1. INTRODUCTION

Chapter 1 provides an overview of the U.S. Department of Energy's (DOE) commercial light water reactor proposal. This chapter discusses the scope and development of the *Environmental Impact Statement for the Production of Tritium in a Commercial Light Water Reactor*, the reactor procurement process, and the reactor alternatives. Chapter 1 also includes background information on nuclear weapons; the Tennessee Valley Authority, operator of the candidate commercial light water reactors; the role of tritium in the weapons; and DOE's compliance with the National Environmental Policy Act for the Commercial Light Water Reactor program. The chapter concludes with a section on the organization of the document, the public scoping and hearings process used to obtain public input on the issues addressed in this environmental impact statement, a summary of the major public comments, and a description of the changes made to the Commercial Light Water Reactor Draft Environmental Impact Statement.

1.1 OVERVIEW

1.1.1 General

The U.S. Department of Energy (DOE) is responsible for providing the nation with nuclear weapons and ensuring those weapons remain safe and reliable. Tritium, a radioactive isotope of hydrogen, is an essential component of every weapon in the current and projected U.S. nuclear weapons stockpile. Unlike other nuclear materials used in nuclear weapons, tritium decays at a rate of 5.5 percent per year. Accordingly, as long as the nation relies on a nuclear deterrent, the tritium in each nuclear weapon must be replenished periodically.

At present, the U.S. nuclear weapons complex does not have the capability to produce the amounts of tritium that will be required to support the nation's current and future stockpile. Pursuant to the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 *et seq*.), and the DOE regulations implementing NEPA (10 CFR 1021), this *Environmental Impact Statement for the Production of Tritium in a Commercial Light Water Reactor* (CLWR EIS) analyzes the potential consequences to the environment associated with the production of tritium using one or more commercial light water reactors (CLWR). In the Record of Decision for this CLWR EIS, DOE anticipates selecting one or more reactors for tritium production.

Concurrent with the preparation of this environmental impact statement (EIS), DOE evaluated the feasibility of various CLWR alternatives through its standard procurement process (see Section 1.1.4). This EIS evaluates the environmental impacts associated with tritium production for all Tennessee Valley Authority (TVA) reactor plants offered by TVA during the procurement process (see Section 1.2 for a list of these reactors). DOE is considering only the purchase of irradiation services, not the purchase of a reactor. Purchase of a reactor is no longer being considered because none were offered for sale during the procurement process.

1.1.2 Proposed Action and Scope

The CLWR EIS evaluates the potential direct, indirect, and cumulative environmental impacts associated with producing tritium in one or more CLWRs for a 40-year period. In addition, this EIS evaluates the environmental impacts of the No Action Alternative. Under the No Action Alternative, the stockpile requirements for tritium would have to be met by the construction and operation of an accelerator at DOE's Savannah River Site in South Carolina (see Section 1.5.2.1). For the purpose of this EIS, a No Action Alternative (i.e., no tritium production would occur at the CLWR) was evaluated for each candidate CLWR.

DOE proposes to use one or more CLWRs to provide tritium in sufficient quantities to support the nation's nuclear weapons stockpile requirements for at least the next 40 years. The proposed action includes: the manufacture of tritium-producing burnable absorber rods (TPBARs) at a commercial facility; the irradiation of the TPBARs at one or more of five operating or partially constructed TVA nuclear reactors; the possible completion of TVA's nuclear reactors; the transportation of nonirradiated and irradiated materials; and the management of spent nuclear fuel and low-level radioactive waste.

More specifically, as depicted in **Figure 1–1**, this EIS analyzes the potential environmental impacts associated with the proposed action: (1) fabricating TPBARs; (2) transporting nonirradiated TPBARs from the fabrication facility to the reactor sites; (3) irradiating TPBARs in the reactors; and (4) transporting irradiated TPBARs from the reactors to the proposed Tritium Extraction Facility at the Savannah River Site. This EIS further analyzes the potential environmental impacts associated with both the management of spent nuclear fuel and the transportation and management of low-level radioactive waste generated from CLWR tritium production.

1.1.3 Development of the CLWR EIS

The CLWR EIS is a tiered document that follows the December 1995 Record of Decision (60 FR 63878) for the *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (Final Programmatic EIS) (DOE 1995b). In that Programmatic EIS, DOE considered a range of reasonable alternatives for obtaining the required quantities of tritium. In the December 1995 Record of Decision, DOE decided to pursue a dual-track approach on the two most promising tritium-supply alternatives: (1) to initiate 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 for tritium production (the Savannah River Site was selected as the location for an accelerator, should one be built). DOE committed to selection of one of these approaches by the end of 1998 to serve as the primary source of tritium. The other alternative, if feasible, would continue to be developed as a backup tritium source. Production of tritium in an accelerator is analyzed in the *Environmental Impact Statement, Accelerator Production of Tritium at the Savannah River Site* (APT EIS), DOE/EIS-0270 (DOE 1997e, DOE 1999a) (see Section 1.5.2.1).

On December 22, 1998, Energy Secretary Bill Richardson announced that tritium production in one or more CLWRs would be the primary tritium supply technology and that the accelerator would be developed, but not constructed, as a backup to CLWR tritium production (DOE 1998f). Secretary Richardson further stated that the Watts Bar and Sequoyah reactors have been designated as the Preferred Alternative for CLWR tritium production. The Secretary's announcement that the CLWR would be the primary tritium supply technology reaffirms the 1995 Record of Decision for the Final Programmatic EIS (60 FR 63878) to construct and operate a new tritium extraction capability at the Savannah River Site.

1.1.4 The CLWR Procurement Process

The production of tritium in a CLWR would require a contract/interagency agreement between DOE and the owner/operator of the CLWR. Accordingly, on June 3, 1997, DOE issued in final form a request for proposals from owners/operators for irradiation services or sale of a CLWR (DOE 1997a). In September 1997, DOE received proposals for producing tritium using operating or partially completed reactors. The proposals for the Watts Bar and Bellefonte Nuclear Plants received from TVA were the only proposals determined to be responsive to the requirements of the procurement request. Under Federal procurement law, a proposal is "responsive" if it meets the criteria set forth in the agency's request for proposals. In addition to the responsive

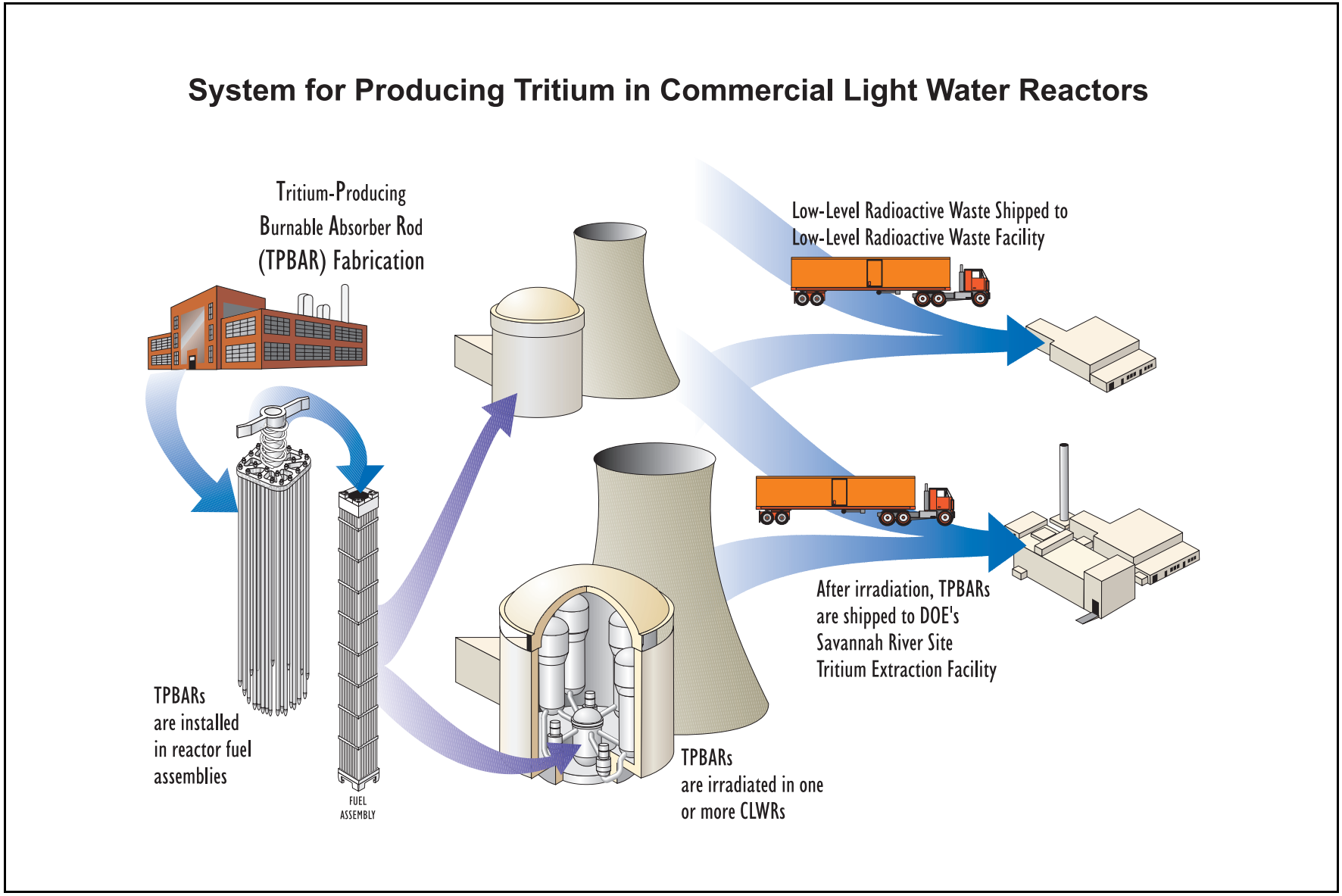

Figure 1–1 Schematic of Process for Producing Tritium in CLWRs

bids discussed in this EIS, DOE received one nonresponsive bid. That bid did not offer to produce tritium. TVA initially offered Watts Bar Nuclear Plant Unit 1 (Watts Bar 1) and Bellefonte Nuclear Plant Unit 1 (Bellefonte 1). Since Bellefonte 1 is a partially completed unit, in the event that it could not be completed and licensed in time to support DOE's requirements for tritium production, TVA, through the procurement process, also offered to make Sequoyah Nuclear Plant Units 1 and 2 (Sequoyah 1 and 2) available to meet the need for tritium. In addition, Bellefonte Nuclear Plant Unit 2 (Bellefonte 2) was considered a reasonable alternative. These reasonable reactor alternatives are identified in Section 1.2. A description of each of these reactor facilities is presented in Section 3.2.5 of this EIS.

Because both TVA and DOE are Federal agencies, an interagency agreement between them could be reached via the Economy Act (31 U.S.C. 1535). The Economy Act is a Federal law that allows two government agencies to enter into an interagency agreement similar to the contractual agreement that a Federal agency would enter with a nonfederal party through the competitive procurement process. The Federal procurement process for the CLWR program explicitly allows for an interagency agreement via the Economy Act.

Subsequent to the initial proposals from TVA, in May 1998 TVA allowed its initial procurement proposal for selling irradiation services at the Sequoyah and Watts Bar reactors to expire. However, because the TVA proposals are also subject to the Economy Act, this action did not affect the TVA reactor alternatives. Thus, the CLWR Draft EIS assessed all five of the TVA reactors as reasonable alternatives for tritium production. In November 1998, Secretary Richardson asked TVA to submit a revised proposal for irradiation services at the Watts Bar and Sequoyah reactors, as well as final proposals for completion of Bellefonte, so that he would have a comprehensive set of options on which to base the technology decision. In December 1998, TVA submitted revised proposals for both the Watts Bar and Sequoyah reactors, as well as for Bellefonte. Consequently, all of the alternatives that were evaluated in the CLWR Draft EIS remain as reasonable alternatives in the CLWR Final EIS.

DOE may enter into an interagency agreement with TVA, contingent on completion of the NEPA process, for production of the tritium required to support the nuclear weapons stockpile. Only those actions that are determined not to have an adverse effect and not to limit the choice of reasonable alternatives would be permitted prior to the completion of the NEPA process. However, before completion of the CLWR EIS and its associated Record of Decision, DOE and TVA have taken and will continue to take appropriate actions (e.g., studies, analyses) related to the potential submission of licensing documents to the U.S. Nuclear Regulatory Commission (NRC). The NRC must approve the use of TPBARs in licensed reactors.

1.2 COMMERCIAL LIGHT WATER REACTOR FACILITIES ANALYZED IN THIS CLWR EIS

This EIS evaluates the environmental impacts associated with producing tritium at one or more of the following reactor facilities:

- Watts Bar Nuclear Plant Unit 1 (Watts Bar 1), Spring City, Tennessee (operating)
- Sequoyah Nuclear Plant Unit 1 (Sequoyah 1), Soddy-Daisy, Tennessee (operating)
- Sequoyah Nuclear Plant Unit 2 (Sequoyah 2), Soddy-Daisy, Tennessee (operating)
- Bellefonte Nuclear Plant Unit 1 (Bellefonte 1), Hollywood, Alabama (partially complete)
- Bellefonte Nuclear Plant Unit 2 (Bellefonte 2), Hollywood, Alabama (partially complete)

These reactors, whose locations are shown in **Figure 1–2**, are owned and operated by the U.S. Government. Because tritium production could occur in one or more of these reactor facilities, this EIS evaluates each reactor for the maximum number of TPBARs that could be irradiated in the reactor. This bounds potential environmental impacts associated with any of the reactor facilities. This EIS also qualitatively evaluates the irradiation of a lesser number of TPBARs and a TPBAR design with higher tritium production and shorter refueling cycles (see Section 5.2.9).

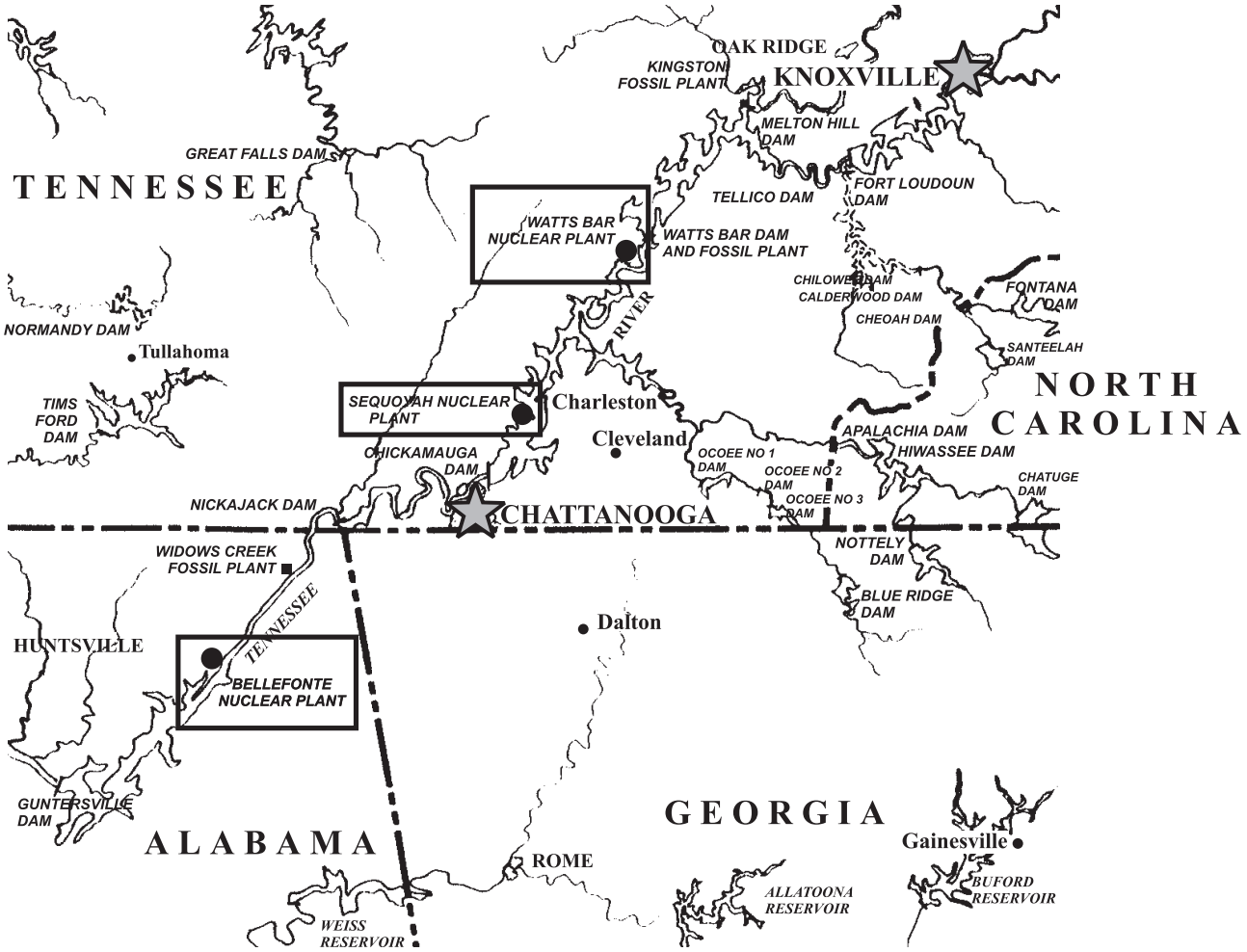

Figure 1–2 Locations of Candidate CLWRs for Tritium Production

In accordance with Council on Environmental Quality regulations, this EIS also evaluates the No Action Alternative. Under the No Action Alternative, DOE would not produce tritium in a CLWR. Consistent with Energy Secretary Bill Richardson's announcement on December 22, 1998 (DOE 1998f), the stockpile demands for tritium would have to be met by the backup technology option, which is the construction and operation of an accelerator at the Savannah River Site (see Section 1.5.2.1).

1.3 BACKGROUND

1.3.1 Defense Programs Mission

Since the inception of the nuclear weapons program in the 1940s, DOE and its predecessor agencies have been responsible for designing, manufacturing, maintaining, and retiring the nuclear weapons in the nation's stockpile. In response to the end of the Cold War and changes in the world political regime, the emphasis of the United States' nuclear weapons program has shifted dramatically over the past few years from producing weapons to dismantling weapons. Accordingly, the nuclear weapons stockpile is being greatly reduced; the United States is no longer producing new-design nuclear weapons; and DOE has closed or consolidated many former weapons production facilities.

Additionally, in 1991 President Bush declared a moratorium on underground nuclear testing, and in 1995 President Clinton decided to pursue a zero-yield Comprehensive Test Ban Treaty. Despite these significant changes, DOE's responsibilities for the nuclear weapons stockpile continue, and the President and Congress have directed DOE to continue to maintain the safety and reliability of the nuclear weapons stockpile and to provide the tritium necessary to satisfy national security requirements. As explained in Chapter 2, the United States will need a new tritium production source by approximately 2005.

The size of the nation's nuclear weapons stockpile is determined by the President through a classified process. The Secretaries of Defense and Energy, in coordination with the Nuclear Weapons Council, jointly sign and submit the Nuclear Weapons Stockpile Memorandum. The Nuclear Weapons Stockpile Memorandum transmits the Nuclear Weapons Stockpile Plan to the President for final approval. **Figure 1–3** depicts this process. The Nuclear Weapons Stockpile Plan covers an 11-year period, specifies the types and quantities of weapons required, and sets limits on the size and nature of stockpile changes that can be made without additional approval from the President. As such, the Nuclear Weapons Stockpile Plan is the basis for all weapons planning in DOE. The President takes the Nuclear Weapons Stockpile Memorandum under advisement and issues a National Security Directive to DOE and the U.S. Department of Defense approving the Nuclear Weapons Stockpile Plan for implementation. Based upon this Presidential directive, DOE determines the tritium requirements. The most recent Presidential direction, which is contained in the 1996 Nuclear Weapons Stockpile Plan and an accompanying Presidential Decision Directive, mandates that new tritium must be available by approximately 2005 if a CLWR is the selected option for tritium production. Chapter 2 provides a description of the tritium requirements this EIS is intended to support.

1.3.2 Nuclear Weapons

A general understanding of a nuclear weapon, including the components that make up the weapon and the physical processes involved, is helpful in understanding the purpose and need addressed in this EIS. **Figure 1–4** presents a simplified diagram of a modern nuclear weapon. An actual U.S. nuclear weapon is much more complicated, consisting of many thousands of parts.

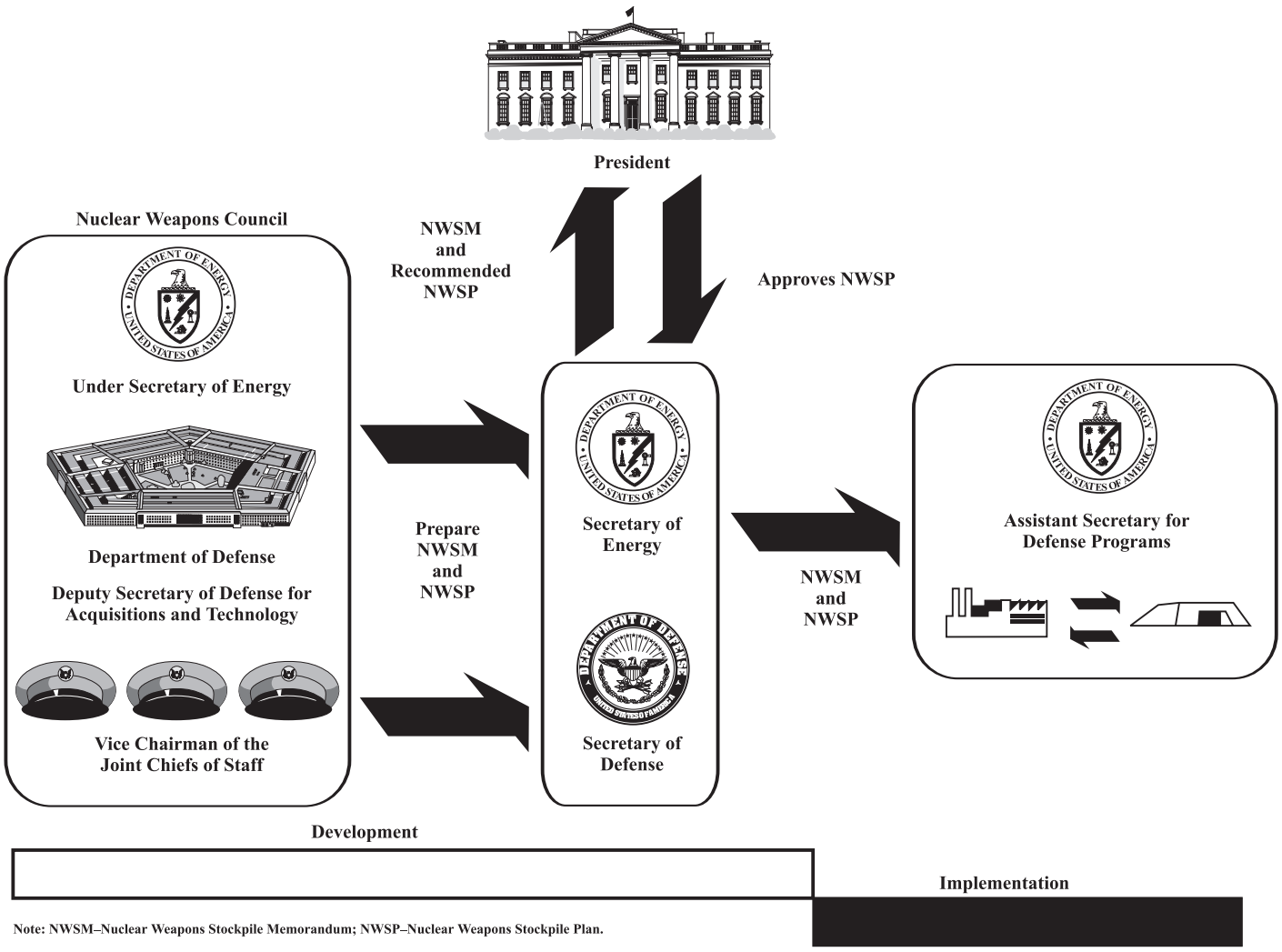

Figure 1–3 Nuclear Weapons Stockpile Memorandum and Plan Process

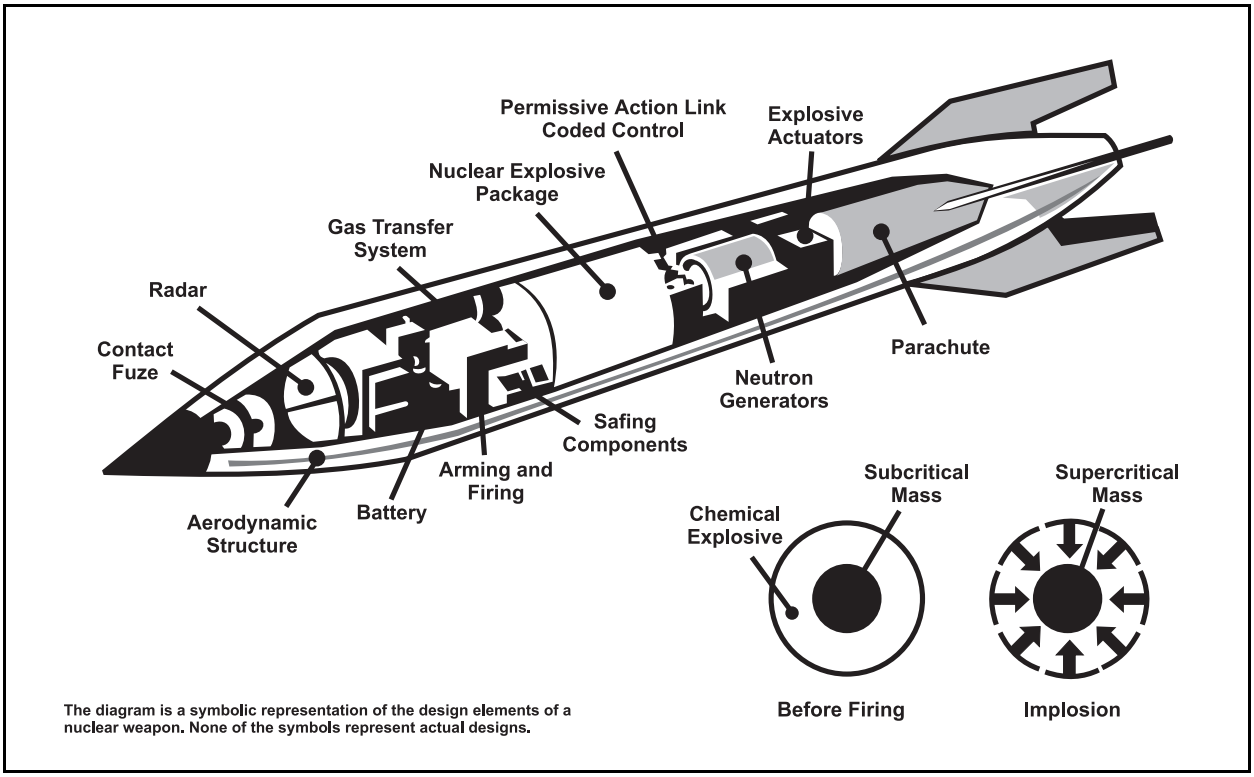

Figure 1–4 Diagram of a Modern Nuclear Weapon

The nuclear weapon primary is composed of a central core called a pit, which is usually made of plutonium-239 and/or highly enriched uranium. This is surrounded by a layer of high explosive which, when detonated, compresses the pit and initiates a nuclear reaction. This reaction is generally thought of as the nuclear fission "trigger" that activates the secondary assembly component to produce a thermonuclear hydrogen fusion reaction. The remaining nonnuclear components consist of everything from arming and firing systems to batteries and parachutes. The assembly of these components into a weapon or the dismantlement of an existing weapon is done at the weapons assembly/disassembly facility.

Tritium is not a fissile material and cannot be used by itself to construct a nuclear weapon. However, tritium is a key component of all nuclear weapons presently in the nation's nuclear weapons arsenal. Tritium enables weapons to produce a larger fission yield while reducing the overall size and weight of the warhead. This process is called "boosting." Boosting is accomplished by injecting a mixture of tritium gas and deuterium gas, a naturally occurring, nonradioactive hydrogen isotope, into the pit. The deuterium and tritium are stored in reservoirs (depicted as the "gas transfer system" in Figure 1–4) until the gas transfer system is initiated. The implosion of the pit along with the onset of the fissioning process heats the deuterium-tritium mixture to the point that the atoms undergo fusion. The fusion reaction releases large quantities of very high energy neutrons that flow through the compressed pit material and produce additional fission reactions. Such boosting has allowed the development of today's sophisticated delivery systems.

In the absence of new weapons designs and the total redesign of all warheads and delivery systems, the nation requires a reliable source of tritium to maintain a nuclear deterrent. Furthermore, total redesign of all warheads would require nuclear testing, which would be contrary to the President's pursuit of a Comprehensive Test Ban Treaty.

1.3.3 Brief History of the Production of Tritium

Tritium is so rare in nature that useful quantities must be manufactured. DOE has constructed and operated over a dozen nuclear reactors for the production of nuclear materials at the Savannah River Site, South Carolina, and the Hanford Site, Washington, starting with the early part of the Manhattan Project during World War II. None of these reactors is currently operational. The last one, the K-Reactor at the Savannah River Site, was shut down in 1988 for major environmental, safety, and health upgrades to comply with today's stringent standards. DOE discontinued the K-Reactor Restart Program in 1993 when smaller stockpile requirements delayed the need for tritium. As explained in the Final Programmatic EIS, the K-Reactor is not a reasonable alternative for tritium production.

In recent years, international arms control agreements have caused the nuclear weapons stockpile to be reduced in size. Reducing the stockpile has allowed DOE to recycle the tritium removed from dismantled weapons for use in supporting the remaining stockpile. However, due to the decay of tritium, the current inventory of tritium will not meet national security requirements past approximately 2005. Therefore, the most recent Presidential direction, contained in the 1996 Nuclear Weapons Stockpile Plan and an accompanying Presidential Decision Directive, mandates that new tritium be available by approximately 2005 if a CLWR is the selected option for tritium production. If the accelerator is the selected option for tritium production, the Presidential directive mandates that new tritium must be available by 2007. Tritium needs during the period 2005-2007 would be met by using the five-year tritium reserve or by a contingency tritium supply source.

1.3.4 Production of Tritium in a CLWR

The production of tritium in a CLWR is technically straightforward and requires no elaborate, complex engineering development and testing program. All the nation's supply of tritium, as mentioned previously, has been produced in reactors. Most existing commercial pressurized water reactors utilize 12-foot-long rods containing an isotope of boron (boron-10) in ceramic form. These rods are sometimes called burnable absorber rods. The rods are inserted in the reactor fuel assemblies to absorb excess neutrons produced by the uranium fuel in the fission process for the purpose of controlling power in the core at the beginning of an operating cycle. DOE's tritium program has developed another type of burnable absorber rod in which neutrons are absorbed by a lithium aluminate ceramic rather than boron ceramic. These TPBARs would be placed in the same locations in the reactor core as the standard burnable absorber rods. There is no fissile material (uranium or plutonium) in the TPBARs.

While the two types of rods function in a very similar manner to absorb excess neutrons in the reactor core, there is one notable difference: when neutrons strike the lithium aluminate ceramic material in a TPBAR, tritium is produced. This tritium is captured almost instantaneously in a solid zirconium material in the rod, called a "getter." The solid material that captures the tritium as it is produced in the rod is so effective that the rod will have to be heated in a vacuum at much higher temperatures than normally occur in the operation of a light water reactor to extract the tritium for eventual use in the nuclear weapons stockpile. Depending upon tritium needs, as many as 3,400 TPBARs could be placed in a CLWR for irradiation.

1.3.5 Nonproliferation

Nuclear proliferation refers to the spread of nuclear weapons to nonnuclear weapons states. In an effort to limit nuclear proliferation, the United States, along with other signatories to the Nuclear Nonproliferation Treaty, has sought to preclude nonnuclear weapons states from acquiring fissile materials (highly enriched uranium or plutonium) for weapons or explosive use. Under the terms of the Nuclear Nonproliferation Treaty, the United States is a weapons state and, as such, is allowed to conduct nuclear weapons activities. The production of tritium is one such activity. Accordingly, the use of a CLWR for the production of tritium is not inconsistent with the terms of the Nuclear Nonproliferation Treaty.

Along with other weapons-state signatories to the Nuclear Nonproliferation Treaty, the United States, under Article VI, undertakes to pursue negotiations on nuclear disarmament. Production of tritium in a CLWR in no way conflicts with these commitments. Since the end of the Cold War, the United States has significantly reduced the size of its nuclear weapons stockpile. At the present time, the United States is further downsizing the nuclear weapons stockpile consistent with the terms of the Strategic Arms Reduction Treaty (START) I. The United States has ratified the START II Treaty and is hopeful Russia also will ratify this treaty soon. Additionally, the United States has ceased production of fissile materials and the manufacture of new-design nuclear weapons and has closed several weapons production facilities.

Negotiations required for further reductions in United States nuclear weapons and, ultimately, total nuclear disarmament, likely will stretch well into the next century. United States production of tritium in a CLWR will support the U.S. nuclear weapons stockpile during this process. Such support of a decreased nuclear weapons stockpile is not inconsistent with the long-range goal of total nuclear disarmament.

The International Atomic Energy Agency (IAEA) is charged with detecting and deterring the spread of nuclear weapons. The United States has offered its commercial power plants for inspection by the IAEA as an act of good faith and to encourage other nations to be equally open about their nuclear programs. Commercial reactor tritium production would not change this commitment. The commercial reactors would remain open for IAEA inspection whether they are producing tritium or not. Furthermore, the IAEA has indicated that CLWR production of tritium would not alter the existing IAEA Safeguards Program.

In accordance with the direction provided in the Fiscal Year 1998 National Defense Authorization Act (P.L. 105-85) conference report, DOE facilitated a high-level interagency review of the policy issues associated with the use of commercial reactors to make tritium for national security purposes. The participants in the interagency review included the NRC, the U.S. Department of Defense, and the U.S. Department of State Arms Control offices. This process was completed in July 1998 and is documented in the *Interagency Review of the Nonproliferation Implications of Alternative Tritium Production Technologies Under Consideration by the Department of Energy, A Report to the Congress* (DOE 1998d). The report concluded that the nonproliferation policy issues associated with the use of a CLWR are manageable and that DOE should continue to pursue the reactor option as a viable source for future tritium production. This conclusion was based upon a number of considerations including the following:

1. The use of CLWRs for tritium production is not prohibited by law or international treaty.

2. Historically, there have been numerous exceptions to the practice of differentiating between U.S. civil and military facilities, including the operation of the N-Reactor at Hanford, Washington; the dual-use nature of the U.S. enrichment program; the use of defense program plutonium production reactors to produce radioisotopes for civilian purposes; and the sale of tritium produced in the defense reactors in the U.S. commercial market.

3. Although the CLWR alternative raised initial concerns because of its implications for the policy of maintaining separation between U.S. civil and military nuclear activities, these concerns could be adequately addressed, given the particular circumstances involved. These circumstances include the fact that the reactors would remain eligible for IAEA safeguards and the fact that, if TVA were the utility selected for the tritium mission, the reactors used for tritium production would be owned and operated by the U.S. Government, making them roughly comparable to past instances of government-owned dual-purpose nuclear facilities.

In addition to those examples referred to in the *Interagency Review of the Nonproliferation Implications of Alternative Tritium Production Technologies Under Consideration by the Department of Energy, A Report to the Congress* (DOE 1998d), there are other instances in which military nuclear programs have been

commingled with civilian programs. These instances include: (1) Atomic Energy Commission purchase of plutonium separated from commercial reactor spent fuel for unrestricted use, including defense purposes; (2) fabrication of both military and commercial reactor fuel by commercial reactor fuel fabricators; and (3) TVA generation of electricity for use in the production of fissile military materials.

1.3.6 Background on the Tennessee Valley Authority

TVA was established by an Act of Congress in 1933 (U.S.C. 831-831dd) as a Federal corporation to improve the navigability of and provide flood control for the Tennessee River; to provide reforestation and ensure the proper use of marginal lands in the Tennessee Valley; to provide agricultural and industrial development of the Tennessee Valley; to provide for the national defense; and for other purposes. Within a few years of its establishment, TVA built a series of multipurpose dams on the Tennessee River system. One of the purposes of these dams was production of abundant, inexpensive electricity. The hydroelectric power generated by these dams met most of the rapidly increasing needs of the region through the 1940s. By the early 1950s, however, the growing demand was quickly outstripping the capacity of the dams and the Watts Bar Fossil Fuel Plant, which began operation in 1942. During the next 20 years, TVA built 11 large, coal-fired, electricity-generating plants to meet the region's growing needs. Some of these plants were the largest, first-of-their-kind coal-fired units in the world. The 1960s brought even greater growth to the region. To meet the anticipated need for more power, TVA began an ambitious program of nuclear plant construction.

Today TVA is one of the largest producers of electricity in the United States, generating 4 to 5 percent of all electricity in the nation. TVA's power system serves almost 8 million people in a seven-state region encompassing some 207,200 square kilometers (80,000 square miles). TVA's electricity is distributed to homes and businesses through a network of 159 power distributors, including municipally owned utilities and electric cooperatives. TVA also sells power directly to approximately 60 large industrial customers and Federal facilities.

TVA's power system, which is self-financed, has a generating capacity of 28,000 megawatts-electric. Its generating system consists of 11 coal-fired plants (53 percent of total generating capacity), 5 nuclear generating units at three sites (20 percent), 29 hydroelectric dams (15 percent), 48 combustion turbine units at four sites (7 percent), and one pumped-storage facility (5 percent). These plants are owned and operated by the U.S. Government. The TVA power system is linked by 25,750 kilometers (16,000 miles) of transmission lines that carry power to 750 wholesale delivery points, as well as 57 interconnections with 13 neighboring utilities.

In December 1995, with the publication of *Energy Vision 2020, Integrated Resource Plan/Environmental Impact Statement* (TVA 1995d), TVA projected demands for electricity in the TVA power service area through the year 2020 and evaluated different ways of meeting these projected increases. Since the Integrated Resource Plan was completed in 1995, TVA has continued to evaluate and select the best resource options based on the latest proposals and TVA’s forecast of power needs. The total system generating capacity has been increased with the successful completion of Watts Bar 1 and the return to service of Browns Ferry Nuclear Plant Unit 3 in Athens, Alabama. Both units have operated above expectations and have proven to be very reliable.

Current projections show the demand for electricity (including reserves) will exceed TVA’s 1998 generating capacity by about 5,200 megawatts-electric in 2005; this projection is slightly less than the 1998-2005 medium load forecast of 5,450 megawatts-electric in *Energy Vision 2020, Integrated Resource Plan/Environmental Impact Statement* (TVA 1995d). About 2,800 megawatts-electric of additional generating capacity will be needed by the year 2001. A portion of this could be met by the proposed Red Hills Power Project. The remainder will be met by option purchase agreements, forward contracts for delivery of electricity to TVA, and internal TVA projects to increase net dependable capacities for TVA’s combustion turbines, fossil plants, and

pumped-storage units. An additional 2,400 megawatts-electric of capacity will be required between 2001 and 2005. The completion of the Bellefonte unit(s) would offset some of this planned capacity.

Producing tritium in a TVA reactor would be consistent with the Congressional purposes that established TVA—namely, to provide for the industrial development of the Tennessee Valley and for national defense. Producing tritium in a TVA reactor would also enable TVA to maximize the utilization of its resources and potentially increase its electricity-generating capacity. TVA, as a Federal agency, in order to fulfill NEPA responsibilities, chose to be a cooperating agency on this EIS. A cooperating agency is defined by Council on Environmental Quality regulations as any Federal agency other than a lead agency having jurisdiction by law or special expertise with respect to any environmental issue involved in a proposal (40 CFR 1508.5).

1.4 NEPA STRATEGY

DOE's strategy for compliance with NEPA has been to make decisions on programmatic alternatives in the Final Programmatic EIS (DOE 1995b) and the subsequent Record of Decision (60 FR 63878), followed by site-specific analyses to implement the programmatic decisions. The decisions made in the December 12, 1995, Final Programmatic EIS Record of Decision have resulted in DOE preparing this EIS and the following NEPA documents:

1. *Environmental Impact Statement, Construction and Operation of a Tritium Extraction Facility at the Savannah River Site* (DOE 1998c, DOE 1999b)

2. *Environmental Impact Statement, Accelerator Production of Tritium at the Savannah River Site* (DOE 1997e, DOE 1999a)

3. *Environmental Assessment, Lead Test Assembly Irradiation and Analysis, Watts Bar Nuclear Plant, Tennessee, and Hanford Site, Richland, Washington* (DOE 1997c)

The relationship of the CLWR EIS with these, as well as other relevant NEPA documents, is explained in Section 1.5.

1.5 OTHER RELEVANT NEPA REVIEWS

This section explains the relationship between the CLWR EIS and other relevant NEPA documents. Completed NEPA actions are addressed in Section 1.5.1; ongoing actions are discussed in Section 1.5.2.

1.5.1 Completed NEPA Actions

1.5.1.1 Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling

The Final Programmatic EIS DOE/EIS-0161, (DOE 1995b) evaluated the alternatives for the siting, construction, and operation of tritium supply and recycling facilities at each of five DOE candidate sites (the Idaho National Engineering and Environmental Laboratory; the Nevada Test Site; the Oak Ridge Reservation, Tennessee; the Pantex Plant, Texas; and the Savannah River Site, South Carolina) for four different production technologies (heavy water reactor, modular high temperature gas-cooled reactor, advanced light water reactor, and accelerator production of tritium). This Final Programmatic EIS also evaluated the impacts of using a CLWR, but did not analyze specific locations or reactor sites. Issued in October 1995, the Final Programmatic EIS was followed by a Record of Decision on December 12, 1995 (60 FR 63878). In the Record of Decision, DOE decided to pursue a dual-track approach on the two most promising tritium supply alternatives: (1) to initiate purchase of an existing commercial reactor (operating or partially complete) or reactor 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 for tritium production (the Savannah River Site was selected as the location for a tritium production accelerator, should one be built) (60 FR 63878). The Record of Decision also called for the construction of a proposed new Tritium Extraction Facility at the Savannah River Site. The CLWR EIS is intended to provide the NEPA analysis necessary to implement the 1995 Final Programmatic EIS Record of Decision, which will select the technology and specific site for a tritium production facility.

On December 22, 1998, Secretary of Energy Bill Richardson announced that tritium production in one or more CLWRs would be the United States' primary tritium supply technology and that the accelerator would be developed, but not constructed, as a backup to CLWR tritium production (DOE 1998f). Secretary Richardson further stated that the Watts Bar and Sequoyah reactors have been designated as the Preferred Alternative for CLWR tritium production. The Secretary's announcement that the CLWR would be the primary tritium supply technology reaffirms the 1995 Record of Decision for the Final Programmatic EIS to construct and operate a new tritium extraction capability at the Savannah River Site.

1.5.1.2 Lead Test Assembly Environmental Assessment

This NEPA analysis addressed the environmental impacts associated with the fabrication of the TPBARs at Pacific Northwest National Laboratory, Washington; the irradiation of these TPBARs in Watts Bar 1; post-irradiation examination of the TPBARs at Pacific Northwest National Laboratory, Washington, and Argonne National Laboratory-West, Idaho; and impacts of transporting TPBARs to and from Watts Bar 1 (DOE 1997c). In the past, the United States produced all necessary tritium in government-owned nuclear reactors. The purpose of the Lead Test Assembly demonstration is to confirm and provide confidence to regulators and the public that tritium production in a CLWR is technically straightforward and safe. DOE issued a Finding of No Significant Impact in July 1997 (DOE 1997d). Subsequently, the TPBARs were placed in Watts Bar 1 on September 25, 1997, and they are presently being irradiated during the normal 18-month fuel cycle. Following irradiation, the TPBARs will undergo post-irradiation examination. To meet its own NEPA requirements, TVA adopted the Lead Test Assembly Environmental Assessment and issued a Finding of No Significant Impact on August 19, 1997 (TVA 1998a). Additionally, NRC prepared an independent environmental assessment and issued its own Finding of No Significant Impact on September 11, 1997 (62 FR 47835).

1.5.1.3 EISs for the Operation of Watts Bar 1 and Sequoyah 1 and 2 and for Construction of Bellefonte 1 and 2

EISs analyzing the environmental impacts associated with operation of the Watts Bar and Sequoyah Nuclear Plants and the construction of the Bellefonte Nuclear Plant (AEC 1974, NRC 1978, TVA 1971, TVA 1972, TVA 1974a, TVA 1974b, TVA 1978, TVA 1993, TVA 1994b, TVA 1995a,) have been completed and serve to a great extent as a baseline on which the environmental impacts associated with tritium production are assessed. For the partially completed Bellefonte 1 and 2, the CLWR EIS also evaluates the environmental impacts associated with the completion and subsequent operation of these units for 40 years.

1.5.2 Ongoing NEPA Actions

1.5.2.1 Environmental Impact Statement, Accelerator Production of Tritium at the Savannah River Site

This EIS analyzes the potential environmental impacts associated with the construction and operation of an accelerator for the production of tritium at the Savannah River Site. On a programmatic level, the accelerator for the production of tritium at the Savannah River Site represents the No Action Alternative for the CLWR EIS. A summary of the APT EIS, DOE/EIS-0270 (DOE 1997e, DOE 1999a), is presented in Section 5.2.11,

Volume 1, of this CLWR EIS. The APT Draft EIS was issued in December 1997. The APT Final EIS for the accelerator was issued concurrently with the CLWR EIS. As a result of the announcement by Secretary of Energy Bill Richardson on December 22, 1998 (DOE 1998f), that the accelerator would be a backup to CLWR tritium production, DOE will continue with developmental activities associated with the accelerator. However, the accelerator will not be constructed. The APT EIS is incorporated in the CLWR EIS by reference.

1.5.2.2 Environmental Impact Statement, Construction and Operation of a Tritium Extraction Facility at the Savannah River Site

This EIS analyzes the potential environmental impacts associated with the construction and operation of a Tritium Extraction Facility at the Savannah River Site. The Draft EIS for the Tritium Extraction Facility was issued in May 1998; a Final EIS was issued concurrently with the CLWR EIS. The purpose of the Tritium Extraction Facility would be to extract the tritium from the TPBARs or from targets of similar design. TPBARs irradiated at the selected CLWRs would be sent to the Tritium Extraction Facility for extraction of the tritium-containing gases. A summary of the environmental impacts of the *Environmental Impact Statement, Construction and Operation of a Tritium Extraction Facility at the Savannah River Site,* DOE/EIS-0271 (DOE 1998c, DOE 1999b), is presented in Section 5.3.4, Volume 1, of this CLWR EIS. The Tritium Extraction Facility EIS is incorporated in the CLWR EIS by reference.

1.5.2.3 Environmental Assessment for the Tritium Facility Modernization and Consolidation Project at the Savannah River Site

This environmental assessment (DOE 1998a) addresses the potential impacts of consolidating the tritium activities currently performed in Building 232-H into the newer Building 234-H. Tritium extraction functions would be transferred to the Tritium Extraction Facility under the Preferred Alternative. The overall impact would be to reduce emissions by up to 50 percent. Another effect would be to reduce the amount of low-level radioactive waste generated. Effects on other resources would be negligible. Therefore, impacts from these actions were not included in the cumulative impacts of the CLWR EIS.

1.5.2.4 Final Environmental Impact Statement for the Bellefonte Conversion Project

This EIS, issued by TVA, addresses the environmental impacts anticipated from: (1) the conversion of partially completed Bellefonte 1 and 2 to fossil fuel electricity-generating facilities, and (2) the No Action Alternative of maintaining the facilities as partially completed nuclear facilities. The EIS was completed in October 1997. The issuance of a Record of Decision on the *Final Environmental Impact Statement for the Bellefonte Conversion Project* (TVA 1997f) will not be made until it is determined whether one or both of these reactor plants will be used for tritium production. The No Action Alternative of the CLWR EIS involves the continued deferral of Bellefonte 1 or both Bellefonte 1 and 2 while TVA explores arrangements with outside entities to complete the units as nuclear facilities. If these reactor plants will not be utilized in the CLWR program, one of the five alternatives addressed in the *Final Environmental Impact Statement for the Bellefonte Conversion Project* could be selected in the Record of Decision for that EIS. If the CLWR EIS Record of Decision indicates that Bellefonte 1 or both Bellefonte 1 and 2 will be used for tritium production, then the construction of the reactor(s) would be completed and the reactor(s) would be operated for both tritium production and electricity production.

1.6 ORGANIZATION OF THIS EIS

This CLWR Final EIS comprises two volumes. Volume 1 contains the main text; Volume 2 contains the comments received on the Draft EIS during the public review period and the DOE responses. Volume 1 contains 11 chapters and 8 appendices. The main analyses are included in the chapters, and additional project information is provided in the appendices. A summary also is available.

The 11 chapters in Volume 1 provide the following information:

Chapter 1—Introduction: CLWR EIS background and the NEPA process

Chapter 2—Purpose and Need: Reasons why the action is needed and the proposed objectives of the action

Chapter 3—CLWR Program Alternatives: Proposed ways to meet the specified need and achieve the objectives; basic assumptions; the development of the reasonable alternatives; and descriptions of the No Action and Preferred Alternatives [The chapter also includes a summary of the potential environmental impacts of the reactor alternatives, as well as a comparison of the environmental impacts between the CLWR alternatives and the accelerator option.]

Chapter 4—Affected Environment: Aspects of the environment that could be affected by the EIS alternatives

Chapter 5—Environmental Consequences: Analyses of the potential impacts of the EIS alternatives on the environment

Chapter 6—Regulatory Requirements: Environmental, safety, and health regulations that would apply for this EIS's alternatives and the agencies consulted for their expertise [The chapter also contains the regulatory history of TVA's reactors.]

Chapters 7-11—References; a list of preparers; a list of agencies, organizations, and persons to whom copies of this EIS are being sent; a glossary; and an index

The eight appendices of technical information contain the following information: CLWR tritium production operations, methods for assessing environmental impacts, normal operational impacts on human health, facility accident impacts on human health, evaluation of human health effects of overland transportation, the public scoping process, environmental justice, and contractor disclosure.

1.7 PUBLIC SCOPING PROCESS

Scoping is a process by which the public and stakeholders provide comments directly to the Federal agency on the scope of the EIS. This process is initiated by the publication of the Notice of Intent in the *Federal Register*.

On January 21, 1998, DOE published in the *Federal Register* a notice of intent to prepare the CLWR EIS (63 FR 3097). In this notice of intent, DOE invited public comment on the CLWR EIS proposal. Subsequent to this notice, DOE held public scoping meetings in Rainsville, Alabama, on February 24, 1998, and in Evensville, Tennessee, on February 26, 1998. The 700 comments received both orally and in writing at these meetings or via letters, fax, the Internet, or the 1–800 phone line during the public comment period were reviewed by DOE for consideration in preparing this EIS. A summary of the comments received during the public scoping process, as well as DOE's consideration of these comments, is provided as Appendix F of this EIS.

Of the approximately 700 comments received from citizens, interested groups, and Federal, state, and local officials during the public scoping period, 156 were verbal comments made during the public meetings. The remainder of the comments (513) were submitted at the public meetings in written form or via mail, Internet, fax, or phone over the entire scoping period. Commentors who spoke at the public meetings often read from written statements that were later submitted during or after the meetings. Where this occurred, each comment provided by an individual commentor in both verbal and written form was counted as a single comment. In

addition to the comments, four petitions totaling 1,586 signatures were submitted in support of completing the Bellefonte plant for tritium production purposes.

The majority of the verbal and written comments received during the public scoping period favored producing tritium at one or more of TVA's nuclear power plants. Comments from residents of northern Alabama were particularly supportive of completing the Bellefonte plant for tritium production. Reasons given for this support mostly involved potential socioeconomic benefits such as job creation, a greater abundance of inexpensive electricity, attraction of new businesses to the area, and increased local revenues.

Many of the comments received from residents of the local areas near the TVA plants also communicated an understanding that the United States will begin producing tritium in the near future–either at the Savannah River Site (the accelerator option) or at one of TVA's nuclear power plants. These commentors expressed confidence in the safety of the TVA plants and the capabilities of area workers to provide the skills needed for tritium production. They also said they believe nuclear power plants are a more sensible choice for tritium production because reactors are a proven technology and the total project cost would be less than the cost of building an accelerator.

A significant number of other comments received during the scoping period opposed tritium production in general and the use of a nuclear power plant for this purpose in particular. This group disagreed with the Presidential and Congressional decision to produce tritium and denied there is any real defense-related need for new tritium production because they believe other options are available. Among the options cited were unilateral disarmament, commercial purchases, recycling the material from deactivated nuclear weapons, and/or extending the half-life of tritium.

Several commentors voiced concerns about the environmental, health, and safety risks they believe are inherent to tritium production. DOE representatives were urged to thoroughly evaluate the potential consequences of the proposed action on local water resources and the health and safety of area residents and wildlife. Concerns also were raised about the safety of TVA's nuclear power plants and how the security of the plants would be managed if tritium production were to begin.

Waste production and disposal were other issues. Some commentors correctly stated that tritium production in a nuclear reactor would increase the amount of spent fuel wastes generated. Questions were posed as to how this additional waste would be dealt with, both on site and in the long term.

Many commentors also viewed the U.S. Government's decision to produce tritium as a violation of its own policies and commitments under the International Nonproliferation and Strategic Arms Limitation Treaties. They accused the U.S. Government of hypocrisy and asserted that tritium production in a commercial light water reactor would blur the historical line between U.S. civilian and military nuclear programs. This action, they warned, would encourage other countries to use their own commercial plants to produce weapons materials and to increase their weapons stockpiles.

The public comments and materials submitted during the scoping period were carefully logged as they were received and placed in the Administrative Record of this EIS. Their disposition is described in Appendix F of this EIS.

1.8 PUBLIC COMMENT PERIOD

In August 1998, DOE issued the CLWR Draft EIS (DOE/EIS-0288D). This document explained the need for a domestic tritium production source to maintain the U.S. nuclear deterrent and described and analyzed the environmental impacts associated with tritium production at one or more nuclear power plants operated by

TVA. The 60-day public comment period on the CLWR Draft EIS began on August 28, 1998, and ended on October 27, 1998.

During the comment period, public hearings were held in North Augusta, South Carolina; Rainsville, Alabama; and Evensville, Tennessee. The public was encouraged to submit comments via the U.S. mail service, e-mail to a special DOE web site on the Internet, a toll-free 800-number phone line, and a toll-free fax line.

The public hearings were conducted using a modified traditional public hearing format that allowed two-way interaction between DOE representatives and members of the public and also encouraged public comments on the document. A neutral facilitator was present at each hearing to direct and clarify discussions and comments. A court reporter was present at each hearing to record the proceedings and provide a transcript of the public comments and the dialogue between the public and the DOE and TVA representatives.

Comments from the public hearings were combined with comments received by other means (mail, e-mail, 800 number, fax, etc.) during the comment period. The written comments were date-stamped and assigned a sequential document number in the order in which they were received. Volume 2 of this CLWR EIS, the Comment Response Document, describes the public comment process in detail (Chapter 1); provides scanned images of all the comment documents received (Chapter 2); summarizes the public hearing comments (Chapter 2); and provides DOE's responses to the public comment summaries (Chapter 3).

Prior to fulfilling the requirement to reach a technology decision by the end of 1998, Energy Secretary Richardson asked TVA to submit final proposals for its Watts Bar and Sequoyah reactors, as well as for completion of its Bellefonte reactor. These proposals were provided to DOE the first week of December 1998, after the October 27, 1998, closing of the public comment period for the CLWR Draft EIS. After receiving these offers, Secretary Richardson directed that this information be presented to the public so they could review the latest TVA offers and provide their comments prior to his reaching the technology decision. To enable this, in spite of the short notice, a public meeting was scheduled and conducted on December 14, 1998. At this meeting, DOE presented information on the new proposals; answered questions; and accepted comments on the proposals, as well as on CLWR tritium production in general. The public was encouraged to comment on the new TVA proposals via U.S. mail, fax, toll-free 800-number phone line, or e-mail. Although the comments received as a result of this December 14, 1998, meeting were submitted after the public comment period, DOE responded to all of these comments as though they were received during the public comment period and they are included in Volume 2, the Comment Response Document.

During the public comment period, approximately 800 comments were received. An additional 230 comments were in conjunction with the December 14, 1998, public meeting. Most of the comments focused on a limited number of major issues. These issues and DOE's responses are summarized below.

By far, a majority of comments supported the completion and operation of the Bellefonte Nuclear Plant for tritium production because it would promote economic development in a depressed area and provide other, similar benefits. Other commentors generally opposed the completion of the Bellefonte plant as a nuclear power plant, particularly for tritium production. In response to these comments, DOE acknowledged there is both public support and opposition for the Bellefonte alternative. The CLWR EIS addresses all of the benefits cited by the commentors who favored the Bellefonte alternative, as well as the concerns expressed by opponents. DOE's response to these and other related comments may be found in Volume 2, Chapter 3 of this EIS, under Category 7: General Support/Opposition.

The cost-effectiveness of the CLWR and APT tritium production alternatives was another frequent theme among many commentors. Most asked for cost-related information and/or expressed the opinion that cost should be the major determining factor in a tritium production decision. In addition, some commentors questioned the accuracy of the cost information that DOE provided at the public hearings and the December

14, 1998, public meeting, and many believed there was little possibility that TVA could complete the Bellefonte plant for the cost estimates cited. Other commentors stated they felt the large expenditures required for CLWR tritium production would be better spent on other, more urgent social needs such as education and environmental restoration. Some commentors were concerned about possible costs to TVA ratepayers resulting from tritium production.

In response to the cost-related comments, DOE stated that the CLWR EIS was prepared in accordance with NEPA, the Council on Environmental Quality's regulations on implementing NEPA (40 CFR Parts 1500-1508), and DOE's NEPA regulations (10 CFR 1021). None of these regulations require the inclusion of a cost analysis in an EIS. As discussed in Volume 1, Chapter 3, Section 3.2.1, the basic objective of the CLWR EIS is to provide the public and DOE decision-makers with a description of the reasonable alternatives for CLWR tritium production and information about their potential impacts on public health and safety and the environment. While costs could be an important factor in the ultimate Record of Decision, the purpose of this and other EISs is to address the environmental consequences of the proposed action. DOE distributed cost information comparing the CLWR and APT alternatives (DOE 1998e) at the public hearings in October 1998, however, and this information is available upon request. In response to comments concerning the accuracy of TVA's cost estimates for completing the Bellefonte plant, DOE considers TVA's cost estimates to be both accurate and conservative, given that the plant is nearly complete and TVA's cost estimates were evaluated by an external reviewer. In response to comments that CLWR funds would be better spent on other, more urgent social needs, DOE noted that Congress determines how funds are allocated, and DOE does not determine Federal spending priorities. Furthermore, such spending priorities are beyond the scope of this EIS. In response to the concerns of TVA ratepayers about potential costs resulting from tritium production, DOE responded that no additional costs to ratepayers are expected. DOE's responses to the cost-related public comments are found in Volume 2, Chapter 3 of this EIS, under Category 23: Cost Issues.

Many commentors questioned the need for nuclear weapons and/or the present need for tritium. Other commentors expressed a belief that the amount of tritium needed to support current and future nuclear weapons stockpiles is less than the amount stated in the CLWR EIS. In response, DOE cited its responsibilities for maintaining the nation's nuclear weapons stockpile under the Atomic Energy Act of 1954 and the requirements of the 1996 Nuclear Weapons Stockpile Plan and accompanying Presidential Decision Directive, which established the size and composition of the nation's nuclear weapons stockpile and the need for a new tritium production source by approximately 2005. DOE stated that sufficient quantities of tritium no longer can be obtained from weapons being retired from the existing stockpile, as cited in the most recent Presidential Decision Directive. DOE's responses to comments concerning the need for tritium are found in Volume 2, Chapter 3 of this EIS, under Category 2: Purpose and Need for Tritium.

Several commentors expressed concern that tritium production in a commercial reactor would violate U.S. policy regarding the separation of commercial and military uses of nuclear energy, would hinder nonproliferation efforts, and would encourage other nations to use their own commercial facilities for nuclear weapons purposes. In response to these concerns, DOE cited the conclusions of a high-level study entitled, *Interagency Review of the Nonproliferation Implications of Alternative Tritium Production Technologies Under Consideration by the Department of Energy, A Report to the Congress* (DOE 1998d). This interagency review concluded that any nonproliferation issues associated with the production of tritium in a CLWR were manageable and that DOE should continue to pursue the CLWR option, as stated in Volume 1, Chapter 1, Section 1.3.5, of the CLWR EIS. DOE also stated that there is no U.S. policy, law, or treaty that prohibits the production of tritium that ultimately will be used in weapons in a commercial reactor. In addition, DOE stated that the United States is a declared weapons state, and the purpose of nonproliferation efforts is to keep nonweapons states from acquiring nuclear weapons while the declared weapons states work toward total disarmament. DOE noted that other nations already operate dual-purpose reactors that serve both civilian and military needs. DOE's responses to comments on nonproliferation, the separation of civilian and military

nuclear facilities, and other policy issues are found in Volume 2, Chapter 3 of this EIS, under Category 1, Policy Issues.

Many commentors were concerned with public and occupational health and safety issues. Some specifically questioned TVA's past history and practices related to plant safety. In response to these concerns, DOE stated that the environmental impacts and potential radiological doses to both workers and the public resulting from tritium production would be well below the limits considered acceptable by Federal and state regulatory authorities. Public and occupational health and safety issues are discussed in Volume 1, Chapter 5, of the CLWR EIS. DOE also stated that prior to irradiation of any TPBARs, an NRC safety evaluation would be required to amend the operating license of the reactors for tritium production. This review specifically would look at all potential health and safety issues. DOE's responses to public and occupational health and safety comments are found in Volume 2, Chapter 3 of this EIS, under Category 14: Occupational and Public Health and Safety - Normal Conditions.

Several commentors stated that DOE has a history of polluting and contaminating every site they have operated and wanted to know why the proposed action would be any different. In response, DOE acknowledged having a number of older facilities in need of environmental cleanup, and an aggressive cleanup program is underway to upgrade these facilities and ensure their continued compliance with Federal and state regulations. All of the CLWR tritium production alternatives involve the use of state-of-the-art TVA reactors. These reactors have excellent environmental compliance records and exemplary environmental, health, and safety programs to ensure their continued compliance with Federal and state regulations. In addition, DOE expressed confidence that tritium production in a CLWR would be safe and is technically straightforward. To commentors who expressed concern that CLWR tritium production expenditures would drain DOE's budget for its facility cleanup activities, DOE responded that the funding for both of these programs would come from separate Congressional appropriations. Funding for CLWR tritium production would not be obtained from funding already allocated for facility cleanup activities. DOE's responses to comments about past DOE practices and conflicts between DOE's cleanup activities and tritium production are found in Volume 2, Chapter 3 of this EIS, under Category 8: Past DOE Practices.

Some commentors suggested that the CLWR EIS was deficient and inadequate as a NEPA document. In response, DOE stated that it believes that the EIS is adequate and fully complies with NEPA. The EIS evaluates all reasonably foreseeable environmental impacts for all reasonable alternatives, in accordance with the requirements of the Council on Environmental Quality's regulations (40 CFR 1500-1508) and DOE's NEPA regulations (10 CFR 1021) and procedures. DOE's responses to NEPA-related comments are found in Volume 2, Chapter 3 of this EIS, under Category 5: NEPA Process.

Other commentors stated that the relationship between the CLWR , APT, and Tritium Extraction Facility EISs was not clearly explained in the CLWR Draft EIS. In response, DOE added a Preface to the CLWR Final EIS to better describe the relationship between the CLWR EIS, the APT EIS, and the Tritium Extraction Facility EIS. This Preface also addresses Energy Secretary Richardson's December 22, 1998, announcement (DOE 1998f) that the CLWR would be the primary tritium supply technology. DOE's response to comments concerning the relationship between the CLWR , APT, and Tritium Extraction Facility EISs is found in Volume 2, Chapter 3 of this EIS, under Category 5: NEPA Process (Comment Summary 05.01).

Several commentors were concerned about the additional spent nuclear fuel that would be generated by tritium production. DOE responded that additional spent nuclear fuel would be generated if more than 2,000 TPBARs were irradiated in a single reactor, as stated in Section 3.2.1 of the CLWR Final EIS. DOE also stated that the CLWR EIS evaluates the environmental impacts of additional spent fuel generation resulting from a maximum number of 3,400 TPBARs. DOE stated that it would manage the tritium production process to minimize, to the extent practicable, the generation of additional spent nuclear fuel. In the event a suitable repository is not available, as required by law, the additional spent nuclear fuel generated as a result of tritium production would

be stored on site in a dry cask independent spent fuel storage installation. DOE's responses to spent nuclear fuel comments are found in Volume 2, Chapter 3 of this EIS, under Category 17: Spent Fuel Management.

Several commentors suggested that the production of tritium in a CLWR would make TVA reactors an attractive target for terrorists and that DOE should address the consequences of such an attack in the EIS. In response, DOE stated that, prior to loading TPBARs in TVA's Watts Bar reactor as part of the Lead Test Assembly Program, a thorough security review was conducted. This review found existing security provisions to be adequate to protect against such a threat. Prior to utilizing Watts Bar or other TVA reactors for tritium production, additional DOE and NRC reviews would be required to ensure safeguard and security provisions are adequate. DOE's responses to these and other security-related comments are found in Volume 2, Chapter 3 of this EIS, under Category 22: Safeguards and Security.

1.9 CHANGES FROM THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

In response to comments on the CLWR Draft EIS and as a result of information that was unavailable at the time of the issuance of the Draft, Volume 1 of the CLWR Final EIS contains revisions and new information. These revisions and new information are indicated by a double underline for minor word changes or by a sidebar in the margin for sentence or larger additions. Volume 2, Comment Response Document, contains the comments received during public review of the CLWR Draft EIS and DOE's responses to those comments. A brief discussion of the most important changes is provided in the following paragraphs.

TPBAR Failures

In analyzing the potential releases of tritium to the environment from the proposed action, the CLWR Draft EIS assumed that two of the TPBARs under irradiation would fail and the entire inventory of tritium would be available to be released to the environment under normal operating conditions. The same two-TPBARs failure assumption was made in the analysis of transportation accidents. The assumption was based on the failure statistics of standard burnable absorber rods, i.e., two failures out of 29,700 rods through July 1980. Since the issuance of the CLWR Draft EIS, additional information obtained from Westinghouse (WEC 1998b) revealed that both failures were attributed to early manufacturing defects that have been corrected. The failures were attributed to slumping of the absorber material—a condition that cannot occur in the TPBARs. Since the two early failures, more than 500,000 Westinghouse burnable absorber rods have been used without a single observed failure. Consequently, the CLWR Final EIS still analyzes the impacts to the health and safety of the public from the potential failure of two TPBARs, but characterizes the event of such a failure as an abnormal event during an irradiation cycle, rather than a continuous, normal-operation occurrence. This change in assumptions results in changes in the potential tritium releases and estimated doses to the public under normal reactor operation and some accident conditions (i.e., the nonreactor design-basis accident) for all reactor alternatives.

The Secretary's Technology Announcement

The CLWR Draft EIS was issued in August 1998. At the time, the decision on the primary and backup technologies to be used for tritium production had not been made. On December 22, 1998, Energy Secretary Bill Richardson announced that the CLWR would be DOE's primary option for tritium production and the proposed linear accelerator at the Savannah River Site would be the backup option (DOE 1998f). In addition, the Secretary designated TVA's Watts Bar and Sequoyah Nuclear Plants as the preferred CLWR facilities. The CLWR Final EIS was revised to reflect the Secretary's announcement and include the Preferred Alternative. Changes were made primarily in the introductory sections of the CLWR Final EIS for accuracy. The evaluation of the impacts was not affected.

Clarification of TVA Proposals

In response to public comments about the status of the TVA proposals to provide irradiation services or the sale of a CLWR, Section 1.1.4 was revised. The discussion of the procurement process clarifies that DOE is considering only the purchase of irradiation services, not the purchase of a reactor. Additionally, the section clarifies that TVA submitted several proposals to DOE during the ongoing negotiations. An earlier TVA proposal for the use of Watts Bar expired. However, in December 1998, TVA submitted to DOE another offer to provide irradiation services at Watts Bar and Sequoyah, as well as additional proposals for Bellefonte. TVA's offer to provide irradiation services at one or more of the three proposed sites is still viable.

Nonproliferation Policy Issues

In response to public comments requesting DOE to provide examples of the commingling of civilian nuclear programs with military nuclear programs, Section 1.3.5 was revised. The discussion of nonproliferation now includes an explanation and some background information on the issue, as well as examples of the commingling of civilian and military uses of nuclear power.

Water Quality Analysis

In response to public comments expressing concern about impacts to public water withdrawals downstream of the Bellefonte Nuclear Plant, sections of Chapters 4 and 5 were revised. The discussion of surface water use for Bellefonte (Section 4.2.3.4) identifies nearby intakes downstream. The discussions of potential impacts to surface water near the three reactor sites (Sections 5.2.1.4, 5.2.2.4, and 5.2.3.4) include the tritium concentration at various locations downstream. In addition, Section 5.2.3.4 was revised to include potential chemical concentrations downstream of Bellefonte.

Accident Analysis

During the preparation of the CLWR Final EIS, data related to the design and fabrication of the TPBARs indicated that the release of tritium from an accidental breach of a TPBAR more likely would be time-dependent than instantaneous and finite, as was assumed in the Draft EIS (PNNL 1999). Consequently, the analysis for the TPBAR handling accident and the transportation cask handling accident at the reactor site (Appendix D), and the transportation cask accident en route (Appendix E), were revised to reflect the more recent data.

Environmental Justice

Figures in Appendix G were revised to improve their quality. New figures were added to show the location of minority and low-income populations within a 16.1-kilometer (10-mile) radius. In addition, a representative average individual dose at 40.2 kilometers (25 miles) to each of the 16 principal directions has been overlaid onto the 80.5-kilometer (50-mile) radius to show the potential dose to minority and low-income populations.

Tritium Requirements and Supply

In response to public comments expressing concerns about the disparity between the amount of tritium needed and the amount that could be supplied by one CLWR, Section 3.2.1 was revised. The discussion explains that the exact amount of tritium needed is classified information, however, for the purposes of analysis, it is not expected to exceed 3 kilograms per year (6.6 pounds per year). It further clarifies that one reactor with 3,400 TPBARs would be expected to satisfy a steady state tritium requirement in most years.

Comparison of the APT and CLWR Alternatives

In response to public comments requesting additional information about the No Action Alternative, Section 3.2.6 was expanded to include a table comparing the impacts of producing tritium under the accelerator and CLWR options. A document comparing the costs of the technology options is available upon request from DOE (DOE 1998e).

Source of Uranium-235 for Tritium Production

In response to public comments concerning the source of blended-down uranium-235 that could be used as nuclear fuel for tritium production, Section 5.2.7 was revised for clarification. A discussion of the environmental impacts resulting from blending-down activities of highly enriched uranium was also added.

Mitigation Measures

The CLWR Draft EIS discusses the need for mitigation measures, if such a need were warranted, right after the presentation of the impacts for each environmental resource. A new Section 5.5 was added to the CLWR Final EIS to summarize these discussions.

Sensitivity Analysis

An additional variation from the baseline analysis has been included in Section 5.2.9 of the CLWR EIS, that is, the possibility of producing tritium at some date later than 2005.

Miscellaneous Revisions and Editorial Changes

Several sections in the CLWR Final EIS were revised to reflect the availability of more recent data, or to include corrections on erroneous information, improvements in the presentation, and other editorial changes. None of these revisions affect the environmental impact assessment of the EIS. The sections with these types of revisions are:

3.2.3	Reasonable Alternatives
4.2.1.1	Affected Environment, Land Resources, Watts Bar
4.2.1.3	Affected Environment, Air Quality, Watts Bar
4.2.1.8	Affected Environment, Socioeconomics, Watts Bar
4.2.2.1	Affected Environment, Land Resources, Sequoyah
4.2.2.3	Affected Environment, Air Quality, Sequoyah
4.2.2.4	Affected Environment, Water Resources, Sequoyah
4.2.2.6	Affected Environment, Ecological Resources, Sequoyah
4.2.2.8	Affected Environment, Socioeconomics, Sequoyah
4.2.3.3	Affected Environment, Air Quality, Bellefonte
4.2.3.4	Affected Environment, Water Resources, Bellefonte
4.2.3.6	Affected Environment, Ecological Resources, Bellefonte
5.2.1.8	Environmental Consequences, Socioeconomics, Watts Bar
5.2.3.6	Environmental Consequences, Ecological Resources, Bellefonte
5.2.3.8	Environmental Consequences, Socioeconomics, Bellefonte
5.2.3.9	Environmental Consequences, Public and Occupational Health and Safety, Chemical Hazards, Bellefonte
	Environmental Consequences, Public and Occupational Health and Safety, Energizing Transmission Lines, Bellefonte
5.2.7	Fabrication of TPBARs

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