DOE/EIS-0240

[Billing Code 6450-01-P]

DEPARTMENT OF ENERGY

Record of Decision for the Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement

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AGENCY: Department of Energy

ACTION: Record of Decision

SUMMARY:

The Department of Energy (DOE) has decided to implement a program to make surplus highly enriched uranium (HEU) non-weapons-usable by blending it down to low-enriched uranium (LEU), as specified in the Preferred Alternative in the *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (HEU Final EIS, DOE/EIS-0240, June 1996). DOE will gradually sell up to 85 percent of the resulting LEU over time for commercial use as fuel feed for nuclear power plants to generate electricity (including 50 metric tons of HEU and 7,000 tons of natural uranium that will be transferred to the United States Enrichment Corporation), and will dispose of the remaining LEU as low-level radioactive waste. This program applies to a nominal 200 metric tons of United States-origin HEU that the President has declared, or may declare, surplus to defense needs. The purposes of this program are to support the United States' nuclear weapons nonproliferation policy by reducing global stockpiles of excess weapons-usable fissile materials, and to recover the economic value of the materials to the extent feasible.

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EFFECTIVE DATE:

The decisions set forth in this Record of Decision (ROD) are effective upon being made public, in [illegible] DOE's National Environmental Policy Act (NEPA) Implementing Procedures

DOE
Box 59
Item 4

and Guidelines (10 CFR Part 1021) and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500-1508).

ADDRESSES:

Copies of the *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement*, the separate *Cost Comparison for Highly Enriched Uranium Disposition Alternatives*, and this ROD are available in the public reading rooms identified at the end of this *Federal Register* notice (section VIII of the Supplementary Information). Copies of these documents may be obtained by writing to the U.S. Department of Energy, Office of Fissile Materials Disposition, MD-4, 1000 Independence Avenue, SW, Washington, D.C. 20585, or by calling (202) 586-4513. The 72-page Summary of the HEU Final EIS, the *Cost Comparison for Highly Enriched Uranium Disposition Alternatives*, and this ROD are also available on the Fissile Materials Disposition Electronic Bulletin Board/World Wide Web Page at: http://web.fie.com/htdoc/fed/doe/fsl/pub/menu/any/

FOR FURTHER INFORMATION CONTACT:

For information on the HEU disposition program or this ROD contact: Mr. J. David Nulton, Director, NEPA Compliance and Outreach, Office of Fissile Materials Disposition (MD-4), U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585, telephone (202) 586-4513.

For information on the DOE National Environmental Policy Act process, contact: Carol M. Borgstrom, Director, Office of NEPA Policy and Assistance (EH-42), U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585, telephone (202) 586-4600 or leave a message at 1-800-472-2756.

materials, of which 165 metric tons are HEU, had been declared surplus to the United States' defense needs.[1]

The disposition of surplus HEU, consistent with the Preferred Alternative in the Draft and Final HEU Disposition EIS and the decisions described in section VI of this ROD, is consistent with the President's policies and complies with the recently enacted USEC Privatization Act (Public Law 104-134). The sale of LEU derived from surplus HEU is also consistent with the Vice President's Reinventing Government initiatives pertaining to sales of unneeded government assets.

III. National Environmental Policy Act Process

A. HEU Draft EIS

On June 21, 1994, DOE published a Notice of Intent (NOI) in the *Federal Register* (59 FR 31985) to prepare a *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement* (Storage and Disposition PEIS), including both surplus and nonsurplus HEU. DOE subsequently concluded that a separate EIS on surplus HEU disposition would be appropriate. Accordingly, DOE published a notice in the *Federal Register* (60 FR 17344) on April 5, 1995, to inform the public of the proposed plan to prepare a separate EIS for the disposition of surplus HEU.

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[1] The Secretary of Energy's *Openness Initiative* announcement of February 6, 1996, declared that the United States has about 213 metric tons of surplus fissile materials, including the 200 metric tons the President announced in March, 1995. Of the 213 metric tons of surplus materials, the *Openness Initiative* indicated that about 174.3 metric tons (hereafter referred to as approximately 175 metric tons) are HEU, including 10 metric tons previously placed under International Atomic Energy Agency (IAEA) safeguards in Oak Ridge, Tennessee. The February 1996 *Openness Initiative* announcement released additional details about the forms and quantities of surplus HEU at various locations, and that information is presented in Figure 1.3-1 of the HEU Final EIS.

In accordance with a then-applicable DOE regulation implementing NEPA, 10 CFR 1021.312, DOE published an implementation plan (IP) for the HEU EIS in June 1995. The IP recorded the issues identified during the scoping process, indicated how they would be addressed in the HEU EIS, and provided guidance for the preparation of the HEU EIS. DOE issued the *Disposition of Surplus Highly Enriched Uranium Draft Environmental Impact Statement* (HEU Draft EIS, DOE/EIS-0240-D) for public comment in October 1995. On October 26, 1995, DOE published a Notice of Availability of the HEU Draft EIS in the *Federal Register* (60 FR 54867). The Environmental Protection Agency's Notice of Availability of the HEU Draft EIS appeared in the *Federal Register* (60 FR 55021) on October 27, 1995, announcing a public comment period from October 27, 1995 until December 11, 1995. In response to requests from the public, DOE on November 24, 1995 published another Notice in the *Federal Register* (60 FR 58056) announcing an extension of the comment period until January 12, 1996. Public workshops on the HEU Draft EIS were held in Knoxville, Tennessee, on November 14, 1995, and in Augusta, Georgia, on November 16, 1995.

During the public comment period, the public was encouraged to provide comments via mail, toll-free fax, electronic bulletin board (Internet), and toll-free telephone recording device. By these means, a total of 72 organizations and 125 individuals submitted a total of 464 comments for consideration. In addition, 224 comments were recorded from some of the 134 individuals who attended the two public workshops. All of the comments received, and the Department's responses to them, are presented in Volume II of the HEU Final EIS, the Comment Analysis and Response Document. All of the comments were considered in preparation of the HEU Final EIS, and in some cases, resulted in changes to the document.

B. Alternatives Considered

The HEU Final EIS analyzed the No Action Alternative and four reasonable alternatives for blending a nominal 200 metric tons of surplus HEU down to LEU to make it non-weapons-usable. The surplus HEU consists of numerous material forms, including metal (pure and alloyed), oxides, unirradiated fuel (including aluminum alloy fuel), nitrate solutions, and other forms. The inventory of material declared surplus also includes irradiated HEU fuel (the total

quantity of which remains classified). As discussed in section VI.A of this ROD, below, the irradiated fuel is not directly weapons-usable. Thus, the irradiated fuel is not within the scope of the HEU Final EIS or this ROD unless the HEU is separated from the fission products pursuant to other DOE programs (such as stabilization for materials management).

There are two possible end products from the action alternatives considered in the HEU Final EIS: 1) LEU that can be used as commercial nuclear reactor fuel feed (at a U-235 enrichment level of about 4 percent), and 2) LEU that can be disposed of as low-level radioactive waste (at a U-235 enrichment level of about 0.9 percent). The HEU Final EIS analyzed down-blending of HEU using one or more of three blending technologies: uranyl nitrate hexahydrate (UNH) blending, molten metal blending, and uranium hexafluoride (UF_6) blending.

The HEU Final EIS analyzed the blending of HEU to LEU at four existing U.S. facilities that presently have the capability to undertake such activities. Two of them, the Y-12 Plant at the Oak Ridge Reservation in Oak Ridge, Tennessee, and the Savannah River Site (SRS) in Aiken, South Carolina, are DOE facilities that have conducted extensive HEU operations in support of nuclear weapons and other DOE programs in the past. The other two analyzed facilities are the only commercial enterprises in the United States that have licenses from the Nuclear Regulatory Commission to engage in HEU operations: the Babcock & Wilcox (B&W) facility in Lynchburg, Virginia, and the Nuclear Fuel Services, Inc. (NFS) facility in Erwin, Tennessee.

Each of the analyzed facilities presently has the capability to engage in UNH blending, which could be used either for blending for commercial use or for blending to waste. Only DOE's Y-12 Plant has the capability to conduct molten metal blending, which would only be used for blending to waste, since the metal product could not be used directly by the commercial fuel fabrication industry. The capability to conduct UF_6 conversion and blending does not currently exist at any of the facilities. It is nonetheless analyzed in the EIS as a possible blending technology that may be added at one or both of the commercial facilities, since UF_6 is the form in which commercial fuel fabricators prefer to receive LEU product, and the two commercial facilities have indicated that they may decide to add UF_6 capability by modifying existing facilities.

Because there are many possible combinations of end-products, blending technologies, and blending sites, DOE has formulated several representative, reasonable alternatives that are described and assessed in Chapters 2 and 4 of the HEU Final EIS. In addition to the No Action Alternative (continued storage of surplus HEU), there are four alternatives that represent blending different proportions of the surplus HEU for commercial use or for disposal as waste, in some cases with variations on number and locations of blending sites:

- Alternative 1—No Action (continued storage)
- Alternative 2 (No Commercial Use)—Blend 100% to waste (at all 4 sites)
- Alternative 3 (Limited Commercial Use)—Blend 75% to waste (at all 4 sites), 25% to fuel (at 2 commercial sites)
- Alternative 4 (Substantial Commercial Use)—Blend 35% to waste, 65% to fuel (at any 1 site, the 2 commercial sites, the 2 DOE sites, or all 4 sites)
- Alternative 5 (Maximum Commercial Use)—Blend 15% to waste, 85% to fuel (at any 1 site, the 2 commercial sites, the 2 DOE sites, or all 4 sites)

Each of the alternatives involving commercial use of LEU derived from surplus HEU (Alternatives 3, 4, and 5) include within them the transfer of 50 metric tons of surplus HEU and 7,000 metric tons of natural uranium from DOE stockpiles to USEC. The alternatives, which were formulated to represent reasonable choices within the matrix of possible combinations, were unchanged from the HEU Draft EIS to the HEU Final EIS.

C. Results of Environmental Analyses

The environmental analyses in sections 4.3, 4.4, and 4.5 of the HEU Final EIS estimated that incremental radiological and several other impacts for HEU disposition during normal, accident-free operations would be low for workers, the public or the environment, and well within regulatory requirements, for all alternatives, technologies, and sites. Because no new construction would be required, and the blending activities that would be conducted for this proposed action are either the same as or very similar to operations that have occurred at the

analyzed facilities in the past, most of the incremental impacts from this action at the blending sites would be low. There would be increases in electrical energy consumption, fuel needs, and waste generation, depending on the site and the alternative. Section III.D. below, discusses potential floodplains impacts.

The transportation analyses in section 4.4 and Appendix G of the HEU Final EIS indicate that radiological impacts to the public and workers from transportation of materials, under both accident-free and accident conditions, would be low. Approximately one to three fatalities, depending on the alternative, could occur over the 20-year duration of the program, primarily as a result of non-radiological impacts from traffic accidents. The facility accident analyses in section 4.3 and Appendix E.5 of the HEU Final EIS indicate that the maximum credible accident from HEU blending operations, using conservative assumptions, could result in latent cancer fatalities to workers and members of the public surrounding the facility. However, the estimated likelihood of occurrence of such accidents is low, so total accident risk (consequences if the accident occurs times probability of occurrence) to the public is low.

An environmental justice analysis was performed (section 4.10 of the HEU Final EIS) to assess whether the proposed action or alternatives could cause disproportionate adverse health impacts on minority or low-income populations residing in communities around the candidate blending sites. First, a demographic analysis was performed for all of the 1990 Census tracts located within an 80-km (50-mi) radius of the candidate sites. Then public health impact analyses were performed to assess whether minority or low-income populations would be disproportionately affected by facility operations through routine and accidental releases of radiation and toxic emissions. Analyses of public and occupational health impacts from normal operations showed that air emissions and releases would be low and within regulatory limits at all candidate sites. The analyses also showed that cumulative effects of continuous operation over time would result in low levels of exposure to workers and the public. As just discussed, the overall risk from maximum postulated accidents is also low. Thus, there would not be any disproportionate risk of significant adverse impacts to particular populations, including low-income or minority populations, from accidents.

Although the EIS indicates that the projected accident-free radiological impacts and overall accident radiological risk from all alternatives would be low, section 2.4 of the HEU Final EIS, Comparison of Alternatives, shows that there would be some differences in impacts among the alternatives, depending on the extent of commercial use vs. disposal as waste of the product LEU material. Table 2.4-2 of the EIS, *Summary Comparison of Total Campaign Incremental Environmental Impacts for the Disposition of Surplus HEU for Each Alternative*, indicates that the Preferred Alternative (85 percent fuel/15 percent waste at four sites) generally would result in somewhat lower impacts from accident-free blending and transportation than would the No Commercial Use Alternative (100 percent waste). Blending for commercial use under the Preferred Alternative would result in lower impacts than blending to waste in the following resource areas: diesel/fuel oil, natural gas, coal, and steam consumption; water use and wastewater; radiological exposure from normal operations; most waste streams; and transportation (under both accident and accident-free conditions). The Maximum Commercial Use Alternative would result in higher total impacts than the No Commercial Use Alternative for the following resources areas: electricity consumed; facility accident consequences (estimated accident probability is low); and mixed low-level and hazardous wastes generated. The differences among the alternatives are negligible for air quality and noise, socioeconomics, and chemical exposure.

As discussed in section 4.7 of the HEU Final EIS, the avoided adverse impacts from displaced uranium mining, milling, conversion, and enrichment over time increase the environmental advantage of commercial use of LEU derived from surplus HEU. Because LEU fuel feed derived from surplus HEU would displace LEU fuel feed derived from virgin uranium, the environmental impacts that normally result from the front end of the nuclear fuel cycle (mining, milling, conversion, and enrichment) would be avoided by using the HEU-derived material instead. In actuality, those front-end environmental impacts have already been incurred for the HEU. By making beneficial use of the material rather than wasting it, the Department would derive both environmental and economic benefit from those sunk costs. The analysis in section 4.7 of the HEU Final EIS indicates that the total avoided impacts in terms of radiological exposure, nonradiological air quality impacts, and waste generation would be greater than those that are projected to result from the HEU blending program.

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An unavoidable corollary to the physical environmental advantages of commercial use of surplus HEU is the potential socioeconomic disadvantage: displacing the front end of the nuclear fuel cycle could impact employment in the domestic uranium mining, conversion, and enrichment sectors. The analysis in section 4.8 of the HEU Final EIS concludes that DOE will be able to avoid causing adverse material impacts on those industry sectors, as required by provisions of the USEC Privatization Act.

D. Floodplains Impacts

1. Floodplain Assessment

As required by DOE's regulations on protection of floodplains and wetlands (10 CFR Part 1022), the HEU Final EIS assesses whether the proposed action would impact or be impacted by the floodplains at the involved sites. The proposed action in the HEU Final EIS involves blending activities that would be accommodated within existing facilities at Y-12, SRS, B&W, and NFS. The locations of facilities at the candidate sites with respect to delineated floodplains are presented in the maps shown in Figures 3.3.4-2, 3.4.4-2, 3.5.1-2, and 3.6.4-1 of the HEU Final EIS, respectively.

Because HEU blending activities associated with the proposed action and its alternatives could be accommodated in existing facilities, no positive or negative impacts on floodplains would be expected at any of the candidate sites. Similarly, since no new construction activity is proposed at any of the candidate sites and blending facilities are not located in the vicinity of wetlands, no impacts to wetlands are anticipated.

As discussed in sections 3.3.4 and 3.5.4 of the HEU Final EIS, and shown in Figures 3.3.4-2 and 3.5.1-2, blending operations at the Y-12 Plant and B&W, respectively, would be accommodated in facilities located outside the 100- and 500-year floodplains. At SRS, the F- or H-Canyons that could be used for blending also fall outside the 100-year floodplains of the Fourmile Branch and the Upper Three Runs Creek (EIS Section 3.4.4). The 500-year floodplain limits at SRS are not currently delineated. However, the blending alternatives at SRS would not likely affect, or be affected by, the 500-year floodplain of either the Fourmile Branch or Upper Three Runs Creek

because the F- and H-Canyons are located at an elevation of about 91 m (300 ft) above mean sea level and are approximately 33 m (107 ft) and 64 m (210 ft) above these streams and at distances from these streams of 0.8 km (0.5 mi) to 1.5 km (0.94 mi), respectively. The maximum flow that has occurred on the Upper Three Runs Creek was in 1990, with a flow rate of about 58 m^3/s (2,040 ft^3/s). At that time the creek reached an elevation of almost 30 m (98 ft) above mean sea level. The elevations of the buildings in F- and H-Canyons are located more than 62 m (202 ft) above the highest flow elevation of the Upper Three Runs Creek. The maximum flow that has occurred on the Fourmile Branch was in 1991 with a rate of approximately 5 m^3/s (186 ft^3/s), and an elevation of about 61 m (199 ft) above mean sea level. Elevations of the buildings in F- and H-Areas are located more than approximately 30 m (101 ft) higher than the maximum flow level that has occurred.

The NFS site is partially located on the 100- and 500- year floodplains of the Nolichucky River and Martin Creek (as determined by the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map, January 3, 1985). However, as described in section 3.6.4 of the EIS and below, mitigation measures have been and would continue to be implemented to reduce potential flooding of the site and the likelihood of adverse impacts to site operations.

2. Final Floodplain Statement Of Findings

The HEU Final EIS includes, in section 4.13.1, a Proposed Floodplain Statement of Findings. The *Federal Register* Notice of Availability for the Final EIS (61 FR 33719) stated that DOE would accept comments on the proposed statement of findings during a 15-day period. The Department received no comments in response to that notice. This section of the ROD constitutes the Final Floodplain Statement of Findings, as required by 10 CFR 1022.15.

Four candidate sites, two DOE (Y-12 and SRS) and two commercial (B&W and NFS), were considered in the HEU Final EIS as potential sites where the proposed action could be implemented. These candidate sites were selected for evaluation because they currently have technically viable HEU conversion and blending capabilities and could blend surplus HEU to LEU for commercial fuel or waste. In addition, the commercial sites considered are the only ones in the United States presently licensed for the processing of HEU.

As described above, all facilities except NFS that are proposed to be used for this proposed action at the candidate sites would be outside the limits of the 100-year floodplain and are at least one foot above the 100-year floodplain elevation and, therefore would conform to both State and local floodplain requirements.

The floodplains of the Nolichucky River and Martin Creek at NFS, as presented in Figure 3.6.4-1 of the HEU Final EIS, cover approximately one-third and two-thirds of the NFS site's northern portion under 100-year and 500-year floodplain conditions, respectively. Based on the Flood Insurance Rate Map and the flood profiles, both published by FEMA, floodplain elevations at the NFS site are determined to be 499.5 m (1639 ft) and 500 m (1640 ft) above mean sea level for the 100-year and 500-years floods, respectively. As stated in the Nuclear Regulatory Commission's (NRC) *Environmental Assessment for Renewal of Special Nuclear Material License No. SNM-124, Nuclear Fuel Services, Inc., Erwin Plant, Erwin, Tennessee* (August 1991), elevations of the building floors are between 500 m (1640 ft) and 510 m (1660 ft) above mean sea level. At the time of construction of the plant (1956), there were no local, State, or NRC requirements prohibiting construction or operation of nuclear facilities in 100- or 500-year floodplains. Presently, the State of Tennessee has no requirements pertaining to building in 100- or 500-year floodplains. Local standards require that any new construction or substantial improvement of any commercial, industrial, or non-residential structure should have the lowest floor, including basement, elevated no lower than one foot above the level of base flood (100-year flood) elevation. Because NFS was built prior to 1974, site operations are grandfathered, and this local requirement does not apply to existing facilities at NFS. NRC, which regulates the NFS site, also has no regulations against building or operating nuclear facilities in floodplains. Nevertheless, with the widening of the site's culvert, upgraded drainage system, rechanneling of the Nolichucky River, and rerouting of Martin Creek to enter the Nolichucky River farther downstream, the chance of flood levels at the site has been lowered. In addition, warning devices and systems have been placed by the State of Tennessee along the river to warn the public and the NFS plant of the chance of possible flooding. In addition, NFS and the State of Tennessee have emergency action plans to mitigate potential flood impacts and protect the public water supply from any possible contamination.

There are two alternatives in addition to no action that could be considered to remediate potential flooding of facilities at NFS. One would be to use the facilities in the 300 Area at NFS, which is outside both the 100- and 500-year floodplain limits, for blending activities. Facilities in the 300 Area have building floor elevations of at least 500.5 m (1642 ft) above mean sea level, which would conform to the local requirement of at least one foot above the 100-year floodplain and would also fall outside of the 500-year floodplain. The second alternative is to eliminate NFS as a candidate blending site. Based on the analyses in the HEU Final EIS and on the information in the Floodplains Assessment and this Statement of Findings, DOE will, for any blending done at NFS on the Department's behalf pursuant to this ROD, specify that the work should be done in the 300 Area, and/or that measures to mitigate potential flood impacts at NFS will continue.

E. Preferred Alternative

The Preferred Alternative is identified in the HEU Final EIS as Alternative 5, Maximum Commercial Use (four sites), which is:

- To gradually blend down surplus HEU and sell as much as possible (up to 85 percent) of the resulting commercially usable LEU for use as reactor fuel over time (including 50 metric tons of HEU that are to be transferred to USEC over a 6-year period, along with 7,000 metric tons of natural uranium), using a combination of four sites (Y–12, SRS, B&W, and NFS) and two possible blending technologies (blending as UF_6 and UNH); implemented over an approximate 15- to 20-year period; with continued storage of the HEU until blend-down occurs; and

- To blend down surplus HEU that has no commercial value using a combination of four sites (Y–12, SRS, B&W, and NFS) and two blending technologies (blending as UNH and metal); to dispose of the resulting LEU as low-level radioactive waste (LLW) pursuant to the *Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-D, draft issued in August 1995) (Waste Management PEIS) and associated RODs, and any subsequent NEPA documents tiered from or supplementing the Waste

Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement (61 FR 33719), along with notification that the Department would entertain comments on it during a 15-day period. No comments were received.

The *Cost Comparison* provides estimates of the potential costs for blending HEU by using each of the blending technologies analyzed in the HEU EIS (UNH, UF_6, and metal blending). It compares the economic impact for disposition of the surplus HEU according to the various action alternatives (Alternatives 2 through 5) defined in the EIS, which are based on different proportions of the material being blended for commercial use or for disposal as waste. The report derives the following estimated unit costs for the various blending technologies and end-products:

metal blending to 0.9-percent LEU for disposal	$13,900/kg of HEU
UNH blending to 0.9-percent LEU for disposal	$22,900/kg of HEU
UF_6 blending to 4-percent LEU for commercial use	$3,200/kg of HEU
UNH blending to 4-percent LEU for commercial use	$5,700/kg of HEU

Unit costs for blending to waste include estimated disposal costs as well as blending costs. The report estimates that the potential sales revenue for each kilogram of HEU blended for commercial use is $11,700, which is substantially greater than the costs for blending it. The cost of ultimate disposal of spent nuclear fuel derived from down-blended HEU that is used commercially would be borne by the utility purchasers of the fuel pursuant to the Nuclear Waste Policy Act.

Based on these unit costs and revenues from commercial sales, the *Cost Comparison* concludes that disposition of the entire nominal 200 metric tons of surplus HEU under the waste option (Alternative 2) would cost approximately $3.4 billion. In contrast, disposition of 170 metric tons of surplus HEU for commercial use, and disposition of the remaining 30 metric tons as waste (the Preferred Alternative) would result in a net return of about $340 to $770 million. The analyses indicate that on average each metric ton of surplus HEU that is blended to LEU fuel and sold.

For surplus HEU that is blended for commercial use as reactor fuel feed, either UNH blending or UF_6 blending could be used. The data in section 2.2.2 and the analyses in section 4.3 of the HEU Final EIS show that, on the whole, at the commercial sites, UNH blending would be the environmentally preferable blending technology for blending surplus HEU for commercial use, although UNH blending would produce greater impacts in three resource areas: liquid hazardous waste generated, solid nonhazardous waste after treatment, and transportation. In the area of potential facility accidents, in particular, UF_6 blending would result in higher accident consequences because of the possibility of a UF_6 cylinder breach accident that could release gaseous UF_6 (both radiologically and chemically toxic) into the environment. However, as discussed in section III.C, above, the probability of accidents that would release significant quantities of material into the environment is estimated to be low. DOE concludes that these differences in impacts would not dictate against the use of UF_6 blending technology for blending surplus HEU for commercial use.

The analyses in section 4.3 of the HEU Final EIS indicate that all four of the analyzed blending facilities (Y-12, SRS, B&W, and NFS) have the capacity to process surplus HEU with low impacts to workers, the public, and, for many parameters, the environment during normal operations. For the two DOE sites, the generation of waste based on an increased usage of utilities represents small increases—less than 5 percent over current operations. For the two commercial sites, the generation of waste based on an increased usage of utilities represents increases of over 20 percent, but both facilities have adequate capacities to accommodate the increases since neither site is currently operating at full capacity. Because the NFS site has not been operating recently, it would require a large increase in water usage (166 percent) and fuel requirements (933 percent) relative to the current baseline. However, because the quantity of water and fuel used in the past for similar operations is comparable to that which would be used for the proposed action, it is anticipated that the increase in these requirements can easily be accommodated at NFS. As discussed in section III.D, above, the potential for flooding at NFS is another relative disadvantage of that facility.

For postulated facility accidents, there are also differences among the sites based on different proximities and concentrations of workers and nearby populations, as well as meteorological

factors. The analyses in section 4.3 of the HEU Final EIS indicate that accident impacts to the maximally exposed individual member of the public and to the population within 80 kilometers (50 miles) would be lowest at SRS, where the involved facilities are in the middle of a very large, limited-access, rural site, so the distances to members of the public are large. The greatest impacts to the public from accidents would be experienced at Y-12 and NFS, at both of which the involved facilities are relatively close to site boundaries (in the case of NFS, the site is small) and population centers. The postulated accident impacts to on-site non-involved workers would be lowest at SRS (because the workers are fairly widely dispersed) and NFS (because there are relatively few workers on the site). The non-involved worker impacts would be highest at B&W, which has a relatively large workforce in close proximity to the blending facility. However, as noted in section III.C, above, the probabilities of serious accidents at all sites are low.

The environmental justice analysis shows that the SRS site has a substantial minority and low-income population in surrounding census tracts (more than 25 percent minority and low-income in most census tracts, and more than 50 percent minority in several). However, the impacts to surrounding populations are projected to be low for all sites, and lowest for SRS, so there would be no disproportionate adverse impacts on minority populations.

In summary, the analyses in the HEU Final EIS indicate that the environmentally preferable blending facility would be SRS. However, since the impacts at all sites are expected to be low during normal operations for many parameters (including radiological impacts), well within regulatory limits, and since overall risks associated with potential accidents are low, DOE concludes that environmental differences among the sites would not serve as a basis for choosing among them. Each of the facilities would be capable of blending up to the entire inventory of surplus HEU without significant adverse environmental impacts, and use of a combination of facilities can facilitate mission accomplishment.

VI. Decisions

A. Programmatic Decisions

DOE has decided to implement a program to make surplus HEU non-weapons-usable by blending it down to LEU, as specified in the Preferred Alternative (Alternative 5, site variation c [all four sites]) in the HEU Final EIS. As defined in section 1.4.2 of the HEU Final EIS, the Preferred Alternative is:

- To gradually blend down surplus HEU and sell over time as much as possible (up to 85 percent) of the resulting commercially usable LEU for use as reactor fuel feed, (including 50 metric tons of HEU to be transferred to USEC over a 6-year period[2]); using a combination of four sites (Y–12, SRS, B&W, and NFS), and two possible blending technologies (blending as UF_6 and UNH); over an approximate 15- to 20-year period; with continued storage of the surplus HEU until blend-down occurs; and

- To blend down surplus HEU that has no potential commercial value; using a combination of four sites (Y–12, SRS, B&W, and NFS), and two blending technologies (blending as UNH and metal); to dispose of the resulting LEU as LLW pursuant to Record(s) of Decision associated with the Waste Management PEIS and any other relevant site- or

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[2] The transfer of 50 metric tons of HEU and 7,000 metric tons of natural uranium from DOE stockpiles to USEC is specifically mandated by section 3112(c) of Public Law 104-134. Both of those transfers are components of the Preferred Alternative and this decision. The delivery to commercial end users of the surplus uranium transferred to USEC could not begin before 1998 pursuant to the statute. Although the transfer of 7,000 metric tons of natural uranium from DOE to USEC is not part of the HEU disposition program, it is part of the same transaction as the transfer of 50 metric tons of HEU, so the environmental impacts of that transfer are assessed in section 4.9 of the HEU Final EIS.

work among the facilities would be low for many parameters (including radiological impacts) during normal operations, and would be bounded by the analyses in the EIS.

As noted in sections 1.3 and 1.4.2 of the HEU Final EIS, decisions about the timing and details of specific disposition actions (which facility or process to use) might be made in part by DOE, by other government agencies, by USEC, by a private successor to USEC, or by other private entities acting as marketing agents for DOE. In the case of the 50 metric tons of surplus HEU that is being transferred to USEC as part of this decision (see below), the choice of blending sites for that work will be made by USEC or its private, corporate successor. The quantities and other characteristics of additional specific "batches" of surplus HEU and the exact time and blending sites at which such batches would be subject to disposition are unknown at this time, and would depend on a number of factors, including the rate of weapons dismantlement; the timing and rate at which any additional HEU may be declared surplus; market conditions; legislative restrictions on delivery to commercial end users (see Public Law 104-134); and available throughput capacities and unrelated workloads at the blending facilities. (See section VI.B.2, below, for a discussion of a possible transfer of "off-spec" surplus HEU material to the Tennessee Valley Authority.) Competitive bidding procedures—including both the commercial and DOE facilities (the latter under their "Work for Others" programs)—as well as facility availability and other business considerations are likely to be key components of disposition actions. DOE is preparing an HEU Disposition Plan, which will be available shortly following publication of this ROD, that will provide additional information concerning specific disposition actions that are expected to commence during the next several years, as well as describe an approach to other future, specific actions. The ultimate distribution of blending work among the four facilities will be determined in multiple individual decisions by multiple decisionmakers, based largely on business and facility availability considerations, over a period of up to 15-20 years.

This programmatic decision does not include within it the choice of blending technologies for specific batches of HEU. The HEU Final EIS analyses indicate that all three of the analyzed technologies (UNH, UF_6, and metal blending) could be used. As in the case of facility selection, the choices of blending technologies are expected to be made largely on the basis of business and

technical considerations, and may be made by DOE, USEC, USEC's corporate successor, or other entities.[4]

A portion of DOE's surplus HEU inventory is in various forms of irradiated HEU fuel (the total quantity of which remains classified) from the Department's nuclear weapons, naval nuclear propulsion, or nuclear energy research programs. The irradiated fuel is not directly weapons-usable, is under safeguards and security, and poses no proliferation threat. DOE is not proposing to process the irradiated fuel to separate the HEU for down-blending as part of this decision. There are no current or anticipated DOE plans to process irradiated fuel solely for the purposes of extracting HEU. However, activities associated with the irradiated fuel for purposes of stabilization, facility cleanup, treatment, waste management, safe disposal, or environment, safety, and health reasons could result in the separation of HEU in weapons-usable form that could pose a proliferation threat and thus be within the scope of this EIS. Under the Preferred Alternative and this decision, DOE would blend such recovered HEU to LEU.[5] To provide a conservative analysis presenting maximum potential impacts, the HEU Final EIS includes such HEU (currently in the form of irradiated fuel) in the material to be blended to LEU, as if such HEU had been separated from the irradiated fuel pursuant to health and safety, stabilization, or other non-defense activities. However, such HEU may actually remain in its present form (without the HEU ever being

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[4] The UF_6 blending technology will not even be available unless the potential commercial blenders make the business decisions to deploy it. If UF_6 blending capability is not developed, all blending for commercial use would use the UNH process. If new blending facilities or processes are proposed in the future, additional NEPA review would be conducted, as appropriate, either by DOE or in connection with NRC licensing proceedings for a commercial facility.

[5] For example, weapons-usable HEU is anticipated to be recovered from dissolving and stabilizing targets and spent fuel at SRS pursuant to the analysis and decisions in the Final EIS (October 1995) and RODs (December 1995 and February 1996) on the Interim Management of Nuclear Materials at SRS.

separated) and be disposed of as high level waste in a repository or alternative pursuant to the Nuclear Waste Policy Act.[6]

B. Basis for Decisions

DOE has concluded that the Preferred Alternative identified in the HEU Final EIS would best serve the purpose and need for the HEU disposition program for several reasons. In terms of the fundamental nonproliferation objective, DOE considers all of the action alternatives (2 through 5) to be roughly equivalent in terms of serving that objective. Both 4-percent LEU in the form of commercial spent nuclear fuel and 0.9-percent LEU oxide for disposal as LLW—and any allocation between them—are considered highly proliferation-resistant material forms, because both reprocessing of commercial spent fuel (to separate the roughly 1 percent of plutonium it contains), and re-enrichment of the 0.9-percent LEU to make HEU again, are technologically difficult, time-consuming, and expensive.

In terms of the economic recovery objective of the program, that objective is best served by the Maximum Commercial Use Alternative. Commercial use would reduce the amount of blending that would be required for disposition (a 14 to 1 blending ratio of blendstock to HEU as opposed to 70 to 1 for waste) and minimize Government waste disposal costs that would be incurred if all (or a greater portion of) the material were blended to waste. The sale of LEU derived from surplus HEU would yield returns on prior investments to the Federal Treasury. As noted in

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[6] If HEU currently in irradiated fuel remains in its current form, it would be managed pursuant to the analyses and decisions in the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement* (April 1995) and the associated RODs (60 FR 28680, June 1, 1995, amended by 61 FR 9441, March 8, 1996), and subsequent, project-specific or site-specific NEPA documentation. Such spent fuel could be disposed of as high level waste in a repository pursuant to the Nuclear Waste Policy Act (42 U.S.C. 10101 et seq.). DOE is in the process of characterizing the Yucca Mountain Site in Nevada as a potential repository for disposal of spent fuel pursuant to that Act.

section IV of this ROD, the *Cost Comparison for Highly Enriched Uranium Disposition Alternatives* indicates that the Preferred Alternative could save as much as $4 billion compared to the blend-to-waste alternative. Under the best case, the proceeds from commercial sales of 85 percent of the inventory could actually more than pay for the entire HEU disposition program, including the blending and disposal of the 15 percent that would still need to be disposed of as waste, and yield $340 million to $770 million in net revenues. (As noted above, however, this degree of commercialization may not ultimately be achieved.)

Finally, as discussed in section III.C of this ROD, the analyses in the EIS indicate that the Preferred Alternative would have somewhat lower overall environmental impacts than the other action alternatives. The Maximum Commercial Use Alternative would generate smaller quantities of radioactive waste requiring disposal than would the No Commercial Use Alternative. Adverse environmental impacts from uranium mining, milling, conversion, and enrichment would be avoided by using this material rather than virgin uranium to produce nuclear fuel. Making beneficial use of the LEU derived from surplus HEU would derive some environmental benefit (when compared to the blend-100-percent-to-waste alternative) in return for the environmental costs that were expended in making the HEU in the first place, thus conserving non-renewable natural resources.

The Maximum Commercial Use Alternative would, as discussed in section 4.8 of the HEU Final EIS, displace some uranium mining, milling, conversion, and enrichment. However, in light of the provision in the USEC Privatization Act that requires DOE to determine that its sales of uranium would not have adverse material impacts on those industries, and the rate at which DOE expects to be able to make surplus HEU available for disposition, serious, long-lasting impacts on those industry sectors is not anticipated. Mitigation of any such impacts, as required by the USEC Privatization Act, is discussed in section VII of this ROD, below.

An indirect impact of the Preferred Alternative would be the creation of spent nuclear fuel (through the use of commercial LEU fuel derived from surplus HEU in power reactors). However, since the LEU nuclear fuel derived from surplus HEU would replace nuclear fuel that would have been created from newly mined uranium without this action, there would be no

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C. Specific Action Decisions

1. Transfer of HEU and Natural Uranium to USEC

As a first concrete disposition action pursuant to the programmatic decisions described in section VI.A of this ROD, above, DOE has decided to transfer title to 50 metric tons of surplus HEU and 7,000 metric tons of natural uranium to USEC for gradual sale and commercial use. In addition to serving the objectives of the HEU disposition program, these transfers are consistent with the Fiscal Year 1996 Federal Budget, and are specifically mandated by the USEC Privatization Act (Pub. L. 104-134, § 3112(c)(1)).

Specifics concerning the timing of deliveries and the characteristics and locations of material to be delivered to USEC (or to blending contractors that USEC selects) are to be established in a separate DOE/USEC Memorandum of Agreement pertaining to the transfers. USEC or its corporate successor will make decisions concerning where and when blending of the 50 metric tons of HEU being transferred will occur, what technologies will be used, and when and how the resultant LEU will be marketed (consistent with the USEC Privatization Act). It is anticipated that USEC will utilize one or both of the commercial blending facilities for down-blending, that the first transfers of HEU will occur before the end of 1996, and that they will continue for about six years. Under the USEC Privatization Act, USEC (or its corporate successor) may not deliver this material for commercial end use prior to 1998, and there are quantitative limits on annual deliveries to end users (Pub. L. 104-134, § 3112(c)(2)).

The transfer of 7,000 metric tons of natural uranium to USEC is not part of the HEU disposition program. However, since it is part of the transaction transferring 50 metric tons of HEU, the impacts of the transfer are assessed in section 4.9 of the HEU Final EIS. This material is in the form of UF_6, and is part of a larger quantity of UF_6 that is in storage at DOE's Portsmouth (Ohio) and Paducah (Kentucky) Gaseous Diffusion Plants, which are currently being leased to USEC for uranium enrichment operations. The most likely disposition of the 7,000 metric tons of natural uranium is eventual use as feedstock for enrichment to nuclear power plant fuel, the usual business of the enrichment plants. If it is so used, and follows the typical path of such uranium, it would probably be enriched to about 2 percent U-235 at the Paducah Plant, then transported to

materials would be blended down to LEU and then either oxidized using the FA-Line in the F-area at SRS, or stored as LEU solutions pending decisions on ultimate disposition.[8]

In addition to the materials noted above, there is also off-spec unirradiated aluminum alloy HEU reactor fuel material located at SRS and Y-12. Pursuant to this HEU ROD, DOE has decided that the unirradiated HEU reactor fuel will also be down-blended at the F-Canyon and/or H-Canyon and associated facilities at SRS, and will eventually be sold for commercial use, if possible. The ability of SRS facilities to withstand earthquakes is currently being reviewed. No surplus HEU from decisions made in this HEU ROD would be introduced into the canyons or blended in the canyon facilities until completion of the seismic review. The HEU down-blending activities at SRS pursuant to this decision will occur during a relatively limited period, subject to facility operations and availability.

The SRS canyon facilities, with their large chemical processing and separations capabilities, are capable of processing these off-spec materials. Commercial blending facilities are reluctant to handle these materials because of the resultant contamination of their facilities with undesirable uranium isotopes. The UNH blending facilities at the Y-12 Plant are also not considered likely candidates for blending of such off-spec material, as their processing capacity and chemical separation capabilities are much lower than the SRS canyon facilities, and may be needed for future defense programs activities.

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[8] As discussed in section 2.2.3.3 of the HEU Final EIS, due to criticality issues, the FA-Line is not capable of oxidizing material at commercial enrichment levels (4-5 percent), so that facility would not be used for oxidation of the commercial material. Rather, these LEU solutions will be stored at SRS until other arrangements can be made for oxidation of commercial-enrichment material. There are several options for providing for solidification of UNH solutions at commercial enrichment levels at SRS, although none is being proposed by DOE at this time. One option being considered is construction of a private, commercial facility on land leased from DOE at SRS. Such a private facility would need to be licensed by the NRC, and would be accompanied by appropriate NEPA review.

The USEC Privatization Act (Pub. L. 104-134, § 3112(e)(1)) provides that DOE may transfer off-spec uranium to a Federal agency without resale or transfer to another entity. Pursuant to the Act, DOE may pursue discussions with the Tennessee Valley Authority (TVA), a Federal agency that operates several nuclear power plants, to try to reach agreement on a demonstration of the use of off-spec LEU derived from surplus HEU that would be down-blended at SRS.

3. Other Future Actions

DOE has no other concrete surplus HEU disposition actions under specific contemplation at this time. DOE has decided that, when additional HEU blend-down actions for either commercial use or for disposal as waste are developed in the future, they could involve the use of all four of the analyzed blending facilities. The commercial facilities (B&W and NFS) are considered to be available for such activities immediately. The SRS facilities may also be available for blending some of the HEU. The Y-12 facilities are currently not operational. Under DOE Order 425.1, *Startup and Restart of Nuclear Facilities*, DOE must successfully complete an Operational Readiness Review addressing operational health and safety issues prior to restart of the Y-12 facilities. HEU operations are expected to resume at Y-12 in 1998. Thus, all four of the facilities would potentially be available, and could be used for portions of the HEU down-blending, in the timeframes that additional disposition actions might develop.

DOE is preparing an HEU Disposition Plan, which will be available shortly after publication of this ROD, that will provide additional information concerning specific disposition actions that are expected to commence during the next several years, as well as describe an approach to other future, specific actions. The plan will be updated periodically based on industry response and program progress.

VII. Avoidance/Minimization of Environmental Harm

As discussed in section III.C. above, implementation of the decisions reached in this ROD will result in low environmental and health impacts during normal operations. However, DOE will take all reasonable steps to avoid or minimize harm, including the following:

- DOE will use current safety and health programs and practices to reduce impacts by maintaining worker radiation exposure as low as reasonably achievable.

- DOE will meet appropriate waste minimization and pollution prevention objectives consistent with the Pollution Prevention Act of 1990. As discussed in section 2.3 of the HEU Final EIS, segregation of activities that generate radioactive and hazardous wastes will be employed, where possible, to avoid the generation of mixed wastes. Treatment to separate radioactive and non-radioactive components will be employed to reduce the volume of mixed wastes. Where possible, nonhazardous materials will be substituted for those that contribute to the generation of hazardous or mixed waste. Waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. In addition to following such practices at its own facilities, DOE will seek to include comparable requirements in any contracts with commercial facilities.

- Consistent with the requirement of the USEC Privatization Act (Pub. L. 104-134, § 3112(d)(2)(B)), DOE will determine, before making sales of LEU derived from HEU for commercial use, whether such sales would have adverse material impacts on the domestic uranium mining, conversion, or enrichment industries, taking into account other DOE sales of uranium and the sales of uranium under the Russian HEU Agreement and the Suspension Agreement. Such determinations may be made on a periodic basis (for example, for all contemplated sales over a certain period), as opposed to a sale-by-sale basis. (No such determination is required under the USEC Privatization Act for the initial transfer of 50 metric tons of HEU and 7,000 metric tons of natural uranium to USEC, as provided in section VI.B. of this ROD, or to transfers to other government agencies [such as TVA] of off-spec material.)

VIII. DOE Public Reading Rooms

Copies of the HEU Final EIS, the *Cost Comparison for Highly Enriched Uranium Disposition Alternatives*, and this ROD, as well as technical data reports and other supporting documents, are available for public review at the following locations:

DEPARTMENT OF ENERGY HEADQUARTERS
Freedom of Information Reading Room
Forrestal Building
1000 Independence Ave., SW
Washington, DC 20585
Attn: Carolyn Lawson
202-586-6020

ALBUQUERQUE OPERATIONS OFFICE
Technical Vocational Institute
525 Buena Vista, SE
Albuquerque, NM 87106
Attn: Russ Gladstone (contractor)
505-224-3286
Elva Barfield (DOE)
505-845-4370

NEVADA OPERATIONS OFFICE
Nevada Operations Office
U.S. Department of Energy
Public Reading Room
2753 South Highland Dr.
P.O. Box 98518
Las Vegas, NV 89193-8518
Attn: Janet Fogg
702-295-1128

OAK RIDGE OPERATIONS OFFICE
U.S. Department of Energy
Public Reading Room
200 Administration Road
P.O. Box 2001
Oak Ridge, TN 37831-8501
Attn: Amy Rothrock
615-576-1216

RICHLAND OPERATIONS OFFICE
Washington State University
Tri-Cities Branch Campus
300 Sprout Road, Room 130 West
Richland, WA 99352
Attn: Terri Traub
509-376-8583

U.S. DOE Reading Room
Carson County Library
P.O. Box 339
Panhandle, TX 79068
Attn: Tom Walton (DOE)
806-477-3120
Kerry Cambell (contractor)
806-477-4381

SANDIA NATIONAL LABORATORY/CA
Livermore Public Library
1000 S. Livermore Avenue
Livermore, CA 94550
Attn: Julie Casamajor
510-373-5500

IX. Conclusion

DOE has decided to implement a program to make surplus HEU non-weapons-usable by blending it down to LEU, and gradually selling as much of it as possible for commercial use over time, as specified in the Preferred Alternative in the HEU Final EIS, and including the mitigation activities identified in section VII. This programmatic decision is effective upon being made public, in accordance with DOE's regulations implementing NEPA (10 CFR § 1021.315). The goals of this program are to support the United States' nuclear weapons nonproliferation policy by reducing global stockpiles of excess fissile materials so that they may never be used in weapons again, and to recover the economic value of the material to the extent feasible. This program will demonstrate the United States' commitment to its nonproliferation goals, as specified in the President's Nonproliferation and Export Control Policy of 1993, and provide an example for other nations, where stockpiles of surplus HEU may be less secure from potential theft or diversion than those in the United States, to encourage them to take similar actions. The impacts on the environment, workers, and the public from implementing this HEU disposition program are estimated to be low for most parameters (including radiological impacts) during normal operations, and well within applicable regulatory limits.

The decision process reflected in this Notice complies with the requirements of the National Environmental Policy Act (42 U.S.C. § 4321 et seq.) and its implementing regulations at 40 CFR Parts 1500-1508 and 10 CFR Part 1021.

Issued in Washington, D.C., July 29, 1996.

Hazel R. O'Leary

Secretary