the process in order to gauge the qualifications of individual candidates.

Affected Public: Individuals or households, Federal agencies or employees.

Annual Burden Hours: 30,000.

Number of Respondents: 10,000.

Responses per Respondent: 1.

Average Burden per Response: 3 hours.

Frequency: On occasion.

Authority: 44 U.S.C. 3506(c)(2)(A).

Dated: May 4, 1999.

Pamela A. Holden,

Lieutenant Commander, Judge Advocate General's Corps, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. 99–12183 Filed 5–13–99; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF ENERGY

Consolidated Record of Decision for Tritium Supply and Recycling

AGENCY: U.S. Department of Energy.

ACTION: Consolidated Record of decision for tritium supply and recycling.

SUMMARY: The U.S. Department of Energy (DOE) completed the Tritium Supply and Recycling Final Programmatic Environmental Impact Statement (PEIS) (DOE/EIS–0161) in October 1995. The Tritium Supply and Recycling PEIS assessed the potential environmental impacts of technology and siting alternatives for the production of tritium for national security purposes as well as the impacts of constructing a new Tritium Extraction Facility (TEF) at the Department's Savannah River Site near Aiken, SC.

On December 5, 1995, DOE issued a Tritium Supply and Recycling Record of Decision (ROD) [60 FR 63878] that selected the two most promising alternative technologies for tritium production and established a dual-track strategy that would, within 3 years, select one of those technologies to become the primary tritium supply technology. The other technology, if feasible, would be developed as a backup tritium source. Under the dual-track strategy, DOE would: (1) Initiate the purchase of an existing commercial reactor (operating or partially complete) or irradiation services with an option to purchase the reactor for conversion to a defense facility; and (2) design, build, and test critical components of an accelerator system for tritium production. Any new facilities that might be required, the production-scale accelerator and a Tritium Extraction Facility to support the commercial reactor alternative, would be constructed at DOE's Savannah River Site. Subsequent to the PEIS and the December 5, 1995 ROD, DOE prepared three site-specific EISs: the Accelerator Production of Tritium at the Savannah River Site (APT) (DOE/EIS–0270), the Production of Tritium in a Commercial Light Water Reactor (CLWR) (DOE/EIS–0288), and the Tritium Extraction Facility at Savannah River Site (TEF) (DOE/EIS–0271). The December 1995 ROD also stated that, although it was rejected as a reasonable long-term supply alternative in the PEIS, DOE's Fast Flux Test Facility (FFTF) at the Hanford Reservation in Washington would be re-examined to determine whether it should play any tritium production role.

On December 22, 1998, the Secretary of Energy announced his selection of the commercial light water reactor alternative as the primary tritium supply. This consolidated Record of Decision documents that decision and announces a series of three tiered decisions which, taken together, comprise the Department's plans for establishing a new domestic source of tritium to support the nuclear weapons stockpile. Each decision results from the preparation of a related environmental impact statement. In the order presented, this consolidated record of decision makes the following decisions based on their associated environmental impact statements (EIS):

1. Supplemental Programmatic Decision for Tritium Supply and Recycling: Documents the Secretary of Energy announcement of December 22, 1998; selects the purchase of irradiation services using commercial light water reactors as the primary tritium supply technology; and designates the accelerator system at the Savannah River Site as the backup technology. This ROD supplements the December 1995 ROD described above. Environmental analysis is contained in the Tritium Supply and Recycling PEIS (DOE/EIS–01621, October 1995).

2. Site-specific Decision for the Production of Tritium in a Commercial Light Water Reactor. Selects the Tennessee Valley Authority's (TVA) Watts Bar Unit 1, Sequoyah Unit 1, and Sequoyah Unit 2 reactors for use in irradiating tritium-producing burnable absorber rods (TPBARs). This decision is tiered from and implements the supplemental programmatic decision described above. Environmental analysis is contained in the Final EIS for the Production of Tritium in a Commercial Light Water Reactor (DOE/EIS–0288, March 1999). This EIS is tiered from the Tritium Supply and Recycling PEIS.

3. Site-specific Decision for Construction and Operation of a Tritium Extraction Facility at the Savannah River Site. Selects the alternative that would design, construct, test, and operate a new TEF in the H–Area immediately adjacent to and west of Building 233–H at the Savannah River Site. This facility is an essential element of the system for producing tritium using commercial reactors. This decision is tiered from and implements the supplemental programmatic decision described above. Environmental analysis is contained in the Final EIS for Construction and Operation of a TEF at the Savannah River Site (DOE/EIS–0271, March 1999) which is tiered from the Tritium Supply and Recycling PEIS.

4. Site-specific Decision for the Accelerator Production of Tritium (APT). Selects the specific location at the Savannah River Site and the technologies to be used for the backup tritium supply technology, should its construction be required. This decision is tiered from and implements the supplemental programmatic decision described above. Environmental analysis is contained in the Final EIS for Accelerator Production of Tritium (DOE/EIS–0270, March 1999) which is tiered from the PEIS.

FOR FURTHER INFORMATION CONTACT: For further information on the commercial reactor program and the Tritium Extraction Facility, contact Stephen M. Sohinki, DP–62, 1000 Independence Avenue SW, Washington, DC 20585, by phone (202–586–0838), or electronically (Tritium web site: www.dp.doe.gov and click on ''Tritium Project Office Home Page'') For further information on accelerator production of tritium, contact William P. Bishop, DP–61, 1000 Independence Avenue SW, Washington, DC 20585, by phone (202–586–0046).

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

SUPPLEMENTARY INFORMATION:

I. Background

DOE has prepared this consolidated ROD pursuant to the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of the National Environmental Policy Act (NEPA)(40

CFR 1500–1508) and the DOE NEPA regulations (10 CFR part 1021). This ROD is based on the Tritium Supply and Recycling Programmatic Environmental Impact Statement (PEIS), and the three site-specific EISs identified above. Non-environmental considerations such as cost, technical maturity, and policy issues are also discussed in this ROD.

The Department of Energy is responsible for supplying nuclear materials for national security needs and for ensuring that the nuclear weapons stockpile remains safe and reliable. Tritium, a radioactive isotope of hydrogen, is an essential component of every nuclear weapon in the current and projected U.S. stockpile. Unlike other materials used in nuclear weapons, tritium decays at a rate of 5.5 percent per year. Accordingly, as long as the Nation relies on nuclear weapons, tritium in each weapon must be replenished periodically. Currently, the U.S. nuclear weapons complex does not have the capability to produce tritium to support the Nation's stockpile.

The President's Nuclear Weapons Stockpile Plan sets forth national security requirements for the current and projected nuclear weapons stockpile. At present, this plan is based on the Strategic Arms Reduction Treaty (START I) between the U.S. and former Soviet Republics. START I, which was signed in July 1991 and became effective in December 1994, reduces the number of strategic nuclear weapons in each side's stockpile. Under the Presidential guidance, new tritium would be needed by about fiscal year (FY) 2005 to offset the decay of tritium in the stockpile, in the required 5-year reserve, and in various operating inventories. Although the actual requirement is classified, the unclassified representation of the steady-state production rate to offset decay would be about 2.5 kilograms per year. If needed to replenish the tritium inventory, the new tritium source should be able to achieve a maximum production rate of around 3 kilograms per year. The START II agreement, which further reduces nuclear stockpiles, was signed in July 1991, but has not been ratified by Russia and is, therefore, not in force. If Russia ratifies START II, the date when new tritium is needed may be as late as 2011 and the steady-state production rate may be as low as about 1.5 kilograms per year.

The Department has not produced any new tritium since the shutdown of the last of its nuclear materials production reactors in 1988. Since that time the Department has examined various methods of producing new tritium. The Department announced on November 11, 1991, that analyses of tritium production alternatives would be incorporated into a programmatic environmental impact statement for the Reconfiguration of the Nuclear Weapons Complex. On October 28, 1994, the Department announced that a separate PEIS for Tritium Supply and Recycling would be prepared (59 FR 54175). On October 27, 1995, the Notice of Availability of the Final PEIS was published (60 FR 55020). Following publication of the Final PEIS, a Record of Decision was issued on December 5, 1995, which stated that the Department would pursue a dual track on the two most promising tritium supply alternatives: (1) to initiate the purchase of an existing commercial reactor (operating or partially complete) or irradiation services with an option to purchase the reactor for conversion to a defense facility; and (2) to design, build, and test critical components of an accelerator system. Within a three-year period, the Department would select one of the tracks to serve as the primary source of tritium. The other alternative, if feasible, would be developed as a backup tritium source. The ROD further stated that the Savannah River Site is selected as the location for an accelerator, should one be built. The ROD also stated that a tritium extraction facility will be constructed at the Savannah River Site if a commercial reactor alternative becomes the primary tritium source. Finally, the ROD stated that the existing tritium recycling facility at the Savannah River Site would be consolidated and upgraded.

In the December 1995 ROD, the Department indicated that the FFTF, which had been rejected as a reasonable long-term production alternative, would be re-evaluated to determine whether it could reasonably play any role in meeting future tritium requirements. In January 1997, the reactor was placed in a stand-by status while additional evaluations were conducted. At the time, placing the reactor in a stand-by condition was thought to provide near-term insurance while the study of the two dual-track options continued.

On December 22, 1998, the Department announced that commercial light water reactors would be used for the production of new tritium and the accelerator would be developed, but not constructed, as the backup technology. Selection of the commercial light water reactor confirms the prior plan to construct a new TEF, an element of the system to produce tritium using reactors. The use of existing commercial reactors was chosen as the preferred alternative. In addition, the Department decided that the FFTF would have no role in tritium supply plans because the Department has high confidence that the primary and back-up roles assigned to the commercial light water reactor and accelerator technologies, respectively, would assure that future tritium requirements are met.

During the 30-day waiting period following publication of the three project-specific EISs in March 1999, DOE received four letters. One from the Department of Human Health and Services regarding the Final EIS for the Tritium Extraction Facility. That letter stated that the potential concerns of the Department of Human Health and Services were addressed in the Final EIS, and that there were no additional comments. The second letter was received from the Department of the Interior regarding the Final EIS for Accelerator Production of Tritium at the Savannah River Site and expressed a number of concerns relating to the biota. Since the APT has been designated as the backup, none of these impacts to biota are expected. However, if a decision is made to pursue the APT at a later date, these concerns would be addressed. The third and four letters, which were from the Environmental Protection Agency's (EPA) Region 4 Office in Atlanta, Georgia, concerned the APT and TEF EISs. The letters stated that DOE adequately responded to all EPA comments, but that EPA continues to have environmental concerns related to the wetlands, surface water, and groundwater impacts for the APT project, and the response to, and potential environmental impacts, associated with accidental releases for the TEF project. If a decision is made to pursue the APT, these concerns would be addressed. The concerns regarding the TEF project will be addressed in further detail during the design and permitting process. No other comments or letters were received.

II. Supplemental Programmatic Decision for Tritium Supply and Recycling

A. Tritium Supply and Recycling Alternatives

The dual-track strategy established in the December 1995 Programmatic Record of Decision defined the alternatives that would remain under consideration: (1) the purchase of an existing commercial reactor (operating or partially complete) or irradiation services with an option to purchase the reactor for conversion to a defense facility; and (2) design and construction of an accelerator system for tritium production. New construction of an accelerator and/or a new tritium extraction facility would be located at DOE's Savannah River Site near Aiken, SC. No new tritium recycling capabilities or facilities are required or contemplated. This decision was based on the Final Tritium Supply and Recycling Programmatic Environmental Impact Statement (PEIS) (DOE/EIS—0161, October 1995).

This supplemental programmatic ROD makes a choice between the two programmatic alternatives. It compares the alternatives with regard to their ability to meet military requirements in terms of technical maturity, capacity, and schedule risk; regulatory and licensing issues; cost; nonproliferation policy issues; flexibility to meet changing requirements, and environmental impacts.

The commercial reactor alternative has narrowed somewhat since 1995. DOE sought proposals from electrical utilities that operate commercial light water reactors (CLWR). No proposals were submitted to sell a reactor (operating or partially complete) to DOE. The Tennessee Valley Authority (TVA) offered to provide irradiation services using an incomplete reactor, for which DOE would provide funds to finish, plus use of its currently operating reactors as needed. TVA also offered the use of its currently operating reactors alone.

1. Description of Tritium Production Using Commercial Reactors

This section describes the process of producing tritium in a CLWR. Current tritium requirements dictate that two CLWRs would be utilized at any given time. DOE-designed Tritium Producing Burnable Absorber Rods (TPBARs) would be placed in the reactors. DOE would have TPBARs manufactured commercially under contract. A maximum of approximately 3400 TPBARs would be inserted in any one reactor for one fuel cycle. TPBARs perform the same functions as burnable absorber rods, which are used or have been used in commercial reactors to absorb excess neutrons to control local power levels and fuel burnup rates. Commercial burnable absorber rods absorb excess neutrons using the isotope Boron-10 in ceramic form. TPBARs would also use a ceramic but substitute the isotope Lithium-6 for Boron-10. Lithium-6 changes to tritium when neutrons are absorbed. TPBARs would be placed in the reactors during normal refueling outages. The TPBARs would remain in the reactors throughout their normal operating cycle, usually a 15–18 month period. The irradiated TPBARs would be replaced in the reactors with new ones during refueling operations. Reactors potentially engaged in tritium production must have their operating licenses amended by the Nuclear Regulatory Commission (NRC). To meet current requirements, DOE plans for the first irradiation cycle to begin in early FY 2004.

After irradiation, TPBARs would be transported in approved shipping casks to a new TEF which would be constructed at DOE's Savannah River Site and ready for operation no later than February 2006. The tritium in each TPBAR is not gaseous, but is held in a solid matrix by several internal structures. These structures are so effective in retaining the tritium that a high-temperature furnace must be used to remove the tritium as a gas. The TEF would use remotely operated handling equipment and the furnaces that would heat the irradiated TPBARs to around 1,000 degrees Celsius. The gases removed from the TPBARs would be partially purified and pumped to the existing Tritium Recycle Facility at the Savannah River Site for further processing and delivery to the nuclear weapons stockpile. Following extraction, TPBARs, classified as low-level radioactive waste, would then be sent to a low-level radioactive waste disposal facility at the Savannah River Site.

2. Description of Accelerator Production of Tritium

The production of tritium in the proposed Accelerator Production of Tritium facility may be viewed as a four-step process. First, protons are accelerated to high energies. Second the protons strike tungsten to produce neutrons through a nuclear process called spallation. Tritium is produced in the third step, when the neutrons are captured by a helium-3 feedstock (He-3) causing a nuclear reaction which produces tritium and other isotopes of hydrogen. The final step is to separate the tritium from the feedstock and purify it for use in the stockpile.

The APT would use radiofrequency waves to accelerate protons (positively charged atomic particles). Electrical power would be converted to radiofrequency waves outside the accelerator beam, and waveguides (hollow metal conduits) would transmit the waves to cells along the beam path. The accelerator design would enable the proton beam to intersect with the radiofrequency waves in the proper orientation to cause the protons to accelerate; in other words, the radiofrequecy waves would push the protons down the beam tube faster and faster.

Once the protons reached the desired energy, they would be directed toward a target/blanket assembly of tungsten surrounded by lead. The high energy of the protons striking the tungsten target would cause the nuclei of the tungsten atoms to break into fragments, ejecting neutrons and secondary particles in all directions (spallation). These neutrons and some protons would be scattered to surrounding lead blanket modules where more neutrons would be produced through additional nuclear reactions. The neutrons freed during spallation would strike and be absorbed by the feedstock material (i.e., He–30) in the target/blanket. This absorption of neutrons would result in the production of tritium and byproduct atoms. The tritium would then be separated from the feedstock and purified. The purified tritium would be transported to the Tritium Loading Facility at the Savannah River Site where it would be used to refill tritium reservoirs in nuclear weapons.

B. Comparison of Non-Environmental Impacts of Tritium Supply Alternatives

DOE is responsible to the President and its primary customer, the Department of Defense, for establishing an assured source of tritium on a schedule that meets the requirements discussed in the background section above. Several factors, not directly related to environmental impacts, are important in assessing the probability that each tritium supply alternative will meet that responsibility. The factors discussed below are: ability to meet military requirements; regulatory and licensing issues; cost; nonproliferation issues; and flexibility to meet changing requirements.

1. Ability To Meet Military Requirements

To meet military requirements, a tritium source must have low technical risk, must have the capacity to produce tritium at required rates, and must meet schedule deadlines. The tritium supply options are assessed in these terms below:

Technology Maturity/Risk

Since its inception, the APT Project has sought to develop and demonstrate critical components of a tritium production system and to reach a level of maturity in the design of a full-scale production system so that its technical risks, costs, and schedule can be fully understood. At this point a majority of the accelerator system's preliminary design has been completed and a low-energy demonstration accelerator at the Los Alamos National Laboratory in New

Mexico has undergone construction and successful operational testing. Several external reviews have revealed no technical ‘‘showstoppers.’’ However, accelerators have never made tritium on a continuous production scale, and the APT would be a first-of-a-kind facility.

Tritium production in reactors has been demonstrated to be safe and technically straightforward. Although there are variations in the technical details, in the past the only method used to produce tritium has been with reactors and tritium-producing ‘‘targets’’ containing lithium. DOE began considering commercial reactor target designs for tritium production in the 1960s. The TPBAR to be used in commercial reactors was designed and extensive development and testing done during DOE's previous New Production Reactor Program (1988–1992). Commercial nuclear power is supported by a well developed, mature industrial infrastructure. During that program, rods of essentially the same design as those to be used in commercial reactors were irradiated in DOE's Advanced Test Reactor at the Idaho National Environmental and Engineering Laboratory. Post-irradiation non-destructive and destructive examinations have shown that the rods performed even better than predicted. Various laboratory tests have consistently shown TPBAR component performance to be as good or better than expectations.

Following two extensive technical reviews by the Nuclear Regulatory Commission (NRC) and the approval of an amendment for its operating license issued in September 1997, the Tennessee Valley Authority's (TVA) Watts Bar reactor irradiated 32 TPBARs over a normal operating cycle for a confirmatory demonstration. Frequent monitoring of the reactor coolant and neutron flux indicated no problems with the rods. Following irradiation, the rods were removed from the reactor's spent fuel on March 19, 1999, and visually inspected. The inspection of the 32 TPBARs showed no indications of any kind of problem. In February 1999, DOE submitted the Tritium Production Core Topical Report to the NRC. NRC's review of the report has raised no significant concerns and a Safety Evaluation Report to this effect is now being finalized by the NRC.

Conclusion: While much progress has been made in addressing the technical issues that existed regarding the APT at the time of the 1995 Record of Decision, tritium production technology for light water reactors is more technically mature, and carries with it less technical risk than the APT.

Capacity

The commercial reactor alternative and the APT alternative would both have a maximum production capacity of about 3 kilograms of tritium per year. Commercial reactors routinely operate at full power for extended periods of time. The national average capacity factor for commercial reactors is in excess of 75 percent, including all refueling shutdown periods. The Watts Bar reactor, while irradiating 32 of DOE's TPBARs, recently shut down for refueling, having been in continuous high-power operation for 353 consecutive days. The availability of multiple candidate reactors for irradiating TPBARs also provides high confidence that tritium production capacity requirements can be met. Although much progress has been made, the APT project has not yet demonstrated its tritium production capacity.

Conclusion: Although either alternative should be able to meet capacity requirements, the availability of multiple commercial reactors and their demonstrated capacity factors provides a greater degree of confidence that production goals can be met consistently.

Schedule

The commercial reactor alternative could begin producing its first batch of tritium in October 2003 when one of the candidate reactors is scheduled to complete a refueling outage. Because many technical and regulatory issues have been addressed already, there is a high degree of confidence that this initial irradiation schedule can be met. The first batch could be delivered to the stockpile as tritium gas as soon as the TEF is operational. Selection of the incomplete reactor approach would not impact the schedule because an existing reactor would be used to irradiate the initial batch of TPBARs. Under both reactor alternatives, current START I requirements would be met without the use of the 5-year tritium reserve. The APT alternative would be operational around 2008 and would begin continuous tritium production at that time. This would require that 3 years of the 5-year reserve be utilized for stockpile support. The APT would need to operate at its maximum capacity for a number of years to replace the depleted reserve.

Conclusion: There is a high likelihood that, with adequate funding, the reactor alternatives can meet the schedule and the tritium reserve would not be impacted. The APT would require that at least 3 years of the reserve be consumed and that the machine operate at maximum capacity until the reserve has been restored. Any schedule delay beyond 2008 would potentially utilize the balance of the reserve and thus potentially impact the stockpile. If START II is ratified and implemented, any schedule risk would be eliminated. However, for current stockpile requirements, the commercial reactor alternative has the best chance for meeting schedule requirements.

2. Regulatory and Licensing Issues

Both the reactor and accelerator alternatives would be overseen by bodies external to DOE. The potential for oversight/regulatory issues to impact the tritium alternatives is discussed below.

The NRC would have to amend the operating licenses of existing commercial reactors to permit production-scale irradiation of tritium-producing rods. Requests for license amendments would be submitted in the middle of calendar year 2000. It is expected that the NRC would be in a position to act upon the amendment requests well in advance of the planned October 2003 start of irradiation. Some experience has already been gained in this area because the Watts Bar reactor's operating license was amended in September 1997 to permit the confirmatory test irradiation of 32 TPBARs. That licensing process was completed in a few months. The NRC has completed two reviews of technical reports on the TPBAR submitted by DOE and a third review of a reactor-specific request to amend the Watts Bar reactor's operating license for the confirmatory irradiation demonstration. No significant safety issues were identified.

If a partially complete reactor were finished and brought on line, the facility would have to be licensed as a new nuclear power plant. The licensing process is likely to take up to 5 years. As discussed above, this would not impact national security because initial tritium production would begin with an existing reactor. However, delays in getting the incomplete plant into operation could delay and possibly reduce DOE's receipt of revenues from the plant's power sales. Thus, the only potential regulatory impact would be financial in nature.

The APT design, construction, and operation would be overseen by the Defense Nuclear Facilities Safety Board (DNFSB). To date, the DNFSB has not identified any issues that would affect the availability of this facility. The APT would not require a license for its construction or operation.

Conclusion: The APT option appears to have no regulatory and licensing issues. The existing-reactor sub-option is not likely to be impacted by regulatory and licensing issues. The incomplete reactor sub-option has potential for these issues to impact its schedule, but is not likely to affect tritium production because initial irradiation would be with an existing reactor.

3. Cost

Cost is determined in terms of investment cost and life-cycle cost. Investment cost is defined as the total of all remaining up-front costs necessary to design, develop, construct, startup, or otherwise establish tritium production capacity. Investment costs are generally the same as project costs. Life-cycle cost is defined as the total amount of money spent to produce 100 kilograms of tritium over the life of the alternative to meet current START I requirements. Life-cycle cost includes investment cost, all operating costs, and decontamination and decommissioning (D&D) costs. All cost discussions refer to constant FY 1999 dollars.

The investment cost remaining (FY 1999–2008) to develop, design, construct, and startup the APT facility, sized to meet START I tritium requirements, would be $3.4 billion. The investment cost remaining to establish capabilities to produce tritium through irradiation services with existing commercial reactors and to design, construct, and startup the TEF would be $580 million. This investment cost would increase by $1.2–1.8 billion if finishing an incomplete reactor is included.

The annual operating cost of the APT would be $135 million when meeting START I tritium requirements. The annual operating cost to produce START I quantities of tritium using existing reactors would be $20–60 million. At the high end of this range DOE would pay for the incremental increase in the enrichment of the host reactors' fuel as needed to accommodate TPBARs for tritium production. At the low end of the range DOE would provide blended-down highly enriched uranium from its national security stocks, and the host utility would reimburse DOE for that portion not directly attributable to tritium production. If DOE provides funds to finish an incomplete reactor, under some scenarios, the Government would share in the power sales revenue of that reactor. These revenues would depend on the amount of investment money provided and whether the funds were provided over a short period or an extended period. Large ''block'' investment payments would result in the highest revenue share. Reduced, extended payments would provide no revenue share. Depending on the investment, the annual operating cost to DOE would range from around $30 million of net income to around $25 million of net outlay.

D&D costs for the APT would be $260 million. For the reactor alternative, DOE would be liable only for D&D of the TEF at $8 million. DOE would have no liability for reactor D&D costs.

The APT and TEF would be designed for a 40-year life. Although the NRC licenses of currently operating reactors would expire before then, extension of the reactors' operating licenses is possible, either to meet power demand or tritium requirements or both. For purposes of this cost analysis, it is assumed that suitable reactors will be available throughout the 40-year period.. Thus, all alternatives were compared on the same life-span basis. Life-cycle cost for the APT is estimated to be $9.2 billion. Life-cycle cost for the use of commercial reactors is estimated to be $1.2 billion to $2.9 billion, depending on the investment-revenue combination discussed above.

The present discount value of the APT alternative, using a 3.6 percent discount rate, would be $5.2 billion. The present discount value of the commercial reactor alternative would range from $880 million to $2.0 billion, depending on the investment and fuel enrichment strategies, as discussed above.

Conclusion: Under current requirements, the commercial reactor alternative would cost significantly less than the APT alternative in terms of investment costs, operating costs, D&D costs, life-cycle costs, and present discount value.

Cost To Meet Reduced START II Requirements

If START II comes into force, the tritium need date could be around 2011 and the maximum tritium production rate may be reduced to about 1.5 kilograms per year. If so, a smaller accelerator could be constructed, reducing its investment cost to $2.8 billion. The existing commercial reactor alternative's investment cost remains about the same as the START I case. The accelerator alternative's life-cycle cost under this reduced-requirement scenario would be $7.5 billion. Life-cycle cost for the commercial reactor alternative, using existing reactors would be $2.2 billion or less, depending on the fuel enrichment strategy. Adding completion of an unfinished reactor could drive the life-cycle costs up or down, depending on the investment strategy.

Conclusion: Under START II requirements, the commercial reactor alternative would cost significantly less than the APT alternative in terms of investment cost, operating costs, D&D costs, and life-cycle costs.

4. Nonproliferation Issues

Concerns have been expressed by members of Congress and other individuals and groups regarding the use of a civilian reactor to assist a defense mission. As a result of these concerns, the Congress requested the Department to facilitate a high-level interagency review of the nonproliferation implications of the various tritium production technologies. Participants in the review included 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 NRC. The report, Interagency Review of the Nonproliferation Implications of Alternative Tritium Production Technologies Under Consideration by the Department of Energy, was provided to the Congress in July 1998. A summary of conclusions of the report follows:

The interagency report noted that tritium is not a fissionable material, and thus there is no legal prohibition on the production of tritium in a commercial reactor to support the stockpile. The report 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.'' This conclusion was based on a number of factors, including the following:

- Use of commercial reactors for tritium production is not prohibited by statute or international treaty;
- There have been several exceptions over the past several decades to the practice of distinguishing between the civilian and military uses of nuclear power.
- Commercial reactors engaged in tritium production would remain eligible for the application of International Atomic Energy Agency safeguards.
- The commercial reactor option would be operated in compliance with international agreements imposing restrictions on use of transferred materials for peaceful purposes only, e.g., no reactor fuel or component

transferred under these agreements would be used by any reactor making tritium; and

- Further mitigation is offered if the existing reactors are operated by TVA. TVA's statutory charter assigns it a national security mission. TVA's reactors are already government facilities. TVA has made contributions to national security in the past including production of munitions and providing power for the enrichment of uranium for civilian and military purposes. It would, therefore, be entirely appropriate for TVA to be assigned the tritium production mission.

The interagency review concluded that the accelerator option would raise no significant nonproliferation policy issues, assuming that export control measures are maintained. Subsequent to the issuance of the report, concerns have been expressed, applicable to both the APT and to the completion of an unfinished reactor, that the commitment to a major new weapons facility would be inconsistent, either in fact or in appearance, with our commitment to further stockpile reductions and thus to our obligations under the Nuclear Nonproliferation Treaty. These concerns were considered in the tritium technology decision process.

Conclusion: Although concerns have been expressed about each of the tritium production alternatives, nonproliferation policy issues would not preclude the selection of any alternative.

5. Flexibility To Meet Changing Requirements

Since tritium production stopped in 1988, the U.S. tritium requirements have been reduced by almost 75 percent, primarily because of the stockpile reductions resulting from bilateral arms control agreements. The current tritium production requirement is based on supporting a stockpile sized for START I. If START II is ratified by the Russian Duma (legislature), the U.S. may decide to reduce its tritium production requirements, thus moving the need date to 2011 and reducing tritium production requirements. Stockpile reductions beyond START II are possible and would hopefully occur, potentially resulting in further extension of the tritium need date and reductions in tritium production requirements.

The APT has significant flexibility to change its rate of tritium production and therefore its operating costs. It is less flexible in its avoidance of capital investment costs. The APT project plan calls for construction of a ''modular'' accelerator sized to produce about 1.5 kilograms per year, the capacity sufficient for a START II stockpile. According to the plan, if current tritium requirements are not reduced by early FY 2000, accelerator construction would proceed with a full-size machine having a capacity of 3 kilograms per year with a $500 million increase in investment cost. If tritium requirements are reduced after early FY 2000 much of the investment cost of the APT would be ''sunk.''

The use of the existing, operating reactors is the most flexible option with respect to changing stockpile levels. If the tritium need date is extended during FY 1999–2000, most investment for this alternative could be suspended indefinitely and then restarted later. A substantial portion of DOE's operating costs would be based on tritium demand on a pay-as-you-go basis. Except for minimal standby costs, DOE would pay for irradiation services, TPBAR manufacturing, and transportation operations only during those years when tritium is actually required. The amount spent for irradiation services would, to a great degree, depend on the amount of tritium produced. If the tritium need date is extended before the TEF handles its first increment of radioactive material, that facility could remain in standby indefinitely for less than $1 million per year.

If completion of an unfinished reactor is considered, the reactor alternative's flexibility characteristics become much like those of the APT. While there is great flexibility in amounts of tritium that can be produced, the large up-front investment cost would have no relation to tritium requirements. Once DOE committed itself to completion of the reactor, there would be no opportunity to reduce investment costs if stockpile tritium requirements were reduced. Revenues would be returned to DOE whether tritium is needed or not, but the cost per kilogram would obviously be higher if tritium requirements were substantially reduced as a result of further arms reduction agreements. The annual net operating cost (positive or negative) of this alternative would vary somewhat with tritium demand because of reductions in the cost for TPBAR manufacturing and transportation, thus reducing the total-life cycle cost.

Conclusion: The use of existing reactors potentially results in the greatest degree of flexibility to meet changing requirements, especially in view of the potential for future reductions in the nuclear weapons stockpile.

C. Comparison of Environmental Impacts of Tritium Supply Alternatives

Since the December 1995 Tritium Supply and Recycling PEIS ROD, a substantial amount of work has been accomplished on both the CLWR tritium production alternative and the APT alternative, including the issuance of project-specific Environmental Impact Statements. In the course of preparing this supplement to the December 1995 ROD for the tritium supply technology decision, in order to select between the two technologies, DOE reviewed the Tritium Supply and Recycling Final PEIS to ensure that the information contained there is still valid. The conclusion of that review is that the Tritium Supply and Recycling PEIS remains a valid basis for the programmatic portion of this consolidated ROD.

In the December 5, 1995 ROD for the Tritium Supply and Recycling PEIS, environmental impacts of the various tritium supply technologies were compared and a general conclusion was reached that ''[for all of the reasonable tritium supply technology alternatives] the environmental impacts are generally small and, except for the commercial reactor options to purchase an existing reactor or irradiation services, the impacts are within the same range. The Department considers the commercial reactor options of purchasing an existing reactor or irradiation services to be the environmentally preferred alternative.'' [60 FR 63889] As discussed below, these conclusions remain true.

Described below are the relative differences in environmental impacts between tritium production in operating CLWRs (TVA's Watts Bar Unit 1 and Sequoyah Units 1 and 2 are used in the analysis) and an incomplete CLWR (TVA's Bellefonte Unit 1 is used in the analysis), and construction and operation of the APT at the Savannah River Site. For an incomplete CLWR, the environmental analysis attributes all of the impacts from completing construction and operating the plant to the tritium production mission. Additionally, because any tritium produced by a CLWR would need to be extracted from TPBARs prior to delivery to the nuclear weapons stockpile, the impacts associated with operation of a TEF are included in the discussion below, as appropriate. DOE has decided previously that a TEF capability would be constructed regardless of whether the CLWR option is selected as the primary or the backup tritium supply [60 FR 63890]. In the latter case the TEF would be needed as part of a viable backup system and could have been incorporated as part of the APT facility. Therefore, construction impacts of TEF apply if either the CLWR or APT option is chosen, but TEF operating impacts apply only to the CLWR. Because of the availability of data in the tiered, final EISs for use of commercial reactors for tritium production, the TEF, and the APT, the discussion below is based upon the best available information and analyses that have been developed to date.

1. Construction Impacts

For tritium production in a CLWR, construction impacts would range from none (for operating CLWRs) to minor (for a CLWR which is currently approximately 90 percent complete, and would only require internal modifications). The predominant construction impact associated with an incomplete CLWR would be on socioeconomics, as approximately 4,500 direct jobs and 4,500 indirect jobs could be created during the peak year of construction. The creation of approximately 9,000 total jobs would have a significant positive impact on the economic area surrounding the incomplete reactor. For the APT at the Savannah River Site, construction impacts would consist of: land disturbance of approximately 250 acres; water use of less than 1 percent of current use; and socioeconomic impacts associated with a peak-year construction workforce of approximately 1,400 direct jobs and approximately 900 indirect jobs. The creation of approximately 2,300 total jobs would have a significant positive impact on the economic area surrounding the Savannah River Site. Construction impacts associated with a TEF at SRS would be minimal. Land disturbance would occur in a densely developed industrial area. Water use would be less than 1 percent of current site use. Socioeconomic impacts associated with a peak-year workforce would be about 740 direct jobs which would have a positive stabilizing influence on SRS employment but an insignificant impact on regional employment.

Conclusion: With respect to construction impacts associated with tritium production, use of an existing CLWR would have the least impact on the natural environment. Completion of an unfinished reactor would have positive socioeconomic impacts, as would the APT at SRS. Using an existing CLWR would have no socioeconomic impacts. For all alternatives, the environmental impacts associated with construction are considered small.

2. Operating Impacts

For an operating CLWR, there would either be no impacts, or negligible impacts, to resources such as: land, infrastructure, noise, visual, air quality, water resources (use and quality), geology and soils, archeological and historic, and socioeconomics. Tritium production and extraction could cause additional impacts in the following resources: spent fuel generation; human health (normal operations and accidents); low-level radioactive waste (LLW) generation; and transportation.

For the alternative that would complete, start up, and operate an incomplete reactor, the operating impacts include those impacts associated with a new commercial nuclear power plant. The following resources would be affected: infrastructure (including visual resources); water resources; spent fuel generation; human health (normal operations and accidents); LLW generation; transportation; and socioeconomics.

Operation of a TEF at the Savannah River Site would affect the following resources: infrastructure; water resources; human health (normal operations and accidents); LLW generation; and socioeconomics.

For the APT, tritium production could cause impacts in the following resources: infrastructure; surface water; human health (normal operations and accidents); LLW generation; and socioeconomics. For the resources potentially affected during operation of any tritium supply technology, the most significant discriminators between alternatives are: infrastructure, spent fuel, human health (including impacts from accidents), low-level waste generation, and socioeconomics. These resources are discussed below for the tritium production alternatives, as appropriate.

Infrastructure

The production of tritium in an operating CLWR would have no impact on the local infrastructure. The impacts of operating a newly completed reactor would produce more than 1,200 megawatts of usable electric power. In an area such as the Tennessee Valley, this beneficial impact would tend to reduce the need for operation of coal-fired or gas-fired power plants, or could offset the need for additional power plants in the future, potentially reducing future air emissions. Although visual resources surrounding the incomplete reactor site would be negatively impacted by a cooling tower plume, this would not be significant enough to change the plant's existing visual resource classification. For the operation of the TEF, estimates for base load electricity use are approximately 2.4 megawatts of electric power, which would be provided through the existing infrastructure at SRS.

For the APT, estimates for base load electricity use are up to 350 megawatts of electric power. Environmental impacts associated with production of electricity by a coal-fired or gas-fired power plant would consist mainly of increased air emissions; however, no air quality standards are expected to be exceeded. The visual impacts of the APT are not deemed significant because the facility would not be visible from the Savannah River Site boundaries to ground-level observers.

Conclusion: Operation of a newly completed reactor would produce a positive impact on the local infrastructure by producing more than 1,200 megawatts of electric power. An operating CLWR used for tritium production would have no additional impact on the local infrastructure. The TEF would have a negligible impact on the local infrastructure at the Savannah River Site. The APT would have a minor negative environmental impact on the local infrastructure by requiring approximately 350 megawatts of electric power.

Spent Fuel

The reactors considered here each use 193 fuel assemblies when operating. At each refueling a percentage of these assemblies are removed from the reactor and placed in the reactor's spent fuel storage pool. The number of assemblies of spent fuel generated by an existing reactor could increase as a result of tritium production. Increases could range from approximately 60 spent fuel assemblies per cycle if a CLWR is loaded with a maximum of 3,400 TPBARs, to no increase in spent fuel if a CLWR is loaded with less than approximately 2,000 TPBARs. The environmental impacts associated with long-term, on-site, dry-cask storage of spent fuel are not significant. For a newly completed CLWR, approximately 72 spent fuel assemblies would be generated during reactor operations without tritium production. For nominal tritium production, the amount of spent fuel generated would not increase as long as less than approximately 2,000 TPBARs are loaded into the reactor. If maximum tritium production is needed, up to 3,400 TPBARs would be used and approximately 69 additional spent fuel assemblies would be generated per cycle. In this regard, it is DOE's intention to minimize, if not eliminate, the generation of additional spent fuel by limiting the number of TPBARs inserted in a single reactor. Neither the TEF, nor the APT, would generate spent fuel.

Conclusion: Operation of a newly completed reactor would generate the most additional spent fuel. Use of currently operating reactors could lead to a limited incremental increase in spent fuel. The APT would generate no spent fuel.

Human Health (Normal Operations)

By adding tritium production to the currently operating reactors, there would be additional radiation doses to workers and the public from tritium production. The incremental increase in annual average worker dose is estimated at approximately 1.1 millirem, while the total population dose within 50 miles is estimated to increase by approximately 2.0 person-rem per year during normal operations. In terms of potential impacts, these values are not significant. For example, a 2.0 person-rem dose translates into a latent cancer fatality risk of 1 in 1,000 years. For the average worker, a 1.1 millirem annual dose translates to a risk to that worker of a latent cancer fatality every 2.3 million years.

By finishing the incomplete reactor and operating it to produce electricity and tritium, there would be radiation doses to workers and the public that do not currently occur. The average annual worker dose is estimated at a maximum of approximately 105 millirem, of which 104 millirem would result from operation of the reactor to produce electricity, and 1.1 millirem would be from tritium operations. The annual total population dose within 50 miles is estimated to be a maximum of approximately 2.3 person-rem. In terms of potential impacts, these values are not significant. For example, a 2.3 person-rem dose translates into a latent cancer fatality risk of 1 in 870 years. A 105 millirem annual dose translates to a risk to an average worker of a latent cancer fatality every 23,000 years.

Operation of the TEF at the Savannah River Site would result in small radiological impacts to workers and the public from tritium production. The average annual worker dose is estimated at approximately 40 millirem, while the total population dose within 50 miles is estimated to increase by approximately 0.77 person-rem per year. In terms of potential impacts, these values are not significant. For example, a 0.77 person-rem dose translates into a latent cancer fatality risk of 1 in 2600 years. For the average exposed worker, a 40 millirem annual dose translates to a risk to that worker of a latent cancer fatality every 62,500 years.

Operation of the APT would result in small radiological impacts to workers and the public from tritium production. The average annual worker dose is estimated at a maximum of approximately 144 millirem, while the total population dose within 50 miles is estimated to be approximately 2.0 person-rem. In terms of potential impacts, these values are not significant. For example, a 2.0 person-rem dose translates into a latent cancer fatality of 1 in approximately 1,000 years. A 144 millirem annual dose translates to a risk to an average worker of a latent cancer fatality approximately every 17,600 years.

Conclusion: Radiological impacts for normal operations are considered small for all alternatives. The APT and commercial reactor options would have comparable impacts to the population. Use of an operating CLWR would have the smallest impact to workers.

Human Health (Accidents)

Based upon tests and analyses that had been performed previously as part of the DOE's New Production Reactor program, the Tritium Supply and Recycling PEIS concluded that ''it appears that no new significant safety hazard is introduced as a result of a decision to produce tritium in an existing CLWR.'' [PEIS, page 4–524] Nonetheless, the PEIS also acknowledged that a complete reactor-specific evaluation remained to be completed. The CLWR EIS provides a detailed evaluation of impacts from accidents on a site-specific basis for the CLWR reactor alternatives. Based upon the CLWR EIS evaluation, the conclusion in the PEIS is further supported. The CLWR EIS documents that the potential impacts from tritium production on accident impacts is small. For design-basis accidents at operating reactors, the risk of a latent cancer fatality to an average individual from tritium production in the 50-mile population surrounding a CLWR would be approximately 1 in 490 million years. At the incomplete reactor site, this risk would be approximately 1 in 1.3 billion years. For beyond design-basis accidents, tritium production would result in very small changes in the consequences of an accident. This is due to the fact that the potential consequences of such an accident would be dominated by radionuclides other than tritium. At the operating reactors, the additional risks to the 50-mile population from adding tritium production would be less than one additional cancer per every 100,000 years from a beyond design-basis accident. At the incomplete reactor site, the total risk of the new reactor and the added tritium mission to the 50-mile population would be approximately 11 latent cancer fatalities per 100,000 years from a beyond design-basis accident.

The potential impacts to the public from accidents associated with operation of the TEF at the Savannah River Site are extremely small. For the design-basis accident, the risks to the 50-mile population would be approximately 7 latent cancer fatalities per 100,000 years.

The potential impacts to the public from either a design-basis or beyond design-basis accident from the APT are small. For a design-basis accident, the risk of a latent cancer fatality to an average individual in the 50-mile population would be approximately 1 in 470 million years. For beyond design-basis accidents, the risks to the 50-mile population would be approximately 3 latent cancer fatalities per 100,000 years.

Conclusion: The risks associated with accidents are small for all the tritium production alternatives. Differences between the CLWR and APT are not deemed to be significant.

Low-Level Radioactive Wastes

LLW generation at the operating reactors could increase by 0.43 cubic meters annually as a result of tritium production. The impact of disposing of the additional LLW at the Barnwell commercial disposal facility at Barnwell, South Carolina would represent much less than 1 percent of the total LLW that is currently disposed of at that facility. The newly completed reactor would generate approximately 40 cubic meters of LLW annually, which would also be less than 1 percent of the total LLW that is disposed of annually at the Barnwell LLW commercial disposal facility. Operation of the TEF would generate approximately 232 cubic meters of LLW annually. These wastes would be manageable using existing waste management treatment, storage, and disposal facilities at the Savannah River Site.

The APT would generate approximately 1,400 cubic meters of LLW annually. These wastes would be manageable using existing waste management treatment, storage, and disposal facilities at the Savannah River Site. The environmental impacts of all waste types for all alternatives, including LLW, would be small and manageable with existing facilities.

Conclusion: Although all of the waste generation impacts are acceptable, the use of currently operating reactors would generate the smallest amount of low-level wastes from tritium production. For all alternatives, the environmental impacts of all waste types, including low-level waste would be small and manageable with existing facilities.

Socioeconomics

Little or no socioeconomic impact is expected by adding the tritium production mission at an operating CLWR. Operation of a newly completed CLWR would add approximately 800 direct and 800 indirect jobs. The socioeconomic impacts of the 1,600 total jobs would have a positive impact on the economic area surrounding the reactor site. Operation of the TEF would add approximately 108 direct jobs. This would not have any significant impact on the local socioeconomic area. Operation of the APT would add approximately 500 direct jobs and 335 indirect jobs. The socioeconomic impacts of the 885 total jobs would have a positive impact on the economic area surrounding SRS.

Conclusion: Operation of a newly completed reactor and the APT would have the greatest positive socioeconomic impacts, while use of currently operating CLWRs to produce tritium would involve insignificant socioeconomic impacts.

Transportation

There will be impacts associated with transporting irradiated TPBARs from the reactor sites to the TEF at the Savannah River Site. There would be approximately 13 shipments of TPBARs annually to SRS which would result in an annual human health risk, over the entire route of the shipments, of less than 1 latent cancer fatality every 100,000 years. The impact on any one individual would be less than that. Because the Tritium Loading Facility and the APT would be located at SRS, there are no impacts directly associated with transportation.

Conclusion: Although all the transportation impacts are negligible, the APT has the least impact.

3. Overall Environmental Conclusion

As described above, and as documented in the environmental analyses that have been developed, it is expected that the overall environmental impacts associated with tritium production in either a CLWR or the APT would be small. Consequently, the environmental impacts associated with the two alternatives are not considered a major discriminating factor in this tritium technology decision. The December 1995 Programmatic ROD stated that the use of existing CLWRs for tritium production would be the environmentally preferred alternative. Subsequent analyses, discussed here, confirm this still to be true.

D. Programmatic Decision

Both technology alternatives are feasible. Consistent with the Department's December 22, 1998, announcement, and based on the above analysis, DOE selects the use of existing commercial light water reactors as the primary technology to produce tritium for national security purposes. In implementing this decision, DOE will construct a new Tritium Extraction Facility on the Savannah River Site.

The use of commercial light water reactors is selected to be the primary tritium supply technology because analysis leads to the conclusion that this technology:

- Would have the best chance of meeting all military requirements due to:
- Lowest technical risk.
- Lowest schedule risk.
- Highest confidence for meeting capacity requirements.
- Would have the lowest investment and life-cycle costs.
- Offers potential to be the most flexible in meeting changing requirement.
- Offers potential to have the least environmental impact.

The Accelerator Production of Tritium (APT) is designated as the backup tritium production technology. The APT Project will complete Engineering Development and Demonstration (ED&D) activities and final design for a few key elements of the accelerator system. Completion of these activities would permit expedient initiation of facility construction if the accelerator is called upon.

In January 1997, the Fast Flux Test Facility (FFTF) was placed in a safe standby condition as near-term ''insurance'' given the uncertainties at that time with the dual-track technologies for tritium production. Because it could not produce enough tritium to meet production requirements, it could not serve as a potential primary long-term tritium supply source. The Department's evaluation of FFTF has focused on whether it can or should play any role as an interim source of tritium until one of the other technologies is implemented. The Department is fully confident that the tritium supply strategy embodied in this decision can meet any current or future tritium requirements. Consequently, the Department's FFTF will have no tritium production role. A separate study is being conducted to determine if that reactor should be restarted and operated for other purposes.

III. Site-specific Decision for the Production of Tritium Using Commercial Light Water Reactors (CLWR)

A. CLWR EIS Alternatives

In conformance with the Department's December 22 announcement, the preferred alternative identified in the CLWR Final EIS is to produce tritium in the Watts Bar and Sequoyah reactors. As a result of the programmatic decision in this ROD (see section II), DOE will produce tritium in a CLWR, and the APT is designated as the back-up technology. Consequently, the comparisons described in this section are focused solely on the TVA reactor alternatives, and not the APT.

The CLWR EIS evaluates the following alternatives: (1) No Action Alternative (which would result in the production of tritium in an accelerator at the SRS); and (2) Tritium production at one or more of the following Tennessee Valley Authority (TVA) CLWRs: Watts Bar Nuclear Plant Unit 1 (Spring City, TN); Sequoyah Nuclear Plants Units 1 and 2 (Soddy Daisy, TN); and Bellefonte Nuclear Plants Units 1 and 2 (Hollywood, AL). The Watts Bar and Sequoyah reactors are existing, operating CLWRs that produce electricity. Tritium production could be performed in these reactors without any significant modifications to these facilities and would not affect electricity production. The Bellefonte units are unfinished nuclear reactors. Bellefonte Unit 1 is approximately 90% complete, and Unit 2 is approximately 58% complete. In order to produce tritium in a Bellefonte reactor, construction would have to be completed and an operating license would have to be received from the NRC.

B. Non-Environmental Comparison of CLWR Reactor Alternatives

1. Cost and Flexibility Factors

Investment cost is defined as the total of all remaining up-front costs necessary to design, develop, construct, startup, or otherwise establish tritium production capacity at each of the CLWRs. Investment costs are generally the same as project costs. Life-cycle cost is defined as the total amount of money spent to produce about 100 kilograms of tritium over the life of the alternative. Life-cycle cost includes investment cost, all operating costs, and decontamination and decommissioning (D&D) costs.

Cost to Meet Current Requirements (cost comparisons are expressed in constant FY 1999 dollars).

The investment cost for the tritium-supply system that would use the Watts Bar and Sequoyah reactors is estimated to be about $580 million, of which approximately $350 million are associated with designing, constructing, and starting up the new TEF. Total investment costs for the tritium-supply system that includes the Bellefonte alternative are estimated to be $1.8 billion to $2.4 billion, depending on the plan selected for payments to TVA to complete the reactor. The Watts Bar/Sequoyah alternative could be accommodated within the DOE Defense Programs budget but the Bellefonte alternative cannot.

The life-cycle cost for the Watts Bar and Sequoyah reactors ranges from $1.4 billion to $2.9 billion, based on the letter agreement between DOE and TVA signed on February 25, 1999. This includes $8 million for D&D of the TEF. The upper end of the life-cycle cost range assumes that DOE would pay cash for the incremental increase in reactor fuel enrichment needed for a reactor to accommodate TPBARs. The lower end of the range assumes that highly enriched uranium, drawn from DOE's defense stocks, would be blended down to provide all the fuel for the host reactors. TVA would reimburse DOE at a market-based rate for that portion of the fuel cost not directly attributable to tritium production. Present discount value for the Watts Bar/Sequoyah option would be in the range of $880 million to $1.6 billion.

Life-cycle cost of the Bellefonte alternative would be $1.2 billion to $2.8 billion, depending on the plan for payments to TVA and DOE's share of Bellefonte's power sales revenues. Because annual budget limitations would likely prevent DOE from making large up-front payments to TVA to complete Bellefonte, the lower-revenue-share/higher-life-cycle-cost scenario is far more likely than the high revenue/low life-cycle cost scenario. For the Bellefonte alternative, no fuel transactions are assumed. Present discount value would be in the range of $1.6–2.0 billion. D&D of the TEF, but no other facility, is included.

Conclusion: The Watts Bar/Sequoyah alternative has the lowest investment cost which can be accommodated within the DOE national security programs budget. There is also strong potential for the Watts Bar/Sequoyah option to have the lowest life-cycle cost because of the likelihood that Bellefonte life-cycle costs would be near the high end of the range. In addition, the Watts Bar/Sequoyah alternative has a significantly lower financial risk because DOE would not pay until tritium is produced. With the Bellefonte alternative there is a degree of risk that, having paid for the plant, DOE would not receive any return from net power revenues because of changes in the power market or failure of the reactor to go into operation.

Cost To Meet Reduced START II Requirements

If START II comes into force, the tritium need date could be around 2011 and the maximum tritium production rate may be reduced to about 1.5 kilograms per year. If so, the existing commercial reactor alternative's investment cost would remain about the same as the current case. Life-cycle cost for the commercial reactor alternative, using the existing TVA reactors would be in the range of $2.2–2.5 billion, based on the DOE-TVA letter of agreement of February 25, 1999. The upper end of this range assumes DOE pays cash for incremental increases in reactor fuel enrichment. The low end of this range assumes DOE fuel stocks are blended to provide for the incremental increase in fuel enrichment. The range could be lower still if TVA purchased all its fuel from DOE. The Bellefonte alternative's relatively high investment costs would not change under a START II scenario and the life-cycle cost would be reduced by $100 million or less.

Conclusion: Under a START II scenario, investment and life-cycle costs would be lowest for the Watts Bar/Sequoyah alternative.

Flexibility To Meet Changing Requirements

If START II is ratified, the U.S. may decide to reduce its tritium production requirements, thus moving the need date to around FY 2011 and reducing tritium production requirements. Stockpile reductions beyond START II are also possible and would result in further extension of the tritium need date and reductions in tritium production requirements.

The Bellefonte reactor alternative's flexibility characteristics are limited. While there is great flexibility in amounts of tritium that can be produced, the large up-front investment cost would have no relation to tritium requirements. Once DOE committed itself to completion of the reactor, there would be no opportunity to reduce investment costs if stockpile tritium requirements were reduced. The annual net operating costs of this alternative would vary slightly with tritium demand only because of reductions in the cost for TPBAR manufacturing and transportation, thus reducing the total life-cycle cost.

The use of the existing Watts Bar and Sequoyah reactors is the most flexible with respect to changing stockpile levels. If the tritium need date is extended, most investment for this alternative could be suspended indefinitely and then restarted later. A substantial portion of DOE's operating costs would be based on tritium demand on a pay-as-you-go basis. Except for minimal standby costs, DOE would pay for irradiation services, TPBAR manufacturing, and transportation operations only during those years when tritium is actually produced. The amount spent for irradiation services would be dependent on the amount of tritium produced. If the tritium need date is extended before the TEF handles its first increment of radioactive material, that facility could remain in standby indefinitely for less than $1 million per year.

Conclusion: The use of the existing Watts Bar and Sequoyah reactors results in the greatest degree of flexibility to meet changing requirements, especially in view of the potential for future reductions in the nuclear weapons stockpile.

Arms Control/Nonproliferation

The use of the currently operating Watts Bar and Sequoyah reactors has unique advantages not available with any other alternative, including the Bellefonte option, which serve to offset the nonproliferation implications of using these reactors. It is the only option that does not require a very large up-front capital expenditure. It is the only option that allows the nation to pursue the goal of further arms reductions without commitment to a major new weapons facility. By selecting Watts Bar and Sequoyah, the nation is assured of a long-term option to make tritium, which may not have to be exercised for many years if arms reduction efforts are successful, as DOE hopes they would be.

By not committing itself to the construction of a major new weapons facility, the U.S. can underscore to other nations, especially would-be proliferant nations, its continuing pursuit of smaller nuclear weapons stockpiles. This would be consistent with recent U.S. actions, including cessation of underground nuclear testing, the stoppage of plutonium production, and closure or withdrawal of defense missions from several sites in the nuclear weapons complex. Commitment to a major new weapons facility could be seen as building up U.S. nuclear weapons production capabilities at a time when the U.S. is seeking to reassure other nations of its commitment to nuclear arms reductions.

These factors offset the fact that the use of the three reactors for tritium production would depart from the general practice of maintaining a distinction between U.S. defense and civilian nuclear activities. Moreover, the Department has determined that the impact of this issue on U.S. nonproliferation policy is manageable, given the surrounding circumstances enumerated above.

Conclusion: The use of the currently operating Watts Bar and Sequoyah reactors is most consistent with stated U.S. nuclear weapons stockpile reduction and nonproliferation goals.

2. Technical Factors

Capacity and Schedule

The Bellefonte alternative and the Watts Bar/Sequoyah alternative could both achieve a production capacity of about 3 kilograms of tritium per year. No matter which alternative is selected, the first batch of tritium could begin production in early FY 2004 when the Watts Bar reactor is scheduled to complete a refueling outage. Because many technical and regulatory issues have been addressed already, there is a high degree of confidence that this initial irradiation schedule can be met. The first batch of tritium gas could be delivered to the stockpile as soon as the TEF is operational. Because the Watts Bar and Sequoyah reactors would be used to irradiate the initial batches of TPBARs, delays in completing the Bellefonte reactor would not be expected to impact the tritium production schedule. Under current START I requirements, neither reactor alternative would require the use of the tritium reserve.

Conclusion: Each reactor alternative can achieve capacity requirements. There is a high likelihood that, with adequate funding, each of the reactor alternatives can meet the schedule and the tritium reserve would not be affected.

Regulatory and Licensing Issues

The Bellefonte alternative would have to be licensed as a new nuclear power plant. The plant's initial NRC operating license would also permit tritium production. This process is likely to take up to 5 years. This would not affect national security because initial tritium production would begin with the Watts Bar reactor. Delays in getting Bellefonte in operation would, however, delay and possibly reduce DOE's receipt of revenues from Bellefonte power sales, if any.

The NRC would have to amend the operating licenses of the Watts Bar and Sequoyah reactors to permit production-scale irradiation of tritium-producing rods. DOE expects that NRC would be in a position to act upon the amendment requests well in advance of the planned October 2003 start of irradiation. Some experience has already been gained in this area because the Watts Bar reactor's operating license was amended to permit the confirmatory test irradiation of 32 TPBARs.

Conclusion: The Bellefonte alternative has potential for these issues to impact its schedule, but is not likely to affect tritium production. However, delays in getting Bellefonte on line would reduce the Government's receipts from its share of Bellefonte revenues, if any. The Watts Bar/Sequoyah option is not likely to be affected by regulatory issues. Watts Bar and Sequoyah are preferred over Bellefonte because the completion and initial licensing of a new nuclear facility entails greater technical and financial risk than obtaining a license amendment for existing facilities.

C. Comparison of Environmental Impacts of CLWR Alternatives

The relative differences in environmental impacts between tritium production in operating CLWRs (Watts Bar and Sequoyah) and the completion and operation of the incomplete Bellefonte Unit 1 reactor are described in the Supplemental Programmatic Record of Decision, Section II.C, above. As described in that section and as documented in the CLWR EIS, DOE expects that the overall environmental impacts associated with tritium production in a CLWR would be small. Consequently, the environmental impacts associated with the CLWR alternatives are not considered a major discriminating factor in this decision. Based on all of the environmental factors considered, the use of the Watts Bar and Sequoyah reactors is the environmentally preferred alternative.

D. CLWR Decision

DOE selects the Watts Bar Unit 1 and the Sequoyah Unit 1 and 2 reactors as the specific CLWRs to produce tritium for national security purposes. Compared to completing the Bellefonte reactor, the use of the currently operating Watts Bar and Sequoyah reactors for tritium production would have the:

- Lowest investment cost and lowest life-cycle cost under most-likely scenarios.
- Lowest financial risk.
- Greatest flexibility to meet changing requirements.
- Most consistency with stated arms reduction goals.
- Lowest overall incremental environmental impact.

By selecting the Watts Bar and Sequoyah reactors, highly enriched uranium, drawn from DOE's defense stocks, would be blended down to provide for the enrichment increase.

IV. Site-Specific Decision for Construction and Operation of a Tritium Extraction Facility (TEF) at the Savannah River Site

A. TEF Alternatives

The proposed action addressed in the Final EIS for the Construction and Operation of a TEF at the Savannah River Site (SRS) is to design, construct, test, and operate TEF at SRS to provide tritium extraction capability to support tritium production technology. The purpose of TEF is to extract tritium-containing gases from TPBARs irradiated in a CLWR or from targets of similar design, and deliver the tritium-containing gases to Building 233–H, the existing Tritium Loading Facility, for final purification. As described below, DOE evaluated two reasonable alternatives and a no-action alternative in the TEF Final EIS.

1. Construct a New Facility in the H-Area (Preferred Alternative)

As identified in the TEF Final EIS, the preferred alternative is to locate TEF in H-Area, immediately adjacent to and west of Building 233-H within the boundaries of SRS. The reasons for co-locating TEF close to Building 233-H are: (1) To share common support facilities, services, and some personnel; (2) to facilitate the transfer of tritium between the two facilities; and (3) to use certain gas-handling processes located in H-Area. TEF would consist of a concrete industrial facility constructed partly below grade. The facility would be divided into two major areas: (1) A remote handling area (RHA) and (2) a tritium processing building. The tritium processing building would be entirely aboveground; the floor of the RHA would be below grade. Construction of the proposed facility would require approximately 4 to 5 years. Major process and operation systems included within the proposed TEF would be: (1) The Receiving, Handling, and Storage System that would support all functions related to the receipt, handling, preparation, and storage of incoming radioactive sources and outgoing radioactive waste materials; (2) the Tritium Extraction System that would get tritium and other gases from irradiated TPBARs, remove contaminants from the gas stream, and store the hydrogen isotope/helium mixture; (3) the Tritium/Product Processing Systems that would separate and purify process gases from the irradiated TPBAR materials; (4) the Tritium Analysis and Accountability Systems that would support monitoring and tritium accountability; (5) the Solid Waste Management System that would receive solid waste generated by TEF for management and storage prior to disposal in the SRS E-Area vaults; and (6) the Heating, Ventilation, and Air Conditioning System that would provide and distribute conditioned supply air to the underground RHA and the aboveground tritium processing area and also discharge exhaust air to the environment via a 100-foot stack.

2. Upgrading the Existing Allied General Nuclear Services (AGNS) Facility

An alternative to constructing a new TEF within H-Area is to refurbish and use the existing Allied General Nuclear Services (AGNS) facility located in Barnwell County, adjacent to the eastern boundary of SRS. AGNS was completed in 1976, and portions of the facility were tested with natural uranium in anticipation of obtaining an operating license to process commercial spent nuclear fuel. However, due to a change in government policy on reprocessing commercial spent nuclear fuel, the facility never opened. It was cleaned up and placed in standby in 1977 and shut down in 1983. The AGNS facility was designed and built to NRC standards. It would not meet all applicable DOE Orders without major modifications as discussed below. Utilization of AGNS would necessitate some new construction and some modifications. Extraction furnaces would have to be designed, built, and installed. A drying oven to remove pool water from CLWR TPBAR bundles or bundles of targets of similar design unloaded in the wet basin would be required (at AGNS, TPBARs would be stored in existing fuel storage basins). A process gas stripper would have to be added to reduce stack tritium releases. Although rail lines to the existing facility have been removed, the tracks within the facility staging area and into the cask unloading bays are still in place. Roads on the AGNS property need moderate repair; and a short connecting road tying AGNS into the SRS road system would have to be constructed. Other requirements include refurbishing the heating, ventilation, air conditioning (HVAC) fans, motors, high-efficiency particulate air (HEPA) filters and dampers; and replacing the chiller water, fire protection, electrical, security, and personnel protection systems.

3. No Action Alternative

Under the no-action alternative, DOE would not construct and operate a TEF either at the preferred location in H-Area or at the alternate location at AGNS. Under the no-action alternative, DOE could incorporate tritium extraction capability into the APT facility at SRS. However, because the use of existing commercial light water reactors has been chosen as the primary tritium supply, selection of no action for the TEF would result in the inability to extract tritium from the irradiated TPBARs because an APT (with extraction capabilities) would not be built. In that case, DOE would not be able to fulfill the purpose and need for the proposed action. Such a decision would be inconsistent with the December 5, 1995 ROD for the Tritium Supply Programmatic EIS, as well as the programmatic decision documented in this Consolidated ROD. Based on the supplemental Tritium Supply and Recycling ROD, the no-action alternative for tritium extraction is unreasonable and is not further discussed in this portion of the Consolidated ROD.

B. Non-Environmental Comparison of Alternatives

1. Cost and Technical Factors

Cost

The life cycle cost estimate for the TEF at the preferred alternative (H-Area) is $920 million compared to the AGNS facility upgrades which is $1085 million. Both estimates are in constant FY 1999 dollars. Because of its close proximity to other tritium facilities in H-Area, the H-Area alternative for TEF enables the sharing of common support facilities, services, and some personnel; to facilitate the transfer of tritium between the two facilities; and to use certain gas-handling processes located in H-Area. Consequently the life-cycle cost of operating the TEF at this location is less than AGNS. The AGNS estimate exceeds the TEF estimate due to the added cost of logistics in moving the tritium containing gases from the AGNS location to the H-Area location for final processing and loading and the additional gas processing equipment needed at the AGNS location.

Conclusion: Locating the TEF in the H-Area would have a lower life-cycle cost than locating it at AGNS.

Technical

Several technical aspects were considered in evaluating the alternatives. For the AGNS facility, these technical aspects included: construction of several new buildings to house the gas processing equipment needed (existing facilities were not large enough to house the needed gloveboxes), installation of a drying oven to remove moisture from TPBARs wetted during underwater cask unloading, the addition of a waste processing facility, and an overhaul of the AGNS ventilation system to facilitate the tritium gas processing requirements. Technical factors involving the location of the preferred alternative are: (1) To share common support facilities, services, and some personnel; (2) to facilitate the transfer of tritium between the two facilities; and (3) to use certain gas-handling processes located in H Area.

The design basis of the Tritium Extraction Facility (TEF) requires that tritium-containing gasses be supplied to the existing Tritium Loading Facility (Building 233–H). Extracted gasses would not be isotopically separated at TEF but would utilize existing equipment in Building 233–H for separation of the hydrogen isotopes. In addition, the TEF would not be designed to separate hydrogen and non-hydrogen isotopes. The cost savings to the TEF project by not including this separation equipment is approximately $50 million. If the TEF were built at the AGNS facility, the TEF would have to include all of the necessary separation equipment as well as the infrastructure required for the facility (electrical, waste water, fire protection, staffing, etc.). The hydrogen isotopic separation equipment would need to ''purify'' the extracted tritium-containing gasses prior to loading on a hydride bed for transporting to the 233–H facility. Additionally, utilization of AGNS would require the unloading of shipping casks underwater which in turn would require the addition of a drying area for the TPBARs prior to extraction. The introduction of water in or around a tritium source greatly increases the hazard to operations personnel in the form of tritium oxide, which is 10,000 times more hazardous to humans than elemental tritium. However, collective doses to the population are expected to equal those of the H-Area alternative.

Conclusion: The ability of the preferred alternative to deliver gas directly to the 233–H facility offers several technical advantages over the AGNS alternative.

C. Comparison of Environmental Impacts of TEF Alternatives

In general DOE considers the expected impacts on the physical, biological, and human environment for both reasonable alternatives to be minor and consistent with what might be expected for an industrial facility. In the comparison of impacts, DOE determined that changes from current site environmental conditions of less than 5 percent are within the margin of error and the conservatism inherent in the analyses. Therefore, DOE finds that in those instances there would be no measurable change from current environmental conditions. As documented in the TEF Final EIS, overall, there are not expected to be any significant differences in environmental impacts between the two reasonable alternatives. Except for the no-action alternative, the construction and operating impacts of the TEF would be added to the impacts of the CLWR alternatives discussed in Section III above.

1. Construction Impacts

Minor differences between the alternatives are expected due to construction. Because much of the AGNS alternative involves internal modifications to an existing facility, less land would be disturbed and less construction waste generated. However, because the land at H-Area is already a densely developed, industrial area, impacts associated with land disturbance are not a significant factor. With respect to construction waste volumes, potential impacts to SRS waste treatment, storage, and disposal facilities would be small for both alternatives because of the low volumes of waste to be generated. At the AGNS site, construction noise and activity could have localized adverse effects on wildlife; however, this is not expected to be significant. Impacts associated with socioeconomics would be similar as each alternative would have a 5-year construction duration and a similar peak workforce (740 for H-Area, 685 for AGNS). While the creation of these jobs would have a positive stabilizing effect on the SRS employment, the overall impact would be minor since either alternative would change the regional employment by less than one-half of one percent.

Conclusion: Although the environmental impacts associated with construction are considered small for both alternatives, the AGNS alternative would have a smaller construction impact.

2. Operating Impacts

Operation of the TEF at H-Area or at AGNS could cause impacts in the following areas: human health (normal operations and accidents); waste generation; and socioeconomics. These areas are discussed below:

Human Health

A primary difference between the preferred alternative at H-Area and the alternative at AGNS is AGNS's proximity to non-government land, and therefore, its greater potential for impacting offsite individuals due to releases near the site boundary. Additional differences include stack height and radionuclides released to the environment. The quantities released at AGNS would differ from those emitted at H-Area because each rod would have to be cut three times in order to fit in the AGNS furnace, while full-height TPBARs would be punctured at H-Area. While processing CLWR TPBARs, the contributions of nonradiological air constituents at AGNS would be 0.13 percent of the applicable standard, and still lower for the onsite H-Area alternative. The radiological dose for the offsite maximally exposed individual would be 0.15 millirem per year for AGNS and 0.02 millirem per year for H-Area. Both of these would be well below the regulatory annual limit of 10 millirem from airborne releases. Because of the location of AGNS, some minority or low-income communities could be disproportionately affected by radiological and nonradiological air emissions; however, such impacts are expected to be minor and within all regulatory standards. Compared to the proposed action, for the maximally exposed individual the AGNS alternative is projected to have a 0.13 millirem per year higher radiation (due to its closer proximity to the boundary) but nearly equal collective population doses.

With respect to impacts from potential accidents, the lower population density in the communities near AGNS would result in a slightly smaller collective doses from potential accidents. For each of the alternatives, the design-basis accident would yield risks to the 50-mile population of approximately 7 latent cancer fatalities every 100,000 years.

Conclusion: Although the differences between the two alternatives are not significant, the preferred alternative (H-area) would have a lower impact on human health because of its greater distance from the site boundary.

Waste Generation

Both alternatives would generate 232 cubic yards of waste annually. The potential impacts to SRS waste treatment, storage, and disposal facilities would be small because the volumes would be small relative to existing waste management capabilities.

Conclusion: There is no apparent difference between the two alternatives' generation of waste.

Socioeconomics

Because of its proximity to other tritium facilities in H-Area, the H-Area alternative for TEF facilitates the use of common support facilities, services, and some personnel. Consequently, the operations workforce for the H-Area alternative is approximately 60 percent as much as the AGNS alternative (108 versus 175). While the socioeconomic impact for each alternative is considered minor, the reduced staffing requirement for the H-Area alternative is a major factor in its reduced life-cycle cost compared to the AGNS alternative.

Conclusion: Although the AGNS alternative would provide 67 more jobs for facility operators, the difference is not significant.

3. Environmentally Preferred Alternative

As described in the TEF Final EIS, the potential impacts from the preferred alternative or the AGNS alternative on the physical, biological, and human environment would be minor and consistent with what might be expected for an industrial facility. The preferred site for TEF is within H-Area, a densely developed, industrialized area near the center of SRS, approximately 6.8 miles from the nearest (western) SRS boundary. There are four existing tritium-related facilities in the immediate vicinity of the proposed TEF site. Advantages to locating TEF within H-Area include minimal environmental impacts associated with construction and operation of the proposed TEF due to the developed nature of H-Area; availability of site infrastructure (i.e., power, steam, potable water, sewerage); and proximity to existing tritium-related facilities and processes to support TEF operations. Both the nonradiological air constituents and annual radiological dose are lower for the preferred alternative compared to the AGNS alternative. Consequently, the H-Area alternative is the environmentally preferred alternative.

D. TEF Decision

The preferred alternative, to design, construct, test, and operate a new TEF in H-Area immediately adjacent to and west of Building 233–H, at the SRS, is selected for implementation. This alternative has the lowest life-cycle cost, has technical advantages, and is environmentally preferred.

V. Site-Specific Decision for Accelerator Production of Tritium (APT)

DOE has prepared this part of the Consolidated Record of Decision to implement that portion of the December 22, 1998 announcement designating the APT as the backup technology. It is based on the analysis from the Accelerator Production of Tritium at the Savannah River Site Final Environmental Impact Statement (DOE/EIS–0270) issued in March 1999, along with other factors such as DOE statutory mission requirements, national security policy, cost, schedule and technical risks.

A. APT Design Features and System Alternatives Considered

The EIS evaluated the no action alternative, and technology and siting alternatives relating to radiofrequency power, accelerator operating temperature, feedstock material, cooling water system, APT site, electric power supply, and APT design variations. The following section summarizes these alternatives.

1. No Action Alternative

No action for the APT is to produce tritium in a commercial light water reactor and to construct and operate a tritium extraction facility. Under the no action alternative the APT is designated the back-up technology for tritium production. As back-up, DOE would complete key research and development, and preliminary design activities for the APT at SRS (but would not construct the facility). Selection of APT technology and siting alternatives would support the research and development and preliminary design activities and facilitate implementation should construction and operation of the APT be called for in the future.

2. Radiofrequency Power Alternatives

APT would use radiofrequency waves to accelerate protons in the accelerator. Specially designed vacuum electron tubes would convert electric power to radiofrequency waves outside of the accelerator. The waves are then transported into the accelerator and used to accelerate the protons. The APT EIS evaluated two alternatives to supply the radiofrequency power for the accelerator, (1) klystron radiofrequency power tubes (DOE's preferred alternative), and (2) high order mode inductive output radiofrequency power tubes.

3. Operating Temperature Alternatives

The operating temperature affects the electrical components in the accelerator. The greater the power converted to heat the greater the amount of electricity used. If the temperature of some materials (e.g., niobium) falls to values near absolute zero (−459°F), the electrical resistance becomes essentially zero, and the component uses much less electricity. This is called superconductivity. The APT EIS evaluated two operating temperature alternatives for the accelerator: (1) operating electrical components at essentially room temperature, and (2) operating high energy accelerating structures at superconducting temperatures and the rest at room temperature (DOE's preferred alternative).

4. Feedstock Material Alternatives

The feedstock material absorbs the neutrons freed during spallation resulting in the production of a tritium atom and a byproduct atom. DOE would use the same target/blanket as the neutron source regardless of the feedstock material. The APT EIS evaluated two feedstock materials, (1) Helium-3 (DOE's preferred alternative) and (2) Lithium-6.

5. Cooling Water System Alternatives

The APT requires cooling water to keep target/blanket components, radiation shielding, beamstops and other components from overheating. DOE proposes to use a similar method for cooling each component. This is a primary coolant loop isolated from the environment through heat exchangers. Components with the potential for radioactive contamination would require a secondary loop to cool the primary loop and isolate potential contamination from the environment. The final cooling system, regardless of the number of loops, would use a cooling water system to discharge heat to the environment. The APT EIS evaluated four designs to provide the necessary cooling capacity for the APT: (1) Mechanical-draft cooling towers with makeup water from the Savannah River and discharge into pre-cooler Ponds 2 and 5 of Par Pond (DOE's preferred alternative); (2) mechanical-draft cooling towers with makeup water from groundwater wells and discharge into pre-cooler Ponds 2 and 5 of Par Pond; (3) once through cooling using Savannah River water and discharge into pre-cooler Ponds 2 and 5 of Par Pond; and (4) use the existing K-Area cooling tower with Savannah River water makeup and discharge to Pen Branch via Indian Grave Branch. A design variation for the first three alternatives would be to discharge the heated water to the head of Pond C of Par Pond but downstream from pre-cooler Ponds 2 and 5.

6. Siting Alternatives

DOE conducted a screening process to select potentially suitable sites within the SRS for the APT. Based on a weighing and balancing of the criteria, DOE selected two sites for further analysis. The APT EIS evaluated (1) a site 3 miles northeast of the Tritium Loading Facility, and approximately 6.5 miles from the SRS boundary (DOE's preferred alternative); and (2) a site 2 miles northwest of the Tritium Loading Facility, and approximately 4 miles from the SRS boundary.

7. Electric Power Supply Alternatives

APT requires large amounts of electricity to operate. Therefore, DOE evaluated two alternatives for the source of electricity for the APT: (1) Obtain electricity from existing commercial capacity and through market transactions (DOE's preferred alternative); (2) obtain electricity from the construction and operation of a new coal-fired or a natural-gas-fired generating plant.

8. APT Design Variations

In addition to the cooling water discharge design variation described above, the APT EIS evaluated two other variations. The first is a modular, or staged, accelerator configuration. It would use the same accelerator architecture as the baseline but could be constructed in stages. An initial stage would produce less tritium than the baseline APT but would be capable of producing as much tritium as the baseline APT with the addition of a second stage.

The second variation would combine tritium separation and tritium extraction facilities to take advantage of common process systems and would be capable of handling both Helium-3 and Lithium-6 feedstock material.

B. Non-Environmental Comparison of APT Design Features and System Alternatives

Technical comparisons are presented for each set of alternatives described above. These are based on various studies completed for each alternative.

1. Technology Factors

Radiofrequency Power

The klystron is an established technology that has been used for years. Thus, this technology has proven reliability and presents no technical challenges to its use in the APT. The inductive output tube has several commercial applications, but additional design and prototyping is needed to demonstrate the applicability to APT. These demonstration tests are scheduled for completion this spring. The inductive output tubes have a greater efficiency in converting DC power to RF power which would reduce power requirements by 15 percent. The inductive output tube also uses one half of the voltage resulting in reduced shielding requirements.

Conclusion: The preferred alternative of klystron power tubes would be used as the basis for the preliminary design. The inductive output tube offers technical advantages and reduces operating costs (less electricity used) and capital costs (less shielding needed). The continued development is justified to achieve these benefits.

Operating Temperature

The room temperature accelerator technology is based on technology demonstrated at the Los Alamos National Laboratory. The accelerator cavities are cooled by the primary water cooling system. As part of the accelerating structures the cavity lengths would increase in size in proportion to the increasing proton velocity. This results in greater complexity of maintenance because each cavity is unique.

The superconducting technology uses two sizes of cavities which are cooled with liquid helium to almost absolute zero. This cooling method eliminates the need for water cooling in the superconducting cavities. The two different sizes of cavities allows for simplified maintenance. The engineering development and demonstration program has completed the design and prototyping of these cavities.

Conclusion: The superconducting cavities allow for easier accelerator maintenance. Experience has shown that liquid helium distribution systems are less prone to leakage than water systems.

Feedstock Materials

Helium-3 is a nonradioactive gas that exists naturally in small quantities and is produced through the radioactive decay of tritium. The helium-3 is contained in tubes within the target/blanket. The helium-3 would absorb neutrons which converts it to tritium and hydrogen The helium-3 and tritium mixture would be continuously or semi-continuously transported via piping to the Tritium Separation Facility. The helium-3 purified in the separations process is returned to the target/blanket to produce additional tritium. This results in reduced inventories of tritium in the target/blanket and prevention of pollution since the helium-3 is recycled. The production of tritium can also be varied through controlling the number of neutrons but without sacrificing continuous separation.

Lithium-6 would be in the form of rods that would be placed in the blanket area. These rods would be similar to the rods DOE used when it operated the SRS tritium production reactors. Because the lithium-6 is incorporated into solid rods, batch production of tritium is required resulting in a higher inventory of tritium in the target/blanket than the helium-3 alternative. Also the rods could not be recycled.

Conclusion: The improved safety factors from reduced inventory of tritium in the helium-3 alternative along with the ability to recycle the helium-3 provides advantages for the helium-3 alternative. The added flexibility of varying production rates also makes the helium-3 alternative attractive.

Cooling Water System

The cooling water system alternatives were evaluated using three evaluation criteria, capital cost, life cycle cost, and permitting risk. The mechanical draft cooling tower with river water makeup was rated the lowest capital cost, the lowest life cycle cost, and the least risk associated with obtaining permits. The evaluation of risks associated with permits is based on the scope of changes to existing systems that would require regulatory reviews as well as the temperature of the blowdown water compared to the threshold limit. This evaluation placed the mechanical draft cooling tower with river water makeup as the best alternative. The mechanical draft cooling tower with ground water makeup was ranked second, once through cooling was third and the use of K–Area cooling tower was fourth. A separate evaluation for the design variation of discharge to Pond C of Par Pond was also completed. This evaluation showed a reduction in costs due to avoidance of costs associated with upgrades to the pre-cooler ponds.

Conclusion: The mechanical draft cooling tower with river water makeup was evaluated as the best alternative based on capital cost, life-cycle cost, and permitting risk criteria. The design variation of discharging to Pond C of Par Pond added the benefit of reducing costs.

Siting

The two sites evaluated in the EIS, a site 3 miles northeast of the Tritium Loading Facility (northeast site), and a site 2 miles northwest of the Tritium Loading Facility (northwest site), were similar in most characteristics. No differences in engineering factors were identified in the Site Selection Study (WSRC-TR–96–0279). The ranking factors where there is a difference between the two sites were in ecology, where the northeast site was better; depth to groundwater, where the northwest site was better; and buffer distance to the public off-site, where the northeast site was better.

Conclusion: Due to increased buffer distance which would reduce public radiological exposure in the case of an incident, the northeast site is a better location.

Electrical Supply

The two alternatives evaluated present different technical and financial challenges. The alternative to construct a new dedicated coal or gas fired plant would probably require both contractual and financial guarantees by DOE to the utility providing the electricity. Prior to a utility constructing a plant, the DOE would need to enter a long-term power purchase agreement to provide assurance to the utility that it would have a market for the output of the plant. The contractual arrangement would therefore entail take-or-pay obligations on the part of DOE for an amount of time necessary for growth in system demand to absorb the generating capacity constructed.

In the alternative of relying on existing capacity and contracting for power purchased on the market, the take-or-pay and/or notice-of-termination provisions associated with a dedicated plant can be minimized or entirely avoided. Shorter term retail sales contracts (2 to 5 years) can be accommodated which would permit the DOE to periodically recompete the APT purchase arrangements. This would also allow DOE to take advantage of renewable energy opportunities that could become available in the future.

The electric power industry is presently subject to significant and widespread changes, with approximately 40 states presently addressing the issue of restructuring the retail power market to permit competition among suppliers. A long-term power supply contract tied to the construction of a dedicated generating facility would eliminate DOE's flexibility in taking advantage of changes in the power supply market over the life of the plant.

Conclusion: The alternative of purchasing power from the electric grid through market transaction provides DOE with greater long-term flexibility and avoids the need to commit to a long-term contract for power.

Modular Design

The modular design was developed to provide tritium production flexibility in the face of changing stockpile requirements, and to optimize the project costs and funding profile. Several different modular designs were evaluated using cost and schedule, technical and programmatic risk, and the potential for future upgrades as general criteria. The preferred design meets current requirements, but allows for a delay in the decision to construct an APT that meets Start I requirements for several years, while avoiding the commitment to the cost of a START I sized facility.

Conclusion: The modular design provides the DOE with enhanced flexibility to only commit to an APT sized to meet requirements in several years.

C. Comparison of Environmental Impacts of APT Alternatives

The APT EIS presents an evaluation of environmental impacts for the combination of the preferred alternatives identified above, and the differences found for each of the alternatives. This summary presents the same format for comparison of the environmental impacts.

1. Construction Impacts for the Preferred Technology and Site Alternatives

APT would require conversion of approximately 250 acres of land from forest to industrial uses. This land would be graded or leveled during construction. Additional roads, bridge upgrades, rail lines, and utility upgrades would be required. No geologically significant formations or surface faults occur on the site. Soils on the site are not classified as significant. The change in land use would have no marked reduction in plant and animal abundance or diversity. There are no impacts to wetlands or threatened or endangered species.

Impact to surface waters are negligible, however, dewatering of the construction site could result in short-term increases in solids to receiving water bodies. Impacts to aquatic organisms in Upper Three Runs and tributaries would be minor due to the use of soil and erosion control measures.

Air emissions would be negligible at the site, and purchases of electricity would be dispersed. There are no radiological emissions during construction. Visual impacts would be negligible. Noise, primarily from construction equipment is not audible at the SRS boundary, however, construction workers could encounter noise levels that would require administrative controls or protective equipment.

APT would generate hazardous solid waste and sanitary solid and liquid waste. These would be deposited at SRS, and would require some landfill construction. Estimated annual volumes of waste are 560 cubic meters of sanitary solid waste, 30,000 cubic meters of construction debris, and 3.6 million gallons of industrial wastewater.

Impacts to public health during construction would be negligible because concentrations of non-radiological constituents are below applicable limits. Increased traffic would result in a small increase in traffic fatalities. Occupational injuries are not expected to be different than those occurring on any large construction site.

The work force required for construction is estimated to peak at 1,400 jobs. This would not result in large regional impacts.

2. Operational Impacts for the Preferred Technology and Site Alternatives

No impacts would occur to landforms, soils, hydrology or geology during operations. No dewatering is required for operations. Electrical use is estimated at 3.1 terawatt-hours per year. Negligible impacts to terrestrial ecology and threatened and endangered species are expected. Mechanical draft cooling towers would result in salt deposition on vegetation, however, maximum levels are below threshold levels. Operations would result in minor impacts to wetlands due to marginally higher temperature of blowdown water.

Blowdown rates of approximately 2,000 gallons per minute would cause negligible impact on surface water levels. Using Par Pond and pre-cooler ponds as discharge points for cooling water, temperatures would not exceed 90 degrees F. Contaminated sediments could be resuspended, resulting in negligible additional fatal cancers from exposure to the public. Impingement and entrainment from intake of river water would not substantially affect Savannah River fisheries. Solids in blowdown water would have no impact on aquatic ecology. Discharge temperatures would only have small localized effects on aquatic communities.

Non-radiological air emissions would be well within the applicable regulatory standards. Radioactive airborne emissions would result in expected latent cancer fatalities of 0.0008 annually. There would be negligible impacts to visual resources, with plumes visible under certain meteorological conditions. Noise generated by equipment and traffic would not be audible at the SRS boundary.

APT operations would generate solid and liquid wastes but no high-level or transuranic waste; waste volumes would have a negligible impact on the capacities of waste facilities. The generation of electricity would produce various types of waste including fly ash, bottom ash, and scrubber sludge. Estimated annual amounts of waste generated are 1,800 metric tons of sanitary solid waste, 3,800 metric tons of industrial waste, 140,000 gallons of radioactive wastewater, 3.3 million gallons of sanitary wastewater, 920 million gallons of non-radioactive process wastewater, 1,400 cubic meters of low-level radioactive waste, 3 cubic meters of high concentration radioactivity low-level radioactive waste, and 12 cubic meters of high concentration radioactivity mixed waste.

The public would receive source radiation exposure from APT emissions and transportation of radioactive material. Workers would receive radiation exposure from facility operations and transportation of radioactive material and from electromagnetic fields. These would result in an annual risk of 0.0016 latent cancer fatalities. There would be negligible consequences from accidents with a frequency of less than once in the operating lifetime of the facility.

The operational work force would be approximately 500. This would not result in large regional impacts. No adverse impacts on minority or low-income populations are expected.

3. Environmental Impacts of Alternatives

Radiofrequency Power Alternative—Inductive Output Tubes

This alternative would have no change in estimated impacts from the preferred alternative for construction impacts. The only change in operational impacts from the preferred alternative is in impacts to surface waters. The inductive output tube would require 7 percent less cooling water.

Operating Temperature Alternative—Operating Electrical Components at Room Temperature

This alternative would have no changes in the estimated construction impacts as described for the preferred alternative, except that 100 fewer construction jobs are estimated, resulting in lower regional community impact; there would be a 9 percent reduction in sanitary waste generated; and there would be a 6 percent reduction in occupational injuries. During operations electricity usage is estimated to be 23 percent higher, and 37 percent more non-radioactive waste water would be generated.

Feedstock Material Alternative—Lithium-6

This alternative would have no changes in the estimated construction impacts as described for the preferred alternative. For operations, the impacts would be similar to the preferred alternative except for slightly increased doses from airborne radiological emissions which would slightly increase the latent cancer fatalities. Also, eight percent more low-level radioactive waste, and 25 percent more high concentration mixed waste would be generated. A minor decrease in radiological doses from accidents with low probability of occurrence would also occur.

Cooling Water System Alternative—Once-Through Using River Water as Makeup

This alternative would have no changes in the estimated construction impacts as described for the preferred alternative. Impacts from operations would also be similar, except blowdown rates of 125,000 gallons per minute (a 2,000 percent increase) would result in higher temperatures to receiving bodies of water and would adversely affect aquatic communities. Also an increase of 1.5 feet in the water levels of the pre-cooler ponds would possibly affect wetland communities. Impingement of 2,600 fish, and entrainment of 3.4 million fish eggs and 6.4 million larvae annually would occur. Resuspension caused by the increased flows would result in slightly increased doses. Latent cancer fatalities would increase from 0.0016 to 0.0017 annually. No mechanical-draft cooling tower noise would be heard at the APT site, but pump noise would be occasionally audible to river traffic. No salt deposition would occur.

Cooling Water System Alternatives—Mechanical Draft Cooling Towers Using Groundwater Makeup

This alternative would have no changes in the estimated construction impacts as described for the preferred alternative. Impacts from operations would also be similar except the removal of 6,000 gallons per minute on a sustained basis could impact groundwater flow to streams and compact clay layers. No impingement and entrainment would occur.

Cooling Water System Design Variation—Discharge to Pond C Avoiding the Pre-cooler Ponds

This design variation applies to the preferred alternative and the two cooling water system alternatives above. This variation would have no changes in the estimated construction impacts as described for the preferred alternative. The operational impacts would be similar to the preferred alternative, except that impacts to the pre-cooler ponds are eliminated, and there would be a minor increase in heated water impacts to Pond C.

Cooling Water System Alternatives—K-Area Cooling Tower Using River Water as Makeup

This alternative would have no changes in the estimated construction impacts as described for the preferred alternative except the wastewater discharges would go to Pen Branch via Indian Grave Branch. The water levels in the upper reaches of the stream system would be raised. Additional cooling water piping to the K-Area would also be needed. The plume from K-Area cooling tower would likely be more visible. There would be no mechanical-draft cooling tower noise at the APT site, but pump and cooling tower noise in the K-Area would increase.

Site Location Alternative—2 Miles Northwest of Tritium Loading Facility

This alternative would have no changes in the estimated construction impacts as described for the preferred alternative except the water table is deeper and would require less dewatering. Also traffic fatalities during construction would be twenty percent less. Changes in operational impacts from the preferred alternative are higher doses due to closer distance to the SRS boundary. The dose from all sources would increase latent cancer fatalities from 0.0016 to 0.0017 annually.

Electric Power Supply Alternative—Construct New Plant

The impacts of a new plant would be dependent on the specific location. A new coal facility would require 290 acres and a natural gas facility 110 acres. The types of impacts presented for the preferred alternative would also occur at the specific site for a new plant. Increased amounts of construction waste would be generated. Construction would require a peak work force of 1,100. Plant operations would require an additional 200 jobs.

Design Variations—Modular Design

This variation would have no changes in the estimated construction impacts as described for the preferred alternative except construction wastes, health impacts, and peak employment all would be 10 percent lower. Operational impacts would also be similar with the following exceptions. Both blowdown water rates and non-radiological air emissions would be 10 percent lower. Electricity usage would be 2.0 terawatt-hours per year, a 32 percent decrease. Wastes from operations would be 10 percent lower.

Design Variation—Combining Tritium Separation and Extraction Facilities

This variation would have no changes in the estimated construction impacts as described for the preferred alternative. Operational impact differences would result in an increase in doses from airborne emissions from 0.0008 latent cancer fatalities to 0.0009.

No Action Alternative

For the APT, no action is to not build the APT, but use the CLWR as a source of tritium. Since the APT would not be built or operated there would be no change in the existing environment at SRS.

4. Overall Environmental Conclusion

As described above, and as documented in the environmental analyses that have been developed, it is expected that the overall environmental impacts associated with tritium production in an APT would be small. Consequently, the environmental impacts associated with the APT alternatives and design variations are not considered major discriminating factors in the decision. Based on all of the environmental factors considered, the no action alternative is the environmentally preferred alternative.

D. APT Decision

DOE selects the APT as the backup tritium supply technology. DOE will complete preliminary design for the

APT facility. To focus this design effort DOE has made the following selections for the different sets of alternatives and design variations described and analyzed above and in the engineering and environmental documents.

1. Radiofrequency Power

The preferred alternative of klystron power tubes would be used as the basis for the preliminary design because the inductive output tube design is still in development. The DOE would, however, continue with development of the inductive output tube. If at a future date, the development of the inductive output tube advances and the APT design is activated as a source of tritium, the inductive output tube may be substituted for the klystron power tubes.

The klystron power tube uses additional electricity, but otherwise, the environmental impacts are similar for the two alternatives. From a technology and cost perspective, the inductive output tubes have a lower cost because they are smaller, more efficient and operate at lower voltage.

2. Operating Temperature

The alternative of using superconducting components is selected as the preferred alternative for specific higher power sections of the accelerator. The use of superconducting components would have:

- Reduced electricity demands resulting in lower environmental impacts.
- Greater safety margin due to less chance for activation of the accelerating structures and cooling system that reduces the number of pipe penetrations into the accelerator.
- Only two cavity sizes allowing for simpler design and maintenance.

3. Feedstock Material

The alternative using helium-3 as a feedstock material is selected as the preferred alternative for production of tritium. The use of helium-3 as a feedstock material would have:

- The least environmental impact.
- Greater flexibility in extracting the tritium on a semi-continuous basis.
- Greater safety margin because the inventory of tritium in the target blanket and separations facilities is less.

4. Cooling Water System

The alternative of mechanical-draft cooling towers with makeup water from the Savannah River is selected as the preferred alternative for the cooling system. The design variation of discharging to the head of Pond C, but downstream from the pre-cooler ponds, is also selected. This alternative is selected because it:

- Has the least environmental impacts.
- Avoids additional costs to upgrade the pre-cooler ponds.

5. Siting

The site 3 miles northeast of the Tritium Loading Facility is selected as the preferred APT site. This site is selected because it results in:

- Greater buffer distance which would reduce public radiological exposure in case of an incident.
- Less impact to terrestrial and aquatic ecology.

6. Electric Power Supply

The alternative of obtaining electricity from the existing commercial capacity and through market transactions is selected as the preferred alternative for electrical power supply. The alternative is selected because:

- It presents the least environmental impact.
- It provides the greatest flexibility in reducing costs through using market mechanisms to obtain bulk wholesale costs.
- It provides opportunities to use alternative supplies of power.

7. Modular Design Variation

The modular design is selected as the preferred design for the APT because it:

- Provides capacity and cost flexibility in meeting changing tritium requirements.

8. Combine Tritium Separation and Tritium Extraction

This design variation is not selected since the APT was not selected as the primary tritium source. Since the CLWR was selected as the primary source, a Tritium Extraction Facility must be built to support this decision.

VI. Consolidated Tritium Supply and Recycling Decision

The Department of Energy will produce new tritium for national security purposes on a schedule and at a rate to meet the requirements of the President's Nuclear Weapons Stockpile Plan. Tritium will be produced by irradiating DOE-supplied tritium-producing rods in commercial light water reactors, specifically the Tennessee Valley Authority's currently operating Watts Bar Unit 1, Sequoyah Unit 1, and/or Sequoyah Unit 2 reactors. To support this method of tritium production, a new Tritium Extraction Facility will be designed and constructed in the H-Area of DOE's Savannah River Site.

The Accelerator Production of Tritium technology will be developed as the backup tritium supply. Engineering development and demonstration, preliminary design, and detailed design of key elements of the system will be completed to permit expeditious initiation of accelerator facility construction at the preferred location on the Savannah River Site should it be needed.

The Fast Flux Test Facility will have no role in tritium production.

Signed this 6th day of May 1999.

Bill Richardson,

Secretary of Energy.

[FR Doc. 99–12019 Filed 5–13–99; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

[FE Docket Nos. 99–22–NG, et al.]

Cascade Natural Gas Corporation, et al., Orders Granting, Amending, and Vacating Authorizations To Import and Export Natural Gas, Including Liquefied Natural Gas

AGENCY: Office of Fossil Energy, DOE.

ACTION: Notice of orders.

SUMMARY: The Office of Fossil Energy (FE) of the Department of Energy gives notice that it has issued Orders granting, amending, and vacating natural gas, including liquefied natural gas, import and export authorizations. These Orders are summarized in the attached appendix.

These Orders may be found on the FE web site at http://www.fe.doe.gov., or on the electronic bulletin board at (202) 586–7853.

They are also available for inspection and copying in the Office of Natural Gas & Petroleum Import & Export Activities, Docket Room 3E–033, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C. 20585, (202) 586–9478. The Docket Room is open between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday, except Federal holidays.

Issued in Washington, D.C., on May 6, 1999.

John W. Glynn,

Manager, Natural Gas Regulation, Office of Natural Gas & Petroleum Import & Export Activities, Office of Fossil Energy.

Attachment