain of radioactive waste after shut-down, including the reactor itself and, typically, an incredibly dangerous stockpile of irradiated reactor fuel. Whereas the reactor itself and the equipment and materials of the central facilities are often treated as the object of decontamination, it must be noted that the previous operation of the plant has dispersed radiation and contamination that did not regard the facility's fenceline as a barrier. Any serious approach to decommissioning a site must take this into account.

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E-RIDS = ADM-03
Add = M. Masnik (MTM2)

CL-47/8 Decommissioning should not be a final opportunity for the nuclear industry to "take the money and run" - be it to make a profit from inadequate cleanup and monitoring, or to limit losses from costs that had been underestimated for decommissioning throughout the

CL-47/9 operating lifetime of the nuclear reactor. There should be no allowance for the industry to

hurriedly raze structures, sweep the radioactive mess under a porous and permeable carpet (or disperse the remains and cleanup materials in many unregulated forms far from the reactor site), cut corners and add risks and contamination to an already precarious clean-up operation. The public must be protected.

Our specific concerns are as follows:

Relegation of More Decommissioning Processes to Generic Status

CL-47/10 In establishing 80% (24 of 30) of the environmental impacts of decommissioning as being "generic" the NRC is doing the industry's bidding to restrict or eliminate the affected public's opportunities to comment on, guide, monitor and review the decommissioning of

CL-47/11 nuclear power reactors in their communities. Regardless of any uniformity that may or may not exist as issues to consider at decommissioning reactors - and our position is that any concerns of the relevant communities are site-specific - the NRC's move to make most considerations within the decommissioning process "generic" is a thinly veiled

CL-47/12 project to eliminate public review and full disclosure through public hearings. Further, this move runs counter to NRC's "Openness" Principle of Good Regulation, wherein "Nuclear regulation is the public's business, and it must be transacted publicly and candidly. The public must be informed about and have the opportunity to participate in the regulatory processes..." and to NRC's Organizational Value of "Service to the public, and others who are affected by our work." (both found at http://www.nrc.gov/who-we-are/values.html)

Arbitrary and Capricious Determination of "Levels of Significance" for Decommissioning Environmental Impacts

CL-47/13 NRC's "Levels of Significance and Accountability of Environmental Impacts" assign values of risk to affected communities as "small," "moderate" and "large" as determinants for the denial or approval of a public site-specific review and, potentially, a public adjudication for environmental mitigation. Public Citizen maintains that these categories are excessively arbitrary and broad, and largely groundless for the following reasons:

1. The biological effects of ionizing radiation are destructive. No safe "threshold level" for exposure to ionizing radiation exists for the general population (including the fetus).

2. There is a long history of unresolved regulatory conflict over radiation protection standards that are utilized to determine NRC risk assessments. Federal regulators, including the NRC and the Environmental Protection Agency, have not reached a consensus on residual radiation criteria for decommissioning, with EPA standards being significantly lower (more protective) than NRC criteria. To our knowledge, this conflict has not been resolved and, therefore, it appears that the NRC has unilaterally and arbitrarily concluded what standards would apply in determining whether a risk is "small," "moderate" or "large."

3. The NRC risk assessment inappropriately ignores the population of children in its "critical group" evaluation as the population most vulnerable to residual radioactivity exposure from decommissioning operations. This runs counter to NRC's Organizational Value to a "Commitment ... to protecting the public health and safety."

4. The NRC has a documented history of significant lapses in effective oversight of decommissioning operations as reported by the General Accounting Office in a May 1989 report, "NRC's Decommissioning Procedures and Criteria Need to be Strengthened" (GAO/RCED-89-119). The GAO not only found that complete information does not exist for all licensed activities or buried wastes, but that NRC was found to have terminated a license with radioactive contamination in excess of its own guidelines. Further, the report noted that NRC regulations lacked a time requirement for document retention. NRC's questionable past performance does not support the agency's move toward generic treatment of decommissioning nuclear facilities where affected communities are denied public review and full disclosure of contamination, the decommissioning plan and license termination plan.

Rubblization

CL-47/14 NRC's proposal to allow "rubblization" (defined as: "the demolition of onsite concrete structures. Rubblizing these structures could result in material ranging from gravels to large concrete blocks, or a mixture of both.") of concrete structures at the reactor site to take place without opportunity for public intervention until after the action is completed

CL-47/15 is outrageous. Rubblization poses some specific risks to the surrounding communities and the site workers, as the rubblized material could contaminate via air, soil, and water pathways. Thus, Public Citizen insists that it is only appropriate that the affected communities surrounding the reactor site be given opportunities to review rubblizing plans and procedures, and that this issue be addressed on a site-specific basis.

Partial Site Release before License Termination

CL-47/16 The Supplement indicates that portions of a nuclear reactor site could be released from regulatory control prior to the site operator's license termination. This would relieve the nuclear utility of responsibility and liability for portions of sites (be they materials or real property) while still being licensed for the control of the entire site. Public Citizen is completely opposed to any such practice, which would allow radiation/radioactively-contaminated materials and wastes to be released, reused, or recycled, without restriction, into the unregulated industrial, commercial, and public environment.

Externalizing Costs to Ratepayers/Taxpayers

CL-47/17 Public Citizen is opposed to any policy that would shift the financial burden of decommissioning to ratepayers. The cost of properly decommissioning (including thorough decontamination) a reactor site can vary widely, depending on the size of the facility, the amount of time in which it was operational, and the degree of contamination.

As the NRC itself stated in the Supplement, the lack of adequate decommissioning funds can potentially result in delays and/or unsafe and improper decommissioning. Further, with utility deregulation and the attendant shuffling of corporate ownership, much uncertainty has developed regarding the ability of the owning and operating utilities to pay for proper decommissioning of their facilities. Public Citizen insists that site-specific reviews are necessary so that the public has an opportunity to ensure that the utility will be able to pay for the entire, thorough decommissioning process.

Relevance of "Out-of-Scope" Activities

CL-47/18 There are several issues in the Supplement which are briefly addressed and dismissed as "out-of-scope" which we insist need to be dealt with as site-specific issues for any thorough EIS on decommissioning, with full public rights to hearings, review, oversight, and disclosure maintained. These include:

1. Spent fuel storage and maintenance - The public at each reactor site community should determine how irradiated/"spent" fuel is stored/dispositioned. If a centralized high-level waste repository is opened at some future date to accommodate the irradiated fuel and high-level waste from a community's decommissioned reactor, the communities that exist along the possible transportation paths should also be involved in site-specific environmental impact reviews/assessments. To exclude spent fuel storage, maintenance, transport, and disposal away from the reactor location from the scope of this GEIS/Supplement, and the opportunity for site-specific EIS reviews, is arbitrary and capricious.

2. Low-level waste disposal at a a LLW site - The concept of rubblizing and capping a reactor site and allowing it to function as a low-level waste disposal facility without having the appropriate permitting and licensing hearing process is a serious departure from past NRC licensing practices, and any such "rubblizing" proposal should not be approved without a site-specific EIS review. To exclude this or any similar proposal from a site-specific EIS review, and the scope of this GEIS/Supplement, is arbitrary and capricious.

Please enter these comments into the public record.

Sincerely,

David Ritter
Policy Analyst
Public Citizen/Critical Mass Energy and Environment Program

From: dianed@igc.org
To: <dgeis@nrc.gov>
Date: 1/30/02 4:55PM
Subject: NIRS, WMEAC, DWM, CFNFGL Comments on DGEIS Supp 1

TO. NRC
FROM: NIRS, WMEAC, DWM, CFNFGL
RE: Comments on NRC Draft GEIS Supplement
Decommissioning of Nuclear Facilities
NUREG 0586 draft supp 1

11/9/01
66 FR 56721
48

Template = ADM-013

E-RIDS = ADM-03
Add = U. Mossik (MTH2)

January 30, 2002

Chief, Rules and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Nuclear Information and Resource Service (NIRS)
Coalition for a Nuclear Free Great Lakes (CNFGL)
Don't Waste Michigan (DWM)
West Michigan Environmental Action Council (WMEAC)

Comments on Decommissioning GEIS Supplement 1

To Whom It May Concern:

Pursuant to the Federal Register Notice of November 9, 2001 on the availability of the draft supplement to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (NUREG-0586) for public comment, Nuclear Information and Resource Service, Coalition for a Nuclear Free Great Lakes and Don't Waste Michigan provide the following comments.

CL-48/1 NIRS reiterates and incorporates our previous comments and fundamental disputes with regard to the decommissioning GEIS as submitted in formal comments to NRC on July 11, 13 and 14, 2000. Our organizations request that NRC include with this submission all of our organizations' previous comments on this and related rulemakings (including but not limited to the environmental procedures on BRC and those

CL-48/2 that led to the development of 10 CFR 20 section E, the License Termination Rule). Our organizations continue to assert that NRC is deferring its regulatory responsibility of radiological decommissioning to facilitate a cost driven utility self assessment through an expedited decommissioning licensing process and by restricting a duly promulgated public hearing process for affected communities as embodied under the

CL-48/3 1988 law. We contend that decommissioning practices on nuclear facilities and its environmental impacts as major federal actions must be conducted under public review with full disclosure and documentation of the amount of radioactivity, the location of residual contamination and the types of radioactive contamination that remain on-site and off-site and are subject to site specific public hearings.

CL-48/4 The NRC claims the agency and the industry have accumulated substantial decommissioning experience and that this is justification for hastening the generic treatment of Environmental Impact Statements. In effect, this eliminates meaningful public involvement in site-specific reviews and prevents

CL-48/5 the necessary full disclosure of nuclear facility contamination and decommissioning practices. The fact is that decommissioning has a long and significantly checkered regulatory history. The draft supplement to NUREG-0586 does not address or acknowledge these repeated oversight failures including numerous decommissioning experiences where licensees did not adequately decontaminate their facilities These failures include but are not limited to:
the NRC does not know the types, amount and location of buried radioactive waste at some of its decommissioned facilities;
-many licensee decommissioning records are nonexistent or incomplete;
-ground water contamination is higher than federal drinking water standards allow and
-the long standing failure of the responsible federal regulatory agencies to prevent and prohibit radiation contamination that can remain after the NRC terminates a nuclear facility license. (The Environmental Protection Agency is on record requiring more protective cleanup levels than NRC, evidence that NRC's requirements are inadequate.)

CL-48/6 These events do not warrant nor should they instill public confidence in staff conclusions that the agency and the industry can reasonably make the leap to the generic treatment of environmental impact statements for decommissioning nuclear facilities and effectively take away a community's review and the

full disclosure of the extent and location of radioactive contamination both on and off site.

CL-48/7 Our organizations are fully supportive of the permanent closure of nuclear power reactors. Our decommissioning comments are not intended to deter or delay the soonest possible shut down of nuclear

CL-48/8 reactors. Our goal is to require that nuclear facility owners and operators, to the best of their ability, function as the good neighbors and responsible corporate citizens they claim to be. That would include fully encapsulating and isolating all of the wastes and radioactively and chemically contaminated materials resulting from their operations and decommissioning. It includes doing everything possible to:

1) Prevent public exposures in the current and future generations to radiation and chemicals from nuclear power production, waste management, transportation, "clean up" and decommissioning,
2) Prevent additional environmental contamination both on-site and off-site and to remediate and minimize that which has already occurred;

CL-48/9 3) Paying the full costs for long-term monitoring and isolation of radioactive wastes Decommissioning should not end up as a new set of public subsidies for nuclear power by allowing the long term costs (economic, health, resource, etc.) to be denied, ignored or defined away by NRC with no recourse for the local community or state and federal taxpayers that will end up with the costs by default.

CL-48/10 Inherent in the decision to operate the reactors is an acceptance on the part of the generator and the regulator of the production of long-lasting radioactive waste and radioactive and chemical contamination of large volumes of resources. Decommissioning should include responsibly managing that material, not denying its existence.

The Commission's Definition of Decommissioning is Fundamentally Flawed and Limited in Scope

CL-48/11 Our organizations have a fundamental dispute with the Commission's definition of decommissioning. The NRC currently defines decommissioning as "to remove a facility or site safely from service and reduce residual radioactivity to a level that permits (1) Release of the property for unrestricted use and termination of the license; or (2) Release of the property under restricted conditions and termination of the license."

Decommissioning should not permit the release of radioactive contamination from regulatory control and the control of some identified responsible party. At public meetings (in 1993 and in 2001) across the country on the issue of "clean-up," the public consistently called for continued regulatory control over any and all wastes, materials, properties and sites with contamination from nuclear power and weapons fuel chain activities. Rather than requiring the identification, capture and isolation of the remains of nuclear power operations, NRC is legalizing the release of contaminated sites, properties, materials and natural resources. By segmenting the portions of the decommissioning process into separate Environmental Impact Statements and supplements, the public is prevented from addressing the amount and method of identifying residual contamination of the environment, natural resources, the community and downstream and downwind ecosystems. The public is prevented from addressing and preventing the concept of allowable doses to the public from nuclear power operation, wastes and decommissioning activities. We protest the designation of issues related to allowable contamination levels and doses being deemed "out of the scope" of this document.

NRC ignores "offsite" radiation exposure.

CL-48/12 This agency's definition of "decommissioning" is fundamentally flawed in limiting its scope of "property" to the site boundaries. The NRC scope needs to be broadened to encompass the decontamination or mitigation of "property" in addition to structures, systems and components of the nuclear power station that exist beyond the fence line that have been contaminated none the less as a direct result of station operation.

1) Radiological effluent pathways from nuclear facilities (water and air) must be included in the decommissioning analysis and mitigation plan.

CL-48/13 Nuclear facility operation results in significant offsite radiological contamination that is ignored under the current definition. For example, one known pathway occurs over the course of reactor operation as the direct result of fuel rod degradation giving way to pin-hole leaks, cracks and loss of rod integrity with radioactive contamination to the reactor coolant system. Primary and secondary coolant piping leakage results in radioactive contamination releases being deposited and accumulated as sediment on river and lakebeds and coastal receiving waters from deteriorated reactor coolant discharge systems. This is of particularly more concern for utilities that operated once-through cooling systems and/or boiling water reactor technology though not exclusively so. Some of our organizations are aware that reactor operators, as in one case of the Big Rock Point nuclear generating station, have argued that offsite radioactive sediment areas should not be disturbed by removal/decontamination efforts and are better left alone than decontaminated. The decommissioning definition does not require the utility to analyze the scope of this offsite contamination, consider its cleanup nor effectively regulate the enforcement of decontamination of residual radioactivity that has migrated from the reactor site and accumulated off site in affected communities resources such as fresh water supplies. These advertent releases of radioactivity as the result of station operation need be covered within the scope and disclosure as environmental impacts within the decommissioning process.

NRC in its evaluation of the environmental impacts acknowledges "Levels of radionuclide emissions from facilities undergoing decommissioning decreased, because the major sources generating emissions in gaseous and liquid effluents are absent in facilities that have been shut down." Consequently, the NRC currently only considers radiological effluent impacts as a result of decommissioning operations while ignoring the potential need for mitigation of cumulative and persistent toxic radioactive materials deposited downstream over the decades of operation of a reactor.

CL-48/14 2) The contamination of soil, land and property beyond the station boundary line must be included in the decommissioning analysis and plan.

Offsite migration of radioactive materials has occurred through both deliberate and inadvertent removal of materials originally contaminated onsite (tools, concrete construction blocks, etc) For example, concrete cinderblocks used to construct a shield wall at the Connecticut Yankee's Haddam Neck nuclear power station were inappropriately distributed to affected communities as construction materials for buildings including a children's daycare facility. We believe the Connecticut Yankee incident is not an isolated case. The scope of the current definition does not provide for the investigation, analysis and mitigation of radioactive materials, equipment and components originating from a nuclear facility that have been deliberately or inadvertently released to affected communities.

CL-48/15 3) The historic undocumented burial of nuclear waste onsite at nuclear power stations must be investigated, surveyed and mitigated by station owners under the decommissioning plan

As the United States General Accounting Office (GAO) May 1989 "NRC's Decommissioning Procedures and Criteria Need to Be Strengthened" (GAO/RCED-89-119) reports in its Executive Summary.

"For almost 25 years, NRC allowed licensees to bury radioactive waste on-site without prior NRC approval. NRC required the licensees to retain records on the amounts and substance buried rather than provide them to NRC. In five of the eight cases GAO reviewed, licensees buried waste onsite, but four licensees either did not keep disposal data or the data are incomplete. In one case, NRC terminated a license and 10 years later learned that radioactive material had been buried on the site. Also, NRC generally does not require licensees to monitor for groundwater or soil contamination from buried waste.
All five licensees have found ground water contaminated with radioactive substances. At four sites, some of the contamination appears to have resulted from the buried waste—
the contamination at one site was 400 times higher than EPA's drinking water standards allow. At another site, the contamination was 730 times higher, but the source was not known."

CL-48/16 4) An inventory of all the radioactivity, radioactive wastes and materials from reactor operation and decommissioning, and independently verified reporting of its disposition (whether onsite or offsite, whether in licensed or unlicensed facilities and specifics of its storage condition) should be a required part of the environmental review and reports. This information must be part of the site-specific Environmental Impact Statement process and fully disclosed at each reactor as site-specific issues, with the opportunity for formal local hearings and legally- binding input. The corporations responsible for the radioactive wastes from nuclear power reactor operations should be required, by NRC, to keep balance sheets of the radioactivity generated by their reactors and the decommissioning process, and track the disposition of that radioactivity whether it is kept onsite, allowed to leak out into the air and water, or shipped to licensed or unlicensed facilities for disposal or processing, and for possible release into household items.

CL-48/17 We oppose any unlicensed disposition of long-lasting radioactivity from the nuclear fuel chain activities As long as radioactive materials remain, someone should retain a license for those materials, and responsibility for them. That burden should not be shifted to the states and local communities without clear acknowledgement of the stewardship responsibility for that material.

CL-48/18 NRC AND INDUSTRY FAILURE TO RELIABLY ESTIMATE THE REAL COST OF DECOMMISSIONING AND REASONABLY ASSURE THE AVAILABILITY OF ADEQUATE DECOMMISSIONING FUNDS DOES NOT JUSTIFY OR SUPPORT GENERIC TREATMENT OF ENVIRONMENTAL IMPACT STATEMENTS

The NRC GEIS does not adequately address the historic inability by the NRC and industry to accurately assess the final and actual costs associated with decommissioning and the associated underestimation of the rate of accrual for funds set-aside by electrical utilities. The final cost for decommissioning remains highly speculative and therefore likely to continue to be significantly underestimated. As NRC has stated in the DGEIS Supplement the unavailability of adequate decommissioning funds potentially can result in delays and /or unsafe and improper decommissioning. Therefore, our organizations contend that site specific reviews are necessary for public review and disclosure of the availability of adequate decommissioning funds assigned to an adopted decommissioning plan

CL-48/19 While the Executive Summary of NUREG-0586 Supplement 1 claims that the NRC and the industry have over 300 years of decommissioning experience with 22 nuclear reactor facilities permanently shut down, the fact remains that the process is still relatively new and NRC has yet to complete a single radiological decommissioning operation to a license termination plan for a typical large U.S. commercial reactor that operated for any significant length of time. As stated by Mr. Michael Masnick with the NRC at the Public Scoping Meeting on Intent to Prepare Draft Supplement To Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities in Boston, Massachusetts, May 17, 2000 with regard to a question on how many license termination plans have been accepted by NRC, he responded, "none

CL-48/20 have resulted in a license termination." It therefore appears that 300 years of decommissioning experience without a single license termination plan approval does not suggest that NRC is prepared to treat the issue of cost to adequately decommission generically.

CL-48/21 The cost of decommissioning nuclear facilities can vary according to the size of the facility and the degree of contamination. As a result of electric utility deregulation where a competitive market has

CL-48/22 replaced regulated rates, traditional methods of amassing decommissioning funds through imbedded utility

CL-48/23 rates have been replaced with by competitive electricity rates. Additionally, ownership of nuclear facilities has changed for more than half of the nuclear power plants in the United States through mergers and transfers. This shuffling of ownership has raised much uncertainty about the availability of adequate funds for the eventual decommissioning of the nuclear facilities.

As reported by GAO December 2001 "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could Be Improved" NRC reviews of financial arrangements exchanged in these

transfers and mergers "were not always rigorous enough to ensure that decommissioning funds would be adequate. Moreover, NRC did not always adequately verify the new owners' financial qualifications to safely own and operate the plants."

CL-48/24 The Yankee Rowe nuclear power station is a clear example of the inability to accurately assess the final cost of decommissioning. Originally decommissioning estimates ran under $100 million dollars while the current expenditures are estimated to be just under $500 million for the small 170 megawatt pressurized water reactor.
The Shoreham nuclear power station can not be relied upon as an accurate gauge for decommissioning costs as it never reached full power operation.

NRC SEEKS TO LIMIT PUBLIC REVIEW AND HEARINGS BY ESTABLISHING ARBITRARY "LEVELS OF SIGNIFICANCE" ON DECOMMISSIONING ENVIRONMENTAL IMPACTS

CL-48/25 **We have a fundamental dispute with the NRC effort to eliminate public review and full disclosure through public hearings on decommissioning practices and mitigating environmental impacts based on arbitrary and capricious categories for determining "generic" and "site specific" proceedings for nuclear power station decommissioning.**

CL-48/26 **NRCs "Levels of Significance and Accountability of Environmental Impacts" assign values of risk to affected communities as "small," "moderate" and "large" as thresholds for denying or conducting a public site-specific review and potentially a public adjudication for environmental mitigation. Our organizations argue that these broad categories established by NRC are largely baseless for the following reasons:**

1. The biological effects of radiation are deleterious. No safe threshold for radiation exposure for the general population (including the developing fetus) has been established.

2. There is a long history of unresolved regulatory conflict over radiation protection standards assumed to determine NRC risk assessments. Both federal and state agencies have sought to provide greater protection than NRC requires. In addition, NRC

3. The NRC risk assessment inappropriately ignores the population of children in its "critical group" evaluation as the population most vulnerable to residual radioactivity exposure from decommissioning operations.

4. There is a documented history of significant lapses in effective NRC oversight of decommissioning operations as reported by The General Accounting Office in May 1989 "NRC's Decommissioning Procedures and Criteria Need to Be Strengthened" (GAO/RCED-89-119). The GAO not only found that complete information does not exist for all licensed activities or buried wastes, but additionally that NRC was found to have terminated a license with contamination in excess of its guidelines and NRC regulations lacked a time requirement for document retention. NRC's checkered history does not provide justification for the agency to move forward with generic treatment of decommissioning nuclear facilities where affected communities are denied public review and full disclosure of contamination, the decommissioning plan and

THE DECOMMISSIONING ALTERNATIVES DO NOT WARRANT GENERIC TREATMENT THE ENVIRONMENTAL IMPACT STATEMENT AND ARE THEREFORE SUBJECT TO SITE SPECIFIC PROCEEDINGS

CL-48/27 **Alternative methods being considered by the NRC include "entombment" and "rubblization." These involve leaving more nuclear waste on-site in an effort to reduce industry's short-term decommissioning costs but are likely to increase long term costs to affected communities once the sites are abandoned after license termination. The proposed alternative methods**

additionally raise significant technical and environmental impact issues and conflicts with the permanent emplacement of so-called "low-level" radioactive waste at nuclear facility sites not originally licensed as regulated nuclear waste management facilities. The proposed alternative methods are tantamount to creating an unlicensed radioactive waste disposal site. These alternative methods must therefore be subject to review by the affected communities with full disclosure and documentation of the amount of radioactivity, the location and condition of all residual contamination and the types of radioactive contamination that remain on-site. On-site and off-site contamination and radioactivity and associated issues involved with extended institutional control must all be subject to site-specific public hearings.

CL-48/28 The NRC effort to approve alternate decommissioning methods constitutes significant uncertainty and an impediment to accurately estimate the real cost of decommissioning nuclear facilities. There is no real assurance that adequate funds will be available to safely and properly decommission the site and provide for remediation of all necessary cleanup. These regulatory and environmental issues do not support generic treatment of environmental impact statements. In fact because of the economic and technical and environmental uncertainties of the Rubblization and Entombment options, they should be subject to much more rigorous review than provided by this Supplement. This Supplement gives only cursory attention and unsubstantiated dismissal of potentially very serious environmental consequences of the Rubblization, Entombment and Partial site release options.

The Entombment alternative

As a decommissioning option, entombment provides for the utility to remove the irradiated fuel from the core for disposition through either on-site dry cask storage or away-from-reactor interim storage Once the fuel is removed, the facility is allowed to radioactively decay for a specified period of time up to 300 years before demolition and site clean up is achieved.

Rubblization as an alternative to licensed radioactive waste disposal sites

Rubblization is described as the partial decontamination and demolition of radioactively contaminated buildings at nuclear power stations. The interior concrete surfaces are only partially decontaminated and the entire structure (concrete, steel re-enforcement bar and other materials) is then razed to grade level into the foundation hole. The burial site is then covered over with soil cap. NRC and industry are also proposing that rubblized contaminated material can be hauled to landfills unlicensed for radioactive waste.

CL-48/29 However, the rubblization process must account for the permeation of porous concrete structures (containment dome, basemat, and walls) with radioactivity much deeper that surface contamination that would be sand blasted during a decontamination process. Activated concrete would be rubblized and would thus constitute so-called "low level" radioactive waste. Long-lasting radioactive elements such as cesium-135 and strontium-90 are present with many other fission products and radioisotopes in the concrete and should not be ignored or defined away. No data are provided in this Supplement to justify Rubblization and on-site or off-site disposition. Thus, local communities have every right to participate legally (in adjudicatory proceedings) and be provided with information- full disclosure of such planning.

CL-48/30 Essentially, the agency and industry are proposing that a so-called "low-level" radioactive waste dump can now be grandfathered on a reactor site without a formal permitting and licensing hearing process. The decommissioning utilities will provide an analysis that can "assure" that no ground water movement will occur through the radioactive burial site providing a potential transport mechanism and potential radioactive exposure to the public and environment. The utilities are to provide a "dose model" to "assure" the affected communities that the radioactive site will pose no health risks to present and future public health and the environment. These "assurances" cannot be bona fide by generic treatment and therefore require the availability of site specific proceedings.

CL-48/31 We concur with the GAO findings as reported in GAO-02-48 "NRC's Assurances of Decommissioning Funding During Utility Restructuring Could be Improved" dated December 2001. GAO reported the following conclusions:

"Rubblization represents a departure from NRC's past licensing practice, which emphasized

shipping low-level radioactive wastes from decommissioning sites to disposal sites. Although NRC has estimated that rubblization could save a licensee from $10 million to $16 million in waste disposal costs during decommissioning, its Advisory Committee on Nuclear Waste has concluded that technical factors, such as the depth of radioactive contamination and the volume of rubblized waste, could significantly diminish the potential cost savings. The Advisory Committee also believes that evaluating radioactive material content and doses from rubblization, both at the site and in local groundwater, may prove difficult and expensive."

CL-48/32 "The NRC staff's decision that entombment might reduce decommissioning costs is questionable."

"According to NRC's staff, 'very expensive remedies' could be required if an entombment configuration proved unable to adequately isolate radioactive contaminants over the 100-year or longer [up to 300-years by NRC projections] time period needed for radioactive decay. Given the length of time involved, states are concerned that they will have to pay remediation costs should an entombment fail."

CL-48/33 "Aside from questionable cost benefits, rubblization and entombment raise a number of technical issues. For instance, NRC does not intend to require that sites where rubblized radioactive materials would be buried have protection equivalent to off-site disposal facilities for low-level radioactive waste. Disposal facilities for commercial low-level radioactive waste, which are licensed and regulated by NRC oar by state (under agreement with NRC), must be designed constructed, and operated according to NRC regulations (or compatible regulations issued by the host state). In addition, to obtain a license to build and operate a disposal facility, the prospective licensee must characterize the facility site and analyze how the facility will perform for thousands of years. However, according to NRC, a rubblized site is not comparable to a low-level radioactive waste disposal facility... Nevertheless, 10 CFR Part 61 does not differentiate between what does or does not qualify as a low-level waste disposal action or facility on the basis of the quantity, forms, or range of the low-level radioactive waste to be buried."

CL-48/34 "Water intrusion is also a major concern for rubblized or entombed sites, and the fact that most nuclear power plants are situtated in shallow water table or flood plan locations may limit the viability of these options."

CL-48/35 The above reasons illustrate the lack of a sound basis for staff conclusions that the decommissioning alternatives of entombment and rubblization are of "minor" environment impact and can be treated generically to avoid public review and full disclosure in formal public hearings. We therefore adamantly oppose such generic treatment.

Overall concerns:
NIRS and numerous other organizations and local community groups have concerns with the following overall effects of this Supplement:

CL-48/36 NRC allows "rubblization" (crumbling the concrete reactor building) of nuclear reactors, without opportunity for public intervention until the action is completed.

CL-48/37 NRC allows portions of sites to be "released" from regulatory control before the whole site it released

CL-48/38 NRC opens up two "entombment" options.

CL-48/39 NRC ignores radiation dangers after decommissioning is done and utility is relieved of liability.

CL-48/40 NRC ignores radiation exposures to children and other vulnerable members of the population and creates a fictitious highest exposed "critical group" based on unsubstantiated assumptions.

CL-48/41 NRC ignores radiation offsite and permits utilities to ignore it in decommissioning planning. NIRS calls on the NRC to incorporate offsite contamination into all evaluations of environmental impacts.

CL-48/42 NRC prevents the National Environmental Policy Act from applying to most of the decommissioning process. (The claim appears to be that this proposed Supplement 1 satisfies the Environmental Policy Act for most of the decommissioning issues)

CL-48/43 NRC cleverly makes most aspects of decommissioning "generic" rather than site-specific, so they cannot be legally reviewed or challenged at individual sites.

CL-48/44 NRC redefines terms to avoid local, site specific opportunity to question, challenge and prevent unsafe decommissioning decisions.

CL-48/45 NRC sets arbitrary and unsubstantiated (low, medium and high) environmental impact categories for each of the steps in decommissioning, to give the appearance that they have minimal effects, to justify not fully addressing them now and to prevent their inclusion in site-specific analysis.

CL-48/46 NRC is removing the requirement for a license amendment when changing from a nuclear power operating license to a nuclear materials possession-only license. (With no license amendment, there is no opportunity for public challenge or adjudicatory processes)

CL-48/47 NRC is attempting, with this supplement, to legally justify the removal of the existing opportunities for community involvement and for legal public intervention until after the bulk of the decommissioning has been completed. This includes such activities as flushing, cutting, hauling and possibly rubblizing of the reactor.

CL-48/48 NRC states that the portion of the decommissioning regulations (10 CFR 20 section E and its Environmental Impact Statement, NUREG 1496) that set the 25, 100 and 500 millirems per year allowable public dose levels from closed, decommissioned nuclear power sites, are not part of the scope of this Supplement

CL-48/49 NRC defines decommissioning, in part, to include the "release of property for unrestricted use...." and the "release of property under restricted conditions..."
NIRS stands firmly against the "release" of radioactively contaminated materials into daily consumer use and commerce or unregulated disposal

Respectfully submitted,

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Letter 49, page 1

From: Eileen Greene <egreene@ikano com>
To: <dgeis@nrc.gov>
Date: 1/31/02 2.23AM
Subject: Comments on Decommissioning Nuclear Power Reactors EnvironmentalImpact Statement

11/09/01
66 FR 56721
49

CL-49/1 I am very concerned that children, who are much more susceptible to the effects of radiation, may not be being looked at in the Environmental Impact Statement. This is a very serious issue, & if left unaddressed, would not only be morally wrong, but could lead to a horrible name in history for the NRC, & possibly legal action.

CL-49/2 I am hopeful that you will act in the interest of the public, & listen to the concerns of all of the communities that will be affected by the by-products of nuclear energy. Offsite radiation is something that must not be ignored.

Thank you for looking into this.

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Template = ADM-013

E-RIDS = ADM-03
Add = M. Masnik (MTM2).

From: CAN <can@nukebusters.org>
To: <dgeis@nrc.gov>
Date: 1/31/02 1:13PM
Subject: Comments onGeneric Environmental Impact Statement onDecommissioning

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11/9/01
66 FR 56721
50

Template = ADM-013

E-RIDS = ADM-03
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Citizens Awareness Network
Comments on Draft Supplement 1 of the GEIS on Decommissioning Reactors

1

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CITIZENS AWARENESS NETWORK

January 30, 2002

Chief, Rules and Directives Branch
Division of Administrative Services
Mail Stop T-6 D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555

RE: Generic Environmental Impact Statement on Decommissioning Nuclear Facilities: Draft Supplement 1 Dealing with Decommissioning of Nuclear Power Reactors

Dear Sir or Madam:

By this letter, the Citizens Awareness Network (CAN) formally submits written comment on the draft supplement1 Generic Environmental Impact Statement (GEIS) involving the decommissioning of nuclear reactors. CAN provided the Nuclear Regulatory Commission (NRC) with verbal comment at the draft supplemental GEIS scoping meeting held in Boston, MA on May 17, 2000 and written comments in July 15, 2000. CAN is a volunteer, grassroots organization with chapters in reactor communities in MA, CT, VT and NY. We have over 3,300 members and represent the views of many thousands more. We attempted to email these comments on 1/30/02, but were unable due to server problems.

CL-50/1 The regulations are in violation of the appellate court decision in CAN v NRC. The court ruled that decommissioning remained a "major federal action" requiring National Environmental Policy Act (NEPA) compliance. CAN strongly urges the NRC to enforce NEPA compliance and require decommissioning

CL-50/2 reactors to undertake site specific Environmental Impact Statements (EIS). In addition CAN requests the Commission withdraw the proposed draft and revise it so that it complies with the ruling of the court decision. Until such a time when site specific EIS's are done, CAN requests that paragraphs below be incorporated into the draft supplement 1 GEIS.

CL-50/3 The Appellate Court justices opined that your agency was in violation of its own regulations and Rulemaking process in approving the experimental decommissioning at the Rowe reactor without a decommissioning plan and an environmental assessment. In addition, the court has ruled that decommissioning is a major federal action and requires NEPA compliance. "An agency can not skirt NEPA or other statutory commands by exempting a licensee from compulsory compliance, and then simply labeling its decision "mere oversight" rather than a major federal action. To do so is manifestly arbitrary and capricious." We believe NEPA

compliance is mandatory for decommissioning. A Generic Environmental Impact Statement can not substitute for an individual EIS, as computer modeling can not substitute for actual testing

CL-50/4 CAN believes it is essential for NRC to continue to define decommissioning as a major federal action. As the Appellate Court opined ".....it is undisputed that decommissioning is an action which, even under the
CL-50/5 Commission's new policy, requires NEPA compliance 10C.F.R S 51.95(b.)" CAN believes that streamlining the process for nuclear corporations and setting aside NRC requirements abdicates the responsibility to protect the health and safety of the workers, the public, the environment, and violates citizen due process. Nuclear power generators should not be given broad discretionary powers to regulate themselves, which this Draft proposes. Protecting public and worker health and safety and the environment must remain the NRC' mission.

CL-50/6 Can requests the NRC restore distinct categories between reactor operations and cessation and that the Possession Only License should be reinstated. It affords citizens the possibility for a hearing prior to reactor decommissioning. The opportunity for a hearing must not be withdrawn by the Commission. The hearing is essential for communities to participate in matters that vitally effect them. To offer a hearing at the termination of the license rather than at the cessation of operations sets aside meaningful citizen participation.

CL-50/7 Major component removal should not be approved with the submission of a Post Shutdown Decommissioning Activities Report (PSDAR). A clear definition must be established to clarify what constitutes major and minor component removal. Approval of decommissioning plan should be required before major decommissioning activities begin The PSDAR does not afford the community effective input into the decommissioning
CL-50/8 process since this document is a skeletal outline of generalized activities planned by the licensee. The elimination of sub part M hearings coupled with the instituting of sub part L further inhibits public participation and is a violation of citizens constitutional rights guaranteed under section 189a of the Atomic Energy Act.

CL-50/9 The PSDAR skirts accountability and obstructs required public participation. The PSDAR does not require a clear description of the methodologies so that the public can understand what will be taking place during decommissioning Only with a sufficiently detailed plan, can the public meaningfully research, investigate, formulate comments and questions, and possible objections to the decommissioning activities. A meeting does not afford citizens the level of institutional accountability necessary given the dangers of enviro-toxic contamination inherent in the reactor cessation Informational meetings, as experienced at Yankee Rowe, CT Yankee, Maine Yankee, and Millstone Unit 1 obfuscated, confused, and ignored the concerns of local citizens. Both the Federal District Court and the Appellate Court chastised the agency for this approach. If the community has concerns, and there is no regulatory recourse save one "meeting" with NRC, the Commission will, in fact, create polarization between the community and regulator leading to erosion of public confidence in the NRC

Further Comments:

CL-50/10 1. Health problems in the community must be determined and taken into consideration when decommissioning plans are being established since continued exposure to radiation through routine decommissioning releases and the inadvertent release of hot particles can jeopardize the health and safety of the public.

CL-50/11 2. New environmental assessment documents must be required, as old assessments are outdated and have been found to be inaccurate both on and offsite.

CL-50/12 3. Although the NRC claims numerous successful decommissionings of nuclear sites, few large-scale reactors that operated for decades have completed successful decommissioning Decommissioning remains experimental. Resources and time required for decommissioning a site have been routinely underestimated. More importantly, worker doses have been repeatedly underestimated. Safe decommissioning is about radiological control and the need to limit exposures to the workers. Nuclear corporations have failed to do this because of inexperience and a lack of enforcement by the NRC. With over 100 nuclear reactors yet to be decommissioned in this country, cutting decommissioning exposures by 200-300 person-rem per reactor will reduce the nation's nuclear workforce exposures by 20,000-30,000 person-rem.

CL-50/13 4. Nuclear reactors, through planned and unplanned radioactive releases, can create plumes of contamination, which migrate offsite. Yankee Rowe currently has a plume, which reached springs, feeding into the Deerfield River where residents recreate. Connecticut Yankee has plumes of tritium and other radionuclides which have migrated into the aquifer and the Connecticut River for decades. Accountability (i e. remediation and/or long term monitoring) for plumes of contamination that have
CL-50/14 offsite consequences must be established. Furthermore, accountability must be established for routine NRC-regulated releases, which have accumulated in the discharge pathways Big Rock Point, Millstone Unit 3 and other reactors have identified contaminated sediment caused by such releases Remediation must capture such plumes both onsite and off.

CL-50/15 5. Methodology must be established to locate and collect for proper disposal contaminated tools, soils, concrete blocks, plywood and other building materials that may have been taken offsite by workers during reactor operation such as was the case at Connecticut Yankee and Yankee Rowe.

CL-50/16 6. In addition to onsite worker doses, decommissioning exposure calculations must capture and include doses incurred by workers involved in offsite reactor decommissioning activities i.e. shipping, decontamination, smelting, recycling etc. of all radioactive materials and components.

CL-50/17 7. Using an adult male as the average member of the critical population for dose calculations in site release criteria does not establish effective clean-up standards. The adult male assumptions address workers during reactor operation, however when reactor sites are released for unrestricted use the "average member" of the critical population requires the inclusion of children since they bear the greatest burden of the affects of ionizing radiation as described in the Biological Effects of Ionizing Radiation (BEIR) V report.

CL-50/18 8. The License Termination Plan (LTP) should be established, reviewed by the public and approved by the NRC before site remediation begins.

CL-50/19 9. Partial release of property for unrestricted use should not be allowed until the LTP has been established, reviewed by the public, approved by the NRC and implemented on the given piece of land. Furthermore, methodology should be established for preventing recontamination of the released

property through environmental migration e g. rain, wind, etc and future decommissioning activities i e excavating, tracking or relocating contaminated materials.

CL-50/20 11. Clear methodologies should be established for the clean up of transuranics and hot particles. Yankee Rowe failed to include transuranic measurements in its LTP and currently Connecticut Yankee intends to avoid doing direct alpha measurements (and beta measurements) through less expensive surrogate measurements of easier-to-detect radionuclides through less expensive surrogate measurements of easier-to-detect radionuclides. Surrogate measurements must not be allowed at sites where consistent ratios of radionuclides do not exist.

CL-50/21 12. The burial of radioactively contaminated material as a means of *site remediation* is unacceptable for property that is to be released for unrestricted use. Rubblization (the burial of contaminated rubble) must not be permitted under any circumstances. The permission to build nuclear reactors hinged upon the utilities' commitments to regulators and the community to restore the site to "green fields". Rubblization is a blatant default on cleanup commitments, is a gross injustice to reactor communities and is a regulatory cave-in to utilities' desires and financial needs. In response to rubblization CAN also incorporates by reference Contention's 5 2 and 5.3 submitted by the organizations to the Commission on March 12, 2001 regarding Haddam Neck Reactor's License Termination Plan (Docket No. 50-213-OLA).

CL-50/22 13. Given the repeated and serious exposure of workers during decommissioning of reactor sites, an onsite NRC inspector should be required throughout decommissioning to protect worker health and safety.

CL-50/23 14. Nuclear corporations should not be allowed to decommission reactors under an operating license through a series of amendments nor should they be allowed to create an Independent Spent Fuel Storage Installation (ISFSI) under an operating reactor license when they are decommissioning Decommissioning reactors installing ISFSI's should be required to go into a part 72 license to provide adequate regulatory oversight protect public health and safety. The part 72 general license provision for creating an ISFSI at an operating reactor was never intended to cover a decommissioning reactor when regulatory oversight is minimized.

CL-50/24 15. Public participation must be instituted for the creation of the ISFSI. At present, the creation of an ISFSI falls into a regulatory no man's land At the NRC pre-hearing on the Yankee Rowe LTP, the NRC administrative law judges were instructed by the commission not to address any contentions concerning the storage of high-level radioactive waste. The creation of the ISFSI has serious consequences for each reactor community that could last hundreds of years. That the public can not participate in the process - give comments, request hearings, intervene - is unreasonable and undemocratic.

CL-50/25 16. Given the recent experience with wild fires at the Los Alamos and Hanford Nuclear Reservation and now the potential for flooding and massive soil erosion, the NRC should re-evaluate risk assessments and dose calculations for decommissioning reactors.

CL-50/26 17. Methodology must be established to determine the extent of underground rad waste contamination and burial. The Multi-Agency Radiological Site Survey and Investigation Manual (MARSSIM) establishes measurement criteria for only 6 inches below the surface of soil. MARSSIM does not

address the serious problem of locating and remediating underground contamination. Before 1980, the NRC in fact allowed the burial of rad waste onsite. A General Accounting Office (GAO) investigation found that the routine burial of rad waste 4 feet deep at reactor sites before 1980 occurred without adequate documentation.

CL-50/27 19. Each reactor community should have representatives trained in MARSSIM and other protocols by the NRC so that they can effectively comment and express their concerns about the adequacy of the procedures being used.

CL-50/28 20 In the aftermath of September 11th, NRC and licensees must address earlier assumptions that decommissioning was less dangerous than operation and that security measures and insurance could be reduced because of it. Nuclear fuels pools as well as on site dry cask storage of high level waste are targets for terrorism. In fact decommissioned sites could be selected as targets because there is less security and oversight during decommissioning and the monitoring of the ISFSI. NRC must required increased security and the reinstatement of insurance provisions. Additionally, emergency preparedness drills and the EPZ should be reestablished. KI should be stockpiled in communities since the potential for off site consequences from a terrorist attack is possible.

Sincerely,

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January 30, 2002

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66 FR 56721
51

Comments on the Draft Supplement to the 1988 "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities."

CL-51/1 The primary reason I am submitting the following comments is to urge the Nuclear Regulatory Commission to maintain its commitment to study the operating history and resulting contamination of each reactor on a site-specific, not generic basis — in its effort to design appropriate decontamination and decommissioning requirements for each site. Only in this way can there be any hope of achieving the requisite, long-term isolation of the contaminants from the human environment.

CL-51/2 1. Site specificity: Many questions regarding decommissioning require site-specific and reactor-specific analyses. The Callaway plant, for example, here in Missouri, is located about 5.5 miles away from the Missouri River, the source of the plant's cooling water and the depository for its liquid effluent. It would seem that testing would be needed of the unusually long effluent-discharge pipe in order to determine where leakage may have occurred during the plant's operation and where soil excavation may therefore be required as a part of the decommissioning.

Sediment samples would be needed where the discharge pipe releases the plant's effluent into the Missouri River. Without such site-specific analyses, a determination of the extent of the riverbed's contamination would not be possible. According to a series of reports published in 1970, 1974 and 1976, by the US Environmental Protection Agency's Office of Radiation Programs, radioactive fission and corrosion products traceable to Dresden-One, Haddam Neck, and Oyster Creek had accumulated in those reactors' discharge areas in the Kankakee River, the Connecticut River and Barnegat Bay, respectively. (BRH/DER 70-1; EPA-520/3-74-007; and EPA-520/5-76-003).

CL-51/3 Reactor contaminants in the sediments in the EPA studies included cesium-134 and –137, cobalt-58 and –60, manganese-54, and antimony-125. With evidence that these isotopes were able to bypass the liquid waste filters, it would seem probable that other fission, activation and corrosion products could have, too. And of course some reactor isotopes are extremely long-lived. I am reminded of the following discussion in a 1978 NRC publication on decommissioning:

> Based on the guidance put forth in [Atomic Energy Commission] Regulatory Guide 1.86 ["Termination of Operating Licenses for Nuclear Reactors," June 1974], entombment of a reactor facility requires the encasement of the radioactive materials in concrete or other structural material sufficiently strong and structurally long-lived to assure retention of the radioactivity until it has decayed to levels which permit unconditional release of the site. (In previous reactor decommissioning, it was assumed possible to entomb the reactor pressure vessel and its internal structures within the biological shield since the principle source of radiological dose was cobalt-60, which decays with a relatively short half-life (5.27 years) Thus, within about 100 years, the residual

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> radioactivity will have decayed to levels indistinguishable from normal background, well within the safe structural lifetime of the entombment structure. The presence of any niobium-94 was ignored. The amount of nickel-59 formed in the relatively brief operating life of these early plants was sufficiently small as to present no significant hazard. However, in large power reactors that have operated for 30-40 years, the induced niobium-94 and nickel-59 activities in the reactor vessel and its internal structures are well above unconditional release levels and, since nickel-59 has an 80,000 year half-life and niobium-94 has a 20,000 year half-life, the radioactivity will not decay to unconditional release levels within the foreseeable lifetime of any man-made surface structure. ("Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130; pp. 4-5, 4-6; emphasis added)

CL-51/4 Nickel-59, mentioned above, is produced when the nickel-58 in stainless steel captures electrons. Since the EPA found corrosion products in the sediment of several metals for which they tested, is it not possible that other metals subjected to the reactor's hostile environment (repeated cycles of temperature and pressure; high neutron fluxes, harsh chemicals, etc.) may also have degraded or dissolved, and migrated out of the plant? Could they be detected in the sediment if tested? Some of the corrosion products identified in the oxide layer ("crud") of various reactors include isotopes of iron, zinc, molybdenum, tungsten, titanium, and carbon. (I would be happy to send a copy of the comments I submitted to the NRC on July 16, 1980, regarding the Draft Environmental Statement on the proposed use of chelates to decontaminate Dresden One in Illinois. Information on chemical decontamination is cited from AEC, EPRI, GE reports, and more.)

2. Rubblization: This word is relatively new to me. But amazingly, the concept is not. I remember when our family first drove by the Elk River reactor in Minnesota on a brief, educational side trip with our children. This was some time before November 1974, when I first began reading and working fulltime against nuclear power. When we drove by Elk River again, four or five years later, the plant had completely disappeared.

Several years after that I learned from one of the former Elk River workers that they had used explosives to "dismantle" the plant. I was incredulous then; I still am. The list of explosives employed for the rubblization of this one small reactor is impressive, or more precisely, worrisome: PETN (pentaerythritol tetranitrate), 85% high velocity gelatin dynamite, cast TNT (high detonation pressure primers), binary energy system (liquid explosives) and water gel explosives. (From the revised "AEC-Elk River Reactor Final Program Report," November 1974, p 31). To quote further from that report:

> For obvious economic reasons, it was desirable to dispose of as much demolition debris as possible in local landfills. Because there were no burial facilities for radioactive materials in the State of Minnesota, and because of existing adverse public reaction to the nuclear industry from certain sectors, great pains were taken to insure that little, if any, radioactivity remained in the structures that were disposed of in Minnesota. For these reasons, the term 'detectable reactor originated radioactivity' or DROR was specified contractually and defined for this project. It should be emphasized that DROR as defined below is unique to the Elk River Reactor project, is a one-time requirement, and there is no intent to suggest a guideline for future decommissioning actions or to supercede guidelines issued by the [AEC] Director of Regulation. The term DROR was applicable only to demolition rubble that was to be left in the State of Minnesota and was defined procedurally by a special sampling and analytical method. (pp. F-4, -5)

Elk River was indeed a tiny reactor — its net electrical output was only 22.5 megawatts, compared with the Callaway plant which was designed and built to provide 1120 megawatts and was subsequently, somehow, allowed to be uprated to 1171 megawatts. To quote further from NUREG/CR-0130:

> [Elk River had operated] for the equivalent of only 2.5 EFPY [effective full power years] when it was dismantled. Thus, the concentrations of the longer-lived radionuclides in the Elk River reactor were quite small compared to the concentrations that will be present in a large PWR [pressurized water reactor] after 30 EFPY of operation. (p. 7-16; emphasis added)

CL-51/5 I understand that Elk River is the only US commercial reactor that has been completely dismantled down to its original greenfield state. It so completely disappeared, in fact, that it is not even mentioned in the "Draft Supplement," in the tables of "permanently shutdown plants" (for example, at pp 3-27, 4-44, and Table F-1). And speaking of Appendix F, by the way: please note

CL-51/6 in Table F-2 that the Callaway plant is located in Missouri, not in Montana.

CL-51/7 It is extremely important for the NRC to level with the public about the potential hazards of the concrete debris and related rubble from the dismantled plants. The porous concrete floors get radioactively contaminated during the operation of the plant. "Radioactive corrosion products and fission products from failed fuel, which are transported throughout the station by the reactor coolant streams, are the principal contributors to the more mobile radioactive contamination on piping, floors, and pool surfaces." (NUREG/CR-0130, June 1978, p.7-15.) Radioactive products can also enter the primary cooling water from pin-hole leaks in the fuel rod cladding; from the fissioning of "tramp uranium" left on the surface of the fuel rod during the fabrication of the fuel; and out of defective welds at the top and bottom of the fuel rod. The cooling water gets contaminated, and it can and does leak onto the plant floors during various routine and accidental activities.

Radioactive fission gases that escape out of the fuel rods can also escape out of the reactor vessel. Some dissolved and entrained noble gases are released to the environment in the plant's liquid wastes Some are vented or purged into the atmosphere. And some migrate into the porous walls, the base mat (floor) or other sub-grade concrete, or the dome or roof of the buildings Radon gas, for example, once in the interstices of the concrete, can decay or break down into radioactive solid daughter products, such as lead-210 that remains radioactive for more than 200 years. Xenon isotopes that permeate the concrete break down into cesium, including Cs-135 with a half-life of 2.3 million years. And krypton, also a fission gas, breaks down into rubidium, and then into strontium. As was admitted during the years of nuclear weapons testing and fallout, cesium and strontium are notoriously radiotoxic. As daughter products of the fission gases, they could remain entrapped in the rubblized concrete, releasing radioactive particles and rays into the air for at least ten half-lives, or they could leach into the groundwater. The rate of dispersal of the radioactive and hazardous contaminants in the rubble cannot be accurately predicted. Natural phenomena, for example, could affect the susceptibility of the radiation to be released. (Regulatory Guide 1.86, p 2)

CL-51/8 Because of the potential presence of highly radioactive "hot particles" in unexpected areas throughout the plant, particularly in the reactor containment building, the rubblized materials proposed for on-site disposal could be more than just "slightly" contaminated. Contrary to the Draft Supplement, at page 1-7, for example, I think it is important to note that the rubblization of concrete could have radiological impacts as well as non-radiological ones. This is of special significance if

CL-51/9 explosives are to be used for the demolition, which will generate radioactive fugitive dust.

CL-51/10 How could the NRC, with its limited surveillance staff, make certain that each licensee would search conscientiously for contamination on the interior as well as the exterior surfaces of pipes,

CL-51/11 drain lines and ductwork? To what extent will chemical decontaminants be used? Chelating agents not only dissolve radioactive isotopes (such as corrosion products), but they keep them in solution and thus subject to widespread dispersal in the environment. (I likened this phenomenon to burying radioactive wastes with roller skates on.) If chelates are used during decommissioning, will the discharge water containing the dissolved, chelated radioactive wastes be kept isolated from the environment until the chelates are broken down?

You will perhaps be interested in the following comment by Robert Bernero, who at the time was the NRC's assistant director of material safety studies. He was quoted in a June 18, 1974, Miami Herald article as saying that "the NRC staff currently favors a policy that would require decontamination and dismantling after a unit is retired from active service. 'It doesn't make any sense just to seal up a nuclear power plant and leave it,' he says. 'An orderly society should select burial grounds for its nuclear waste. It should not expect to use power plant sites for that purpose.' " (emphasis added)

CL-51/12 I find it hard to believe that the massive structures of concrete and steel reinforcing bars found in a typical commercial power plant could be rubblized. The complexity and size of the task seem overwhelming. What technologies could be used to dismantle the base mat of the Callaway reactor building, for example: 13,400 tons of concrete plus 1,470 tons of intertwined #18 reinforcing steel

CL-51/13 bars? Do most 1,000-megawatt pressurized water reactor containment buildings have similar base

CL-51/14 mats? How can the radioactive content of this structure be accurately estimated? If rubblization

CL-51/15 were technologically achievable, where on a plant site could the wastes be stored in perpetuity? Would that be above grade or below? Would a leachate collection system be required where the rubble is stored in order to monitor for potential impacts on the groundwater?

CL-51/16 Since the NRC would no longer have regulatory authority over the site, what governmental institution or corporation would be entrusted with the long-term collection, monitoring and analyses of the groundwater samples? Who would determine if remediation were needed; who would be

CL-51/17 liable for the costs of off-site contamination or other accidents? Who would be responsible to

CL-51/18 protect against the inadvertent recycling of radioactively contaminated building rubble and soil into new construction or as fill, a possibility mentioned but basically discounted in SECY-00-0041, a letter about rubblized concrete dismantlement, from William Travers, NRC Executive Director for Operations, to the Commissioners (February 14, 2000)?

CL-51/19 3. Costs: Because of current efforts to restructure and deregulate the electric power industry, decisions about decommissioning could be driven by economic considerations, not by safety — by efforts to cut costs in order to stay competitive. I believe the electric utilities should not be relieved of liability for their decommissioned reactors

CL-51/20 Because of deregulation, the US public must rely more than ever upon the NRC to maintain its authority and responsibility to identify, assess and regulate the full range of potential, high-risk impacts of every commercial reactor — before, during and following its decommissioning The NRC is our only option.

CL-51/21 4. The threat of terrorism: With terrorism now a legitimate concern in the United States, the potential of a suicide assault on a nuclear plant --- whether the plant is operable or decommissioned --- must be assessed plant by plant, not generically.

CL-51/22 No facility exists for the permanent disposal of the nation's high-level waste (irradiated reactor fuel), and only one burial site, in Barnwell, SC, is currently available to most reactors for the rest of their wastes (their so-called "low-level" wastes, which ultimately could include the rubble and dismantled components from decommissioned plants). That one "low-level" waste facility, however, that is serving most of the nation, is expected to be closed in the near future to non-Southeast-US reactors.

Because of the lack of off-site disposal facilities, it is understandable that the NRC staff would be promoting rubblization, and on-site burial and bunkering of the rubble after decommissioning. According to the Code of Federal Regulations, Title 10, 50.82; "Decommissioning will be completed within 60 years of permanent cessation of operations." That time frame takes in all reactors in operation today. Even if off-site disposal space were available to host all the nation's decommissioning rubble, the cross-country transporting of such large volumes of waste would probably be prohibitively expensive and would no doubt be protested by the residents of the corridor communities.

CL-51/23 The transformation of the nation's abandoned nuclear power plants into de facto waste facilities is worrisome from environmental, safety and national security standpoints. To quote from President George W. Bush's State of the Union address yesterday: "Our discoveries in Afghanistan confirmed our worst fears .... And the depth of their [our enemies'] hatred is equaled by the madness of the destruction they design. We have found diagrams of American nuclear power plants and public water facilities ...." (NYT, Jan. 30, p. A22; emphasis added)

Articles published for decades have predicted today's disturbing conundrum: The Wall Street Journal on October 12, 1977 --- "Scrapping the atom; U.S. is facing problem of how to dismantle used nuclear reactors; Agency hit for not having long-term burial plan; Tombs and mothballing; Can a big plant be cut up?" The Miami Herald on June 18, 1979 --- "Nuclear cleanup: Power plants generate a long-term dilemma." The Progressive in December 1977 --- "A Landscape of Nuclear Tombs: What will we do with deactivated reactors, and who will pay for doing it?" The Interdependent, of the United Nations Assn., September 1977 --- "How do you get rid of a dead nuclear plant?" Technology Review of MIT, June/July 1979 --- "Decommissioning Commercial Nuclear Reactors: Nuclear power plants do not last forever. In the United States some large commercial reactors are scheduled for decommissioning within the next 20 years and many others will follow. But the process and its costs are still subject to uncertainties."

The more I learn about nuclear power's radioactive waste, the more I wonder if and when its proponents will admit that no safe solution may ever be found.

5. Concerns --- from the past and into the future:

CL-51/24 Surely the most surprising and disturbing pronouncement in the "Draft Supplement" appears on page 1-7: "The decommissioning process continues until the licensee requests termination of the license and demonstrates that radioactive material has been removed to levels that permit termination of the NRC license. Once the NRC determines that the decommissioning is completed,

the license is terminated. At that point, the NRC no longer has regulatory authority over the site, and the owner of the site is no longer subject to NRC regulations." (p 1-7; emphasis added)

CL-51/25 The federal government (the US Atomic Energy Commission and its progeny) initiated and funded the promotion of nuclear power. How, then, can it walk away from the long-term surveillance of the plant sites, even though it will have declared the residual radioactive contamination to be at permissible levels? As happened here in St. Louis at the Mallinckrodt Chemical Works, buildings and land contaminated in the years 1942-1957 were cleaned up to contaminant levels declared to be safe for unrestricted use by the public. Not many years later, however, some of those same buildings and open spaces were found to require major additional remediation because radiation standards had became more stringent, reflecting a greater understanding of the health hazards of radiation. Monitoring equipment also had become somewhat more sophisticated.

CL-50126 Concerns and unknowns about the decommissioning of nuclear power plants started many years ago. In January 1975, for example, Sheldon Meyers, as director of the EPA's Office of Federal Activities, included the following observation about the Callaway plant's draft environmental statement: "The section in the draft statement regarding decommissioning of the plant indicates the plant site may require long term surveillance after being shut down. This section should be expanded to provide an estimate of the length of the surveillance time and the length of time the land must stand unproductive. It should also identify who will be responsible for the surveillance activity and who will incur the cost." (published by the NRC in March 1975; p. A12, emphasis added) Why has no one answered these concerns prior to now? Or are there no credible answers?

6. Some concluding comments:

CL-51/27 I guess one of the reasons I wanted to comment on this "Draft Supplement" is because it so dramatically reflects the backward world of Alice in Wonderland and of commercial nuclear power: "Sentence first --- verdict afterwards." **Make a permanent mess first --- try to figure it out afterwards.**

Because I have been studying and opposing nuclear power for 27 years, it should not surprise you that my dream would be for America's nuclear electric utilities to expedite the shutdown of all their reactors. The questions raised above --- and I have many more --- are not meant to be hostile and are certainly not meant to suggest that decommissioning a reactor should be made more burdensome, dangerous or costly than its continued operation. On the contrary.

The longer the reactor operates, the greater will be (1) the levels of radiation to which the demolition workers will be exposed, (2) the volumes of radioactive waste generated and stockpiled; and (3) the risk of a major radiological emergency. And now I guess we should add, the greater will be the potential for acts of radiological sabotage or terrorism (as per 10 CFR Part 73).

CL-51/28 The reactors must be decommissioned in a prudent manner that will seek to protect the health and safety of the workers and the public. In the United States we must rely on the Nuclear Regulatory Commission for its knowledge, guidance and surveillance. I hope that trust is warranted.

Sincerely,

Kay Drey

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RE: Draft Supplement 1 to the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586

Dear Madam or Sir:

CL-52/1 The following comments on Draft Supplement 1 to NUREG-0586 are submitted on behalf of the Pennsylvania-based Environmental Coalition on Nuclear Power (ECNP) We concur with and adopt by reference the comments of the Nuclear Information and Resource Service, submitted by Paul Gunter

In our state, decommissioning of the Shippingport reactor, Saxton and Waltz Mills experimental reactors, and the Quehanna industrial nuclear facility and former reactor have occurred. The old Molycorp thorium processing facility near Washington PA is currently in the early stages of decommissioning. The Peach Bottom Unit 1 and Three Mile Island Unit 2 reactors have been awaiting decommissioning for more than twenty years. The nine other operating commercial reactors will ultimately also require decommissioning upon expiration of their operating licenses, as will numerous other industrial and research nuclear facilities

CL-52/2 . This Supplement to the Final GEIS fails to address decommissioning of nuclear facilities other than commercial reactors. It therefore fails to take into account the subject of NUREG-0586: the environmental impacts of decommissioning nuclear facilities -- all nuclear facilities

CL-52/3 Moreover, in order to assess the full environmental impacts of each facility's decommissioning, it is necessary to take into account its impacts in concert with the impacts of all other nuclear facilities that contribute additive radiological and other contamination to the biologic system.

Pennsylvania remains the Host State for "disposal" of the "low-level" radioactive wastes generated in the Appalachian States Regional Compact, despite failure of the contractor, Chem-Nuclear Systems, to site a LLRW disposal facility. The Department of Environmental Protection recently adopted expanded permissible disposal of radioactive materials at municipal landfills Pennsylvania has not yet obtained Agreement State status. Our law provides for regulation by the state of radioactive materials and wastes if NRC releases them from its regulatory control.

Moreover, the Pennsylvania Constitution provides that the people of the Commonwealth have the right to a clean, livable environment for themselves and for their descendants. Thus, for these several reasons, the decommissioning decisions of the NRC are of substantial concern to residents of this Commonwealth, where the nation's worst commercial nuclear power accident has not been forgotten.

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CL-52/4 A fundamental obligation of the NRC is to protect the health and safety of the public and the quality of the environment – the general welfare – from radiation-related harm Failure of NRC regulatory control to require that the radioactively-contaminated materials and wastes remaining at a reactor site post-closure will not be released into the biosystem -- as described in this document and in NRC regulations – constitutes a serious violation of the provisions of the Atomic Energy Act, as amended, Chapter 1, and of the National Environmental Policy Act. Any such decisions by the NRC are therefore arbitrary and capricious, and contrary to both the AEA and NEPA.

CL-52/5 In practice, in the decommissioning of reactors the NRC's Decommissioning Rule has both allowed release into the environment of radioactive materials and wastes and disallowed members of the affected public from an opportunity for adjudicatory hearings in advance of

CL-52/6 decommissioning activities. These denials of access to the judicial system are currently being extended in the form of NRC's proposed Rule, "Change of Adjudicatory Process," compounding

CL-52/7 the illegalities inherent in this Supplement. Increasingly, no forum is available to citizens in which to exercise their rights under the Federal Administrative Procedure Act. This is yet another reason that this Supplement is unacceptable and should be withdrawn.

CL-52/8 Furthermore, a "generic" EIS cannot provide adequate assurance that the unique situation and condition of each nuclear facility have been fully analyzed and accounted for Each plant is unique; each plant's impacts must be examined in relationship with all other nuclear facilities that affect the condition of the environment. In the real world environment, radioactive and hazardous materials are not necessarily static, they move; they interact with other materials; they accumulate; they may have their adverse impacts at or near their site of origin or far away from it. The totality of those impacts, upon both human and non-human inhabitants of the biosphere, must be incorporated into an environmental analysis and accounted for fully also for adversely affected individuals in any cost-benefit analysis. All issues should be examined at each plant.

CL-52/9 Exclusion of licensee decisions and actions prior to certification that plant operations have permanently ceased means that the Supplement fails to consider factors that may have negative impacts on the quality of the decommissioning activities and on minimization of the quantity and condition of the wastes resultant from the handling and removal of radioactive

CL-52/10 materials from plant structures, systems, and components. Exclusion from consideration of the fate of contaminants post-license termination also renders this Supplement insufficient and not

CL-52/11 acceptable to account for the environmental impacts of decommissioning. In effect, the NRC plans to wash its hands of any responsibility for the long term damage that may result from reactor decommissioning (and that of all other nuclear licensees' facilities and activities. It is the state or municipality and community in which a plant is located and the residents that will be required to bear the burdens of injury and costs of further clean-up after the NRC has vanished

CL-52/12 Underlying these failures of the agency's responsibility for the facilities and activities that it had sanctioned by granting an operating license and through its regulatory actions and inactions is the failure of the NRC – and of EPA – to set radiation protection standards that recognize the

CL-52/13 great varieties of adverse effects of low-level radiation on human beings. Affected populations are composed of many individuals who are not close to being that "standard man" in whom the
CL-52/14 NRC places so much faith. The trans-solutional problem of complete site decontamination is here evident: the NRC does not require the return of a decommissioned facility and site to its pre-
CL-52/15 operational radiation level. Because the costs of sequestration ("disposal") of wastes is high, and deemed to be a "burden" for the licensee, the agency continues its endeavor to allow massive deregulation -- release, recycle, and re-use -- of radioactively-contaminated materials and wastes and their entry into the "free market" for resale and reuse in a host of consumer products

CL-52/16 Subsequent uses of these "slightly contaminated" materials and wastes -- in roadbeds, or construction, consumer products, or other objects individuals may contact -- will each add to the
CL-52/17 radiation doses received without knowledge or consent of the recipient. These exposures from multiple unmonitored, unlabeled, uncontrolled sources are in no way accounted for, but they are additive and cumulative for that individual. They violate the fundamental tenet of radiation protection. *viz.*, that the recipient of a radiation dose that is in addition to naturally-occurring background exposures should receive a benefit equal to or greater than the risk incurred. The
CL-52/18 NRC should not permit radioactive materials or wastes to be released into the environment. That is the basic message, the rightful demand of all those who will be affected negatively by releases.

CL-52/19 As techniques of research and analysis in complex biological systems improves, it is becoming more apparent to thoughtful, careful scientists and regulators that it is imperative to include the impacts of low-level radiation exposures on all forms of living beings, not merely on
CL-52/20 humans But it is also increasingly important to incorporate into radiation protection standards
CL-52/21 low-dose effects. An EIS must also consider the effects of the synergies between and among ionizing radiation and the multitude of hazardous materials also released into the environment.

CL-52/22 • Instead, the NRC has chosen to abandon its former regulatory philosophy (defense in depth and redundancy of safeguards) in favor of the far less restrictive and less protective
CL-52/23 approach (performance-based and risk-informed). The relaxation of regulatory control is also evident throughout this draft volume. Decommissioning is the final chapter for the agency in its relationship to a given site and license. For people, the community, municipality, and state, it is the beginning of an essentially endless association with a nuclear site that may continue to
CL-52/24 endanger their lives and environment. The NRC has a statutory obligation to do a better job

CL-52/25 These admonitions have been presented to the NRC repeatedly in many Commission and staff meetings, agency panels and workshops, public hearings, legal proceedings. Until they are heard, adopted, and adhered to, this Supplement, the Final GEIS on Decommissioning of Nuclear Facilities and the Decommissioning Rule and NRC's radiation protection standards will continue to be inadequate and in violation of the applicable laws, including but not limited to the AEA, NEPA, and APA cited above. All four should be withdrawn and entirely rewritten to provide true protection from radiological contaminations.

Sincerely,

Judith D. Johnsrud

11/9/01
66 FR 57121
(53)

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Comments of the San Luis Obispo Mothers for Peace
On the NRC Draft GEIS on Decommissioning
Nuclear Power Plants

The San Luis Obispo Mothers for Peace (SLOMFP) is aware that the comment period ended on January 30, 2002. Regardless, it is compelled to submit the following comments on the draft GEIS and observations from transcripts of NRC meetings.

Comments:

1. The SLOMFP echos the statement of Sara Barczak representing Georgians for Clean Energy at the Georgia meeting regarding the following:

CL-53/1 a. SLOMFP is troubled by the inability of the public to have adequate access to the NRC website. Prior to the censorship, the existence of the website had been viewed as a giant step forward in communication between the public and the Commission.

CL-53/2 b. A reduced security force at a decommissioned nuclear plant increases the threat of terrorism. A thorough amended review of necessary security measures during decommissioning of nuclear facilities [due to 9/11] must be compiled by the NRC and added to the supplement.

CL-53/3 c. Existing nuclear power plants are not generically designed and, therefore, a generic program for decommissioning is completely inadequate to protect public health and safety. New and site specific Environmental Impact Statements must be required to address how different power plants should be decommissioned (from the standpoint of historical operations, age-related degradation, salt water intrusionâ€¦) in the safest manner possible for each location. In the case of Diablo Canyon, new seismic information should be sought to assure the public that the process would not increase the dangers of an already dangerously sited nuclear plant.

CL-53/4 d. When California's nuclear plants received licenses for construction and operation, promises were made that high-level radioactive waste would be removed within a few years. Every deadline to open a safe and permanent repository for high-level radioactive waste has been missed. Therefore, the issue has grown; we are not accessing only the decommissioning of a power

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plant but dealing also with storage and transportation of lethal substances unforeseen when licenses were granted.

Observations:

CL-53/5 SLOMFP reviewed the four transcripts from the four meetings held by the NRC on the draft GEIS and was appalled by the waste of taxpayer dollars. The NRC gave 10 individuals representing 10 different environmental groups only 5 minutes each to express their concerns. Furthermore, it is outrageous that the NRC located these proceedings hundreds of miles from the affected communities - and those who are most concerned about the decommissioning of nuclear plants. There is no doubt that the lack of public participation was due to the location of the meetings, not to lack of public concern. Mr. Cameron has heard this concern expressed in the past.

CL-53/6 Both the NRC and taxpayers would have been better served by sending the draft GEIS to all individuals and groups that have demonstrated interest in safety issues at nuclear plants over the last two decades, with a questionnaire, a comment section, and a self-addressed, stamped envelope.

Sincerely,

Rochelle Becker February 2, 2002
San Luis Obispo Mothers for Peace

Cc: Senator Dianne Feinstein
Senator Barbara Boxer

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10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

This document is a final supplement to the NRC Generic Environmental Impact Sta tement on Decommissioning of Nuclear Facilities (GEIS), issued in 1988 as NUREG-0586. This supplement was prepared because of the technological advances in decommissioning operations, experience gained by licensees, and changes made to NRC regulations since the 1988 GEIS. It is intended to be used to evaluate environmental impacts during the decommissio ning of nuclear power reactors as residual radioactivity at the site is reduced to levels that allow for termination of th e NRC license. This supplement addresses only the decommissioning of nuclear power reactors licensed by the NRC. It updates the sections of the 1988 GEIS relating to pressurized water reactors, boiling water reactors, and multiple reactor statio ns. It goes beyond the 1988 GEIS to consider high-temperature gas-cooled reactors and the fast breeder reactors. This docum ent can be considered a stand-alone document and the environmental impacts described herein supercede those describ ed in the 1988 GEIS.

The scope of this supplement is based on the decommissioning activities perform ed to remove radioactive materials from structures, systems, and components from the time that the licensee certifies t hat they have permanently ceased power operations until the license is terminated. An evaluation process was develope d to determine environmental impacts from the specific activities that occur during reactor decommissioning, based on data fr om site visits and from licensees at reactor facilities being decommissioned. The data obtained from the sites were analyze d and then evaluated against a list of variables that defined the parameters for facilities that are currently operating but whi ch one day will be decommissioned. This evaluation resulted in a range of impacts for each environmental issue that may be used for comparison by licensees that are or will be decommissioning their facilities. The staff has considered public c omments received during scoping and on the draft in preparation of this final supplement.

12 KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

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