INTERAGENCY REVIEW

OF

THE NONPROLIFERATION IMPLICATIONS

OF

ALTERNATIVE TRITIUM PRODUCTION TECHNOLOGIES

UNDER CONSIDERATION

BY

THE DEPARTMENT OF ENERGY

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A REPORT TO THE CONGRESS

JULY 1998

INTRODUCTION

This report to Congress is provided in response to the direction set forth in the National Defense Authorization Act for Fiscal Year 1998 (P.L. 105-85) Conference Report. The report directs the Secretary of Energy to utilize a senior level, interagency process to review and assess the issues associated with the commercial reactor option for tritium production.

The Department of Energy (DOE) must establish a new source of tritium to maintain the U.S. nuclear weapon stockpile. Currently, the Department is pursuing a dual-track strategy for tritium production: (1) use of a commercial light water reactor (CLWR), and (2) development of a proton accelerator for tritium production. In addition, the Department is evaluating whether an existing research reactor, known as the Fast Flux Test Facility (FFTF) should play a role in the Department's tritium production strategy. Although the congressional direction required the Department to report only on the issues associated with the commercial reactor option, the Department chose to evaluate the nonproliferation issues associated with each of the options under consideration. This report reflects the Administration's views on all of the technologies.

The report outlines the findings of the review and summarizes the conclusions of Executive Branch agencies developed in the course of the review.

The Nonproliferation Implications of Alternative Tritium Production Technologies Under Consideration by The Department of Energy

Summary of Conclusions of DOE Review

and

Results of Interagency Evaluation

I. Background

The Department of Energy (DOE) must establish a new source for producing tritium needed to maintain the U.S. nuclear weapon stockpile. Tritium, a radioactive isotope of hydrogen, is required for all U.S. nuclear weapons to function as designed. The United States has not produced tritium since 1988, when the last of the defense production reactors at DOE's Savannah River Site was shut down. Tritium decays at a rate of about 5.5 percent per year, thus it must be replenished in all U.S. weapons on a routine basis. Since the U.S. nuclear weapons stockpile has been reduced consistent with the Strategic Arms Reduction Treaty, the United States has been able to fulfill its ongoing tritium needs since 1988 by recycling tritium from weapons that have been withdrawn from the stockpile. However, given projected force requirements, the size of the existing tritium stockpile, and tritium decay rates, the United States must establish a new production source by 2005 in order to maintain the reliability of the enduring nuclear weapon stockpile.

It is important to note at the outset that tritium is not a fissionable material capable of sustaining a nuclear reaction. Thus, it is not classified as a special nuclear material and is therefore not subject to the prohibition in the Atomic Energy Act of 1954, as amended, on the use of such materials for nuclear explosive purposes if produced in a commercial light water reactor.

In December of 1995, DOE, in consultation with the Department of Defense (DOD), decided to pursue research and development of two tritium production technologies: (1) a commercial light water reactor (CLWR), and (2) a proton accelerator. In January 1997, Secretary Hazel O'Leary directed that a third technology, an existing DOE test reactor, known as the Fast Flux Test Facility (FFTF), also be evaluated for its potential role in tritium production.

While resolution of any nonproliferation policy issues is important in making a final determination on a future tritium source, it should be noted that the nonproliferation issues

identified in this report represent only one of a range of factors that the Department must take into account in making the tritium production technology decision. The Secretary of Energy must also consider cost, technical risk, legal or regulatory challenges, compatibility with the requirements established in the Nuclear Weapons Stockpile Memorandum, and environmental impacts associated with each option in making his final selection. In particular, it should be recognized that there can be a wide divergence in the relative attractiveness of the various options depending upon which selection criterion is being considered.

DOE analyses have estimated, for example, that the investment cost of the Commercial Light Water Reactor option could be as low as $613 million over the next seven years, while the cost of building an accelerator for tritium production is currently estimated to be in the range of $3.4 - $4.4 billion over a similar timeframe. A second critical factor in making the selection of a tritium production technology will be the ability of the respective technologies under review to fulfill DOD's stockpile needs in a timely and reliable manner. In this respect, the CLWR option promises to meet all these requirements, and an appropriately-sized accelerator option is also capable of meeting the production requirements. The FFTF, at best, appears able to meet a substantial portion, but not the full requirements, of projected total tritium demand. The current production goal for tritium is 3 kilograms (kgs) per year, assuming a START I-sized stockpile. If U.S. stockpile requirements are revised in the future to reflect a START II-sized force structure, we estimate the annual production goal could be reduced to as low as 1.5 kgs.[1]

A final decision will not be made exclusively on the basis of nonproliferation considerations, but must be taken in the broader context of the best overall technology after all factors have been thoroughly weighed.

In accordance with the direction provided in the Fiscal Year 1998 National Defense Authorization Act Conference Report, DOE undertook a two-phased review of the nonproliferation issues associated with the three tritium production options. In the first phase of the review, the Department solicited contributions from elements within the Department, as well as from outside experts recognized in the field of nonproliferation. The DOE assessment developed findings and issues that were presented for discussion within the broader interagency context during the second phase of the review, which consisted of a series of meetings and discussions with senior officials of other agencies, beginning in April, 1998.

Participants in those meetings included high-level representatives from the National Security Council, the Department of Defense, the Department of State, the Arms Control and Disarmament Agency, the White House Office of Science and Technology Policy, the Office of the Vice President, and the Nuclear Regulatory Commission.

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[1] The production goal of 3 kgs represents the current capacity planning requirement for the technologies under consideration. The actual amount of tritium required to maintain the U.S. nuclear weapon stockpile on an annual basis is classified.

After an extensive and interactive review, the Administration has concluded that the nonproliferation policy issues associated with the use of a commercial light water reactor are manageable and that the Department should continue to pursue the CLWR option as a viable source for future tritium production.

With respect to the FFTF, the review concluded that the plutonium-fueled option for the FFTF was undesirable, because, after an initial period, it would be necessary to begin fueling the FFTF with plutonium that the President had declared excess to defense needs and never to be used for nuclear arms. High enriched uranium (HEU) could be used as an alternative fuel source for the FFTF, but the use of HEU fuel would run counter to U.S. policy to minimize the use of this fuel globally and would reduce the tritium production output of the FFTF to levels below those required for the stockpile, even under a reduced START II-level requirement.[2]

Finally, the review concluded that the accelerator option raised no significant nonproliferation policy issues, assuming export control measures covering this area are maintained.

II. Summary of Review

Commercial Light Water Reactor

With respect to the nonproliferation impacts of the CLWR option, the DOE review determined that the principal impact was that this option had potential implications for the U.S. policy of separating civilian and military nuclear activities. The review concluded, however, that the use of CLWRs for tritium production was not prohibited by law or international treaty; that, historically, there had been numerous exceptions to the practice of differentiating between U.S. civil and military facilities;[3] and that several factors would mitigate the possible impact of the selection of this option on U.S. nonproliferation policy. On this basis, the Administration has

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[2] The FFTF cannot meet the current annual tritium production requirement established by the DOD for a stockpile consistent with the START I treaty, whether the plutonium or the HEU fuel option were selected. If the requirement were reduced in the future because of strategic arms reductions under the START II treaty, the FFTF could probably produce just enough tritium to meet the annual production requirement, if plutonium fuel were used. However, since the HEU fuel option is expected to reduce the FFTF's tritium output by approximately 20 percent, the reactor would not meet either the current START I stockpile requirement or the projected START II stockpile requirement if HEU fuel were used.

[3] These exceptions included the operation of the N-Reactor at Hanford, the dual-use nature of the U.S. enrichment program, the use of defense program plutonium production reactors to produce radio-isotopes for civilian purposes, and the sale of tritium produced in defense reactors in the U.S. commercial market.

concluded that the nonproliferation policy issues associated with the use of a commercial light water reactor are manageable and that the Department should continue to pursue the reactor option as a viable source for future tritium production.

It should be noted that, if enacted into law, the Markey Amendment to the House-passed version of the FY 1999 National Defense Authorization Act would be the first legally binding restriction on the use of CLWRs for the production of tritium for defense purposes and would effectively eliminate all CLWR options.

Background. One of the key issues associated with the CLWR option is the potential impact on U.S. nonproliferation policy of using a civil reactor to produce an essential material for U.S. nuclear weapons. The civil/military separation in U.S. nuclear energy programs evolved gradually during the 1950s and 1960s, as the non-defense component of the U.S. nuclear program grew. The separation facilitated the development of the commercial nuclear power industry, both here and abroad, by insulating that industry from any direct connection to nuclear weapons production. In addition, the civil/military distinction enabled the United States to demonstrate that a significant portion of U.S. nuclear activities were not contributing to the production of nuclear weapons. The bifurcation of the U.S. nuclear program has also facilitated U.S. exchanges with non-nuclear weapon states on the peaceful uses of nuclear energy and supported the basis for U.S. leadership in the International Atomic Energy Agency (IAEA) and other multilateral organizations involved in civil nuclear activities.

Over the years, the policy of distinguishing between military and civilian activities was made more explicit. In 1983, for example, the Hart-Simpson Amendment to the Atomic Energy Act expressly prohibited the use of special nuclear material (SNM) derived from commercial reactors for nuclear arms.[4] Similarly, at the 1985 and the 1990 Nuclear Nonproliferation Treaty Review Conferences, U.S. interagency-cleared issue papers supported the civil/military dichotomy.

Absence of Legal Prohibitions. Notwithstanding this background, U.S. policy does not specifically prohibit the production of tritium for defense purposes in a CLWR, nor is this prohibited by U.S. law or by any international agreement to which the United States is a party. The sole legal prohibition against the use of a commercial reactor for defense purposes relates to a ban on the use of SNM produced in a commercial reactor for nuclear explosive purposes. Tritium

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[4] Section 11aa of the Atomic Energy Act defines special nuclear material as "(1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission [today, the Nuclear Regulatory Commission, or, for certain purposes, possibly, the Department of Energy] pursuant to the provisions of section 51, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material." No determinations under section 51 of the Atomic Energy Act have been made to date to add new materials to the definition of special nuclear material.

is not classified as a special nuclear material under the Atomic Energy Act, and it is not a fissionable material capable of sustaining a nuclear reaction. Under that law, tritium falls within the definition of a byproduct material. Section 11(e) of the Atomic Energy Act defines byproduct material as (1) any radioactive material (except SNM) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing SNM and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.[5]

Exceptions to Policy. The civil/military separation has never been absolute. The Department's Hanford N Reactor, for example, was built to produce plutonium for nuclear weapons, but simultaneously generated steam that was in turn sold to a commercial vender for the production of electricity. In addition, the Department's production reactors at the Savannah River Site were also used to create plutonium-238 for NASA's civilian programs, and, over the years, the defense side of the U.S. nuclear program was the primary source of many radio-isotopes, including cesium and californium, used for civilian applications. Indeed, DOE sold tritium produced in U.S. defense production reactors for civilian uses on the U.S. market until the early 1990's (when it became apparent that the U.S. would not restore a tritium production capability within the near future).

Similarly, the U.S. uranium enrichment infrastructure produced enriched uranium for both military and civilian purposes for decades. It should also be noted that a significant proportion of the electricity produced at several U.S. commercial nuclear power plants owned by the Tennessee Valley Authority (TVA) has been purchased by the U.S. Government to operate uranium enrichment plants at Oak Ridge, whose output, in turn, has been used, in the production of nuclear weapons and naval propulsion fuel. Since the mid-1960s, however, no U.S. commercial nuclear power reactor has produced materials for use in nuclear weapons, and today, with the U.S. Enrichment Corporation limited to civilian purposes and the N Reactor shut down, there are no major dual-use nuclear facilities in the United States.

The Non-Proliferation Treaty (NPT) and U.S.-International Atomic Energy Agency (IAEA) Voluntary Offer Safeguards Agreement. No restriction in the NPT would prevent the use of U.S. CLWRs for production of tritium for defense purposes, because the United States is a nuclear weapon state party to that treaty. For this reason, the United States is not prohibited by the treaty from manufacturing nuclear weapons or producing the materials needed for their

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[5] Section 51 of the Atomic Energy Act authorizes the Nuclear Regulatory Commission (NRC), or for certain purposes, possibly, the Department of Energy, to add new materials to those defined as SNM in Section 11 of that statute. Before making any such determination, the NRC (or the Department) must find that any such material is capable of releasing substantial quantities of atomic energy and must find that the determination that such material is SNM is in the interest of the common defense and security. In addition, the President must have expressly assented in writing to the determination. Tritium, as a byproduct material, is not and has never been subject to the more stringent restrictions imposed upon SNM.

production. This, in turn, means that the United States is not required to accept IAEA inspections (known as "safeguards") on its nuclear facilities to ensure that they are not being used for weapons purposes. The NPT thus presents no barriers to the CLWR option for tritium production.

Similarly, the U.S.-IAEA Safeguards Agreement does not ban the production of tritium in U.S. CLWRs. In 1980, the United States agreed to make all of its non-defense nuclear facilities, including all U.S. commercial nuclear power plants, eligible for IAEA safeguards to verify that special nuclear material in inspected facilities is not removed from IAEA oversight, except in accordance with the terms of the agreement -- in effect, a pledge that materials under inspection are not being used for nuclear arms. Through the agreement, the United States sought to reduce the perceived discriminatory nature of the Nonproliferation Treaty regime, which requires all non-nuclear weapon state parties to accept such safeguards on all of their nuclear installations. The U.S. initiative is also known as the "Voluntary Offer," because, as noted above, the United States is a nuclear-weapon-state party to the NPT and is therefore not required to accept any IAEA inspections.[6] In practice, at the present time, the IAEA has chosen not to inspect any U.S. commercial nuclear power plants under the Voluntary Offer, but remains empowered to do so.

The IAEA, it should be emphasized, safeguards materials directly usable for nuclear weapons, such as high enriched uranium and plutonium, and other materials in the nuclear fuel cycle, such as low enriched and purified natural uranium, that can be transformed into direct-use materials. It does not, however, apply safeguards to tritium, which does not fall into these categories, and which, as noted above, is a byproduct material.

The IAEA Secretariat has indicated that a U.S. civilian reactor providing irradiation services for tritium production would not have to be withdrawn from the Eligible List under the U.S.-IAEA Safeguards Agreement. After consultations with IAEA officials, representatives of the U.S. Mission to the IAEA in Vienna reported that the IAEA stated that it "does not see a legal impediment to the possible U.S. production of tritium in a facility that is eligible for IAEA safeguards." In addition, the IAEA "confirmed that neither the material being irradiated nor that being produced would be subject to safeguards under the terms of the Voluntary Offer."

Nuclear Suppliers Group. The United States is a member of the Nuclear Suppliers Group (NSG), an organization whose thirty-five member countries have agreed to implement uniform export regulations requiring strict nonproliferation controls on transfers of nuclear equipment and material. Under guidelines issued by the NSG, tritium and tritium production equipment cannot be exported unless the recipient government provides assurances that they will not be used in any nuclear explosive activity or in any nuclear fuel-cycle activity not subject to IAEA safeguards. Before embarking on a tritium production mission in a CLWR, DOE would

[6] The U.S.-IAEA Agreement, though accepted voluntarily by the United States, is a legally binding agreement between the United States and the IAEA.

provide assurances that none of the tritium production equipment had been imported from any NSG country.

Bilateral Agreements. Certain U.S. bilateral agreements for nuclear cooperation prohibit the use of fuel and equipment imported under those agreements from being used for nuclear explosives. In pursuing the CLWR option, DOE would assure its trading partners that no foreign nuclear fuel or equipment supplied that was subject to such restrictions was being used for tritium production in a CLWR.

CLWR: Mitigating Factors. A number of factors associated with the CLWR option help mitigate any potential concerns about using a "commercial" facility for tritium production.

First, the review noted that under the 1980 U.S.-IAEA Safeguards Agreement, all U.S. CLWRs are eligible for IAEA safeguards[7] and that the IAEA, which does not monitor the production of tritium, had advised the U.S. Government that the use of any CLWR to produce this material would not prevent the IAEA from applying safeguards at such facility. The interagency review concluded that should the decision be reached to produce tritium at a CLWR, the United States should maintain the facility on the list of installations eligible for IAEA inspection, which, if applied, would provide assurance that no special nuclear material at the facility was being used in nuclear weapons.

The review further concluded that to minimize divergence from the military/civilian dichotomy, the Department should fuel such a reactor exclusively with U.S. low enriched uranium fuel that was unencumbered by peaceful use pledges, thereby precluding the possible use of fuel derived from excess high enriched uranium that the President has pledged will never again be used in nuclear weapons.[8]

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[7] As noted above, under the U.S.-IAEA Safeguards Agreement, the IAEA verifies that nuclear material placed under its safeguards will not be removed from a safeguarded facility, except in accordance with the terms of the agreement. Among other requirements, the agreement specifies that the United States must formally notify the Agency in advance of its intent to remove safeguarded material from the scope of IAEA monitoring. As a practical matter, this means that as long as inspections continue over particular quantities of nuclear material, that material is not being used for weapons purposes. The application of IAEA safeguards at a CLWR used for the production of tritium and over the spent nuclear fuel the reactor produced would thus have the effect of ensuring that plutonium produced in the CLWR's spent fuel at the facility was not being used for nuclear weapons, thereby limiting the deviation from the principle of maintaining the separation of civil and military nuclear activities.

[8] There are ample supplies of unencumbered U.S. low enriched uranium to satisfy the fueling needs of a CLWR used for the production of tritium.

In addition, the review noted that at present, the Tennessee Valley Authority (TVA) is the sole utility to bid for the contract to produce tritium through the use of CLWRs. Because TVA is an instrumentality of the United States Government, if its bid were accepted, the particular CLWRs to be used for this mission would be wholly owned by United States Government, rather than by a private sector entity. Moreover, TVA was chartered in its authorizing statute to serve both the nation's civilian and national security needs. In fulfillment of this mission, for decades, TVA provided the power essential for the production of enriched uranium for the nation's nuclear arsenal. Thus, if a TVA reactor were used to produce tritium, the review concluded, the activity would be, in effect, extending the past practice of using government-owned facilities simultaneously for civil and military purposes rather than setting a precedent.[9]

Also, to reinforce the special nature of the TVA facility, DOE could mandate that DOE employees would participate in all tritium handling activities at TVA facilities. In the case of a TVA reactor, only U.S. Government employees would be involved as TVA is a U.S. government-owned and operated organization/instrumentality.

Finally, it was noted that the actual extraction of the tritium gas from the target rod material would not take place at the reactor site, but rather would be performed at a DOE defense facility, *i.e.*, at a location entirely separate from the CLWR.

On balance, the review concluded that, although the use of a CLWR to produce tritium for nuclear weapons raised initial concern about keeping military nuclear activities separate from civilian ones, this concern would be satisfactorily addressed by ensuring that the reactors would remain eligible for IAEA safeguards, requiring tritium production activities be performed by DOE defense program personnel, and using only unencumbered fuel in the facilities. Moreover, if the

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[9] Because, at the time of the review, TVA was the sole utility to bid for the CLWR tritium production contract, the Department and the other agencies assessing the nonproliferation aspects of this option concentrated on this case. While many factors noted above would also apply in the case of a CLWR owned and operated by a private U.S. utility, no such utility has proposed to produce tritium for the Department. Thus, this alternative was not before the Department or the other interested agencies when their review was undertaken.

The review briefly examined the option, if a TVA reactor were selected, of formally declaring a CLWR to be a defense facility under TVA's charter. While such a step would ensure that any new tritium production mission would occur within a "defense" facility, it would not resolve the issue of performing both a defense mission and a civilian power mission within the same facility. An undesirable consequence of this designation would be that TVA would be producing and selling electricity from a "defense" facility -- because the facility's primary mission would, in fact, continue to be its civilian power generation mission. In addition, it could complicate the government's ability to retain the reactor on the list of facilities eligible for IAEA inspection under the Voluntary Offer Agreement. Accordingly, further consideration of this option was deferred.

reactors used for the tritium mission were owned and operated by the U.S. Government, their use for the tritium production mission would be roughly comparable to past instances in which government-owned facilities were used for dual-purpose missions. Given the essential requirement for tritium to maintain the U.S. nuclear weapon stockpile and the flexibility, technological maturity, and cost-effectiveness of the light water reactor option, the review concluded that DOE should continue to pursue the reactor option as a viable option for future tritium production.

Fast Flux Test Facility (FFTF)

The FFTF is a DOE, rather than a commercial, facility. Originally built as part of the DOE civil nuclear program, the FFTF has been placed on the list of U.S. nuclear facilities eligible for IAEA inspection. If used to produce tritium for nuclear weapons, however, the FFTF's civil status could be readily changed, and it could be declared to be a part of the DOE defense complex. It could then either be removed from the IAEA-safeguards Eligible List or kept on the list as a unique exception to the rule that limits the list to non-defense facilities.

The FFTF can be fueled either with plutonium or high enriched uranium (HEU). Virtually all plutonium available for this fuel, however, except for an initial supply that would last for about eighteen months, is encumbered by pledges made by President Clinton, Secretary of Energy O'Leary, and/or Secretary of Energy Peña that this material will never be used in nuclear arms and by the characterization of this material as "excess to U.S. defense needs." AND HEU

In declaring 200 tons of U.S. fissile material (including the subject plutonium) to be "excess to defense requirements," the President stated in March 1995 that the material would "never again be used to build a nuclear weapon." Similarly, the thrust of Secretary Peña's address to the IAEA General Conference in September 1997 was that the 52 tons of HEU and plutonium he was making eligible for IAEA inspections had been "removed from military use." Technically, it is true that using the material to produce tritium *for* nuclear weapons is not the same as using the material *in* such weapons. The use of the material for a clearly military purpose, however, would appear to require its removal from its current classification as "excess material." As a practical matter, using such plutonium to produce tritium for nuclear weapons could be perceived as running counter to these undertakings and would raise serious questions internationally about U.S. arms control commitments.[10]

The second fuel option for the FFTF would be the use of HEU fuel, material that would be enriched to approximately 60 percent U-235. (Uranium enriched to more than 20 percent U-235 is classified as high enriched uranium.) While not weapons-grade, uranium that is 60 percent U-235 is weapons-usable and is in the category of nuclear materials requiring the highest level of protection under DOE regulations. The United States has enough unencumbered HEU to permit

[10] A nonproliferation benefit from using this plutonium in the FFTF, however, is that it would irradiate the material and make it less accessible for use in nuclear weapons.

the FFTF to operate without the use of material declared excess to defense needs. The review also noted, however, that the use of HEU-fuel would reduce the tritium output of the reactor by approximately 20 percent thus further increasing the gap between the total production capacity of the reactor and projected tritium requirements.

Operation of the FFTF on HEU, however, would run counter to the longstanding U.S. policy of minimizing the civil use of HEU. While FFTF would not be a "civil" facility if used for the tritium production mission, it would nonetheless represent the first new use of HEU in a reactor in the United States since 1978, when the Reduced Enrichment for Research and Test Reactors (RERTR) program was launched, under which the United States took a more active role in minimizing the global commerce in HEU. Use of HEU in the FFTF would undercut the RERTR program and would also erode parallel U.S. efforts to persuade Russia to avoid the use of HEU in several Russia nuclear reactors used for district heating. As a mitigating factor, however, it was noted that the Department of Energy and the Department of Commerce continue to operate five other non-power reactors that are fueled with HEU, even as the United States has pursued, with considerable success, its efforts to reduce the use of HEU globally. It was therefore not clear that the use of HEU to fuel the FFTF would have an unacceptable impact on this aspect of U.S. nonproliferation policy.

On balance, the review concluded that because the use of plutonium to fuel the FFTF would require the reversal of U.S. commitments regarding material declared excess to defense needs, this option appeared unattractive. The nonproliferation impacts of the HEU option, while not insignificant, were more difficult to measure. However these impacts need not, in themselves, preclude further study of the HEU fuel alternative, if after assessment for flexibility, technological maturity, and cost-effectiveness, this option continued to receive consideration.

Accelerator

The tritium production accelerator would be built as a DOE defense facility and thus does not raise any of the proliferation concerns associated with the options discussed above.

However, the accelerator system does involve the deployment of technology sufficiently powerful to produce special nuclear material in quantities of proliferation concern. For this reason, the accelerator technology would be controlled under Part 810 of the Code of Federal Regulation, Volume 10. Under Part 810, an authorization is required by the Secretary of Energy for the export of any technology that directly or indirectly could contribute to the production of special nuclear material.

It should also be noted that it is possible that a DOE tritium-producing accelerator could be a dual-use facility, producing radioisotopes for use in the civilian medical community.[11]

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[11] If the accelerator were operated as a dual-use facility, it would blur the distinction between U.S. civil and military nuclear activities, raising issues similar to those discussed in the

In view of these considerations with regard to the accelerator option, the interagency concluded that the APT project does not pose proliferation risks.

Conclusions

Overall, the interagency review of the nonproliferation aspects of the Department's selection of a tritium production technology reached several important conclusions.

First, it found that although the CLWR alternative raised initial concerns because of its implications for the policy of maintaining separation between U.S. civil and military nuclear activities, these concerns could be satisfactorily addressed, given the particular circumstances involved. These included the fact that the reactors would remain eligible for IAEA safeguards, and the fact that if TVA were the utility selected for the tritium mission, the reactors used for tritium production would be owned and operated by the U.S. Government, making them roughly comparable to past instances of government-owned dual-purpose nuclear facilities. Given the essential requirement for tritium to maintain the U.S. nuclear weapon stockpile, and the flexibility, technological maturity, and cost-effectiveness of the light water reactor option, the review concluded that DOE should continue its pursuit of the reactor option as a viable source for future tritium production.

With respect to the FFTF, there was general agreement that the plutonium-fueled option for the FFTF was undesirable, because under this option, in order to use the FFTF to produce tritium for nuclear weapons, it would be soon be necessary to use plutonium that had been declared by the President to be "excess to defense needs." High enriched uranium could be used as an alternative fuel source for the FFTF, but the use of HEU fuel would run counter to U.S. efforts to minimize the use of this fuel globally. In addition, the use of HEU fuel would reduce the tritium production output of the FFTF to levels below those required for the U.S. nuclear weapon stockpile, even under a reduced START II-level requirement.

Finally, there was general agreement that the accelerator project does not pose proliferation risks, assuming export control measures covering this area are maintained.

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case of the CLWR option. As noted above, however, the separation of the two aspects of U.S. nuclear activities has never been complete, and the accelerator, as a DOE facility constructed specifically to support the Department's defense mission, would fit squarely within past precedents, which include the production of radioisotopes for civilian use at DOE defense installations.