Chapter 1
Background, Purpose of, and Need for the Proposed Action

1.1 BACKGROUND

In December 1996, the U.S. Department of Energy (DOE) published the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (*Storage and Disposition PEIS*) (DOE 1996a). That PEIS analyzes the potential environmental consequences of alternative strategies for the long-term storage of weapons-usable plutonium and highly enriched uranium (HEU) and the disposition of weapons-usable plutonium that has been or may be declared surplus to national security needs.[1] The Record of Decision (ROD) for the *Storage and Disposition PEIS*, issued on January 14, 1997 (DOE 1997a), outlines DOE's decision to pursue a hybrid approach to plutonium disposition that would make surplus weapons-usable plutonium inaccessible and unattractive for weapons use. DOE's disposition strategy, consistent with the Preferred Alternative analyzed in the *Storage and Disposition PEIS*, allows for both the immobilization of some (and potentially all) of the surplus plutonium and use of some of the surplus plutonium as mixed oxide (MOX) fuel in existing domestic, commercial reactors. The disposition of surplus plutonium would also involve disposal of both the immobilized plutonium and the MOX fuel (as spent fuel) in a potential geologic repository.[2,3]

On May 22, 1997, DOE published a Notice of Intent (NOI) in the Federal Register (FR) (DOE 1997b) announcing its decision to prepare an environmental impact statement (EIS) that would tier from the analysis and decisions reached in connection with the *Storage and Disposition PEIS*. This EIS, the *Surplus Plutonium Disposition Environmental Impact Statement* (SPD EIS), addresses the extent to which each of the two plutonium disposition approaches (immobilization and MOX) would be implemented and analyzes candidate sites for plutonium disposition facilities and activities (i.e., lead assembly fabrication and postirradiation examination),[4] as well as alternative technologies for immobilization. In July 1998, DOE issued the SPD Draft EIS. That draft included a description of the potential environmental impacts of using from three to eight commercial nuclear reactors to irradiate MOX fuel. The potential impacts were based on a generic reactor analysis. In March 1999, DOE awarded a contract for MOX fuel fabrication and irradiation services.[5] After this award, DOE issued a *Supplement to the SPD Draft EIS (Supplement)* (April 1999) that describes the potential environmental impacts of using MOX fuel at three proposed reactor sites and provides updated information on the proposed disposition program. These updates and site-specific analyses have been incorporated in this SPD Final EIS.

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[1] DOE addresses the disposition of surplus HEU in a separate environmental impact statement, the *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE 1996b) issued in June 1996, with the ROD (DOE 1996c) issued in August 1996.

[2] The U.S. Nuclear Regulatory Commission (NRC) has reviewed DOE's plans to place immobilized material into the potential geologic repository and has agreed that with adequate canister and package design features, the immobilized plutonium waste forms can be acceptable for disposal in the repository (Paperiello 1999).

[3] Sidebars are used throughout this SPD Final EIS to indicate where changes were made since the SPD Draft EIS and *Supplement* were issued. Section 1.7.4 discusses these changes.

[4] This SPD EIS also analyzes a No Action Alternative, i.e., the possibility of disposition not occurring and instead continued storage of surplus plutonium in accordance with the *Storage and Disposition PEIS* ROD.

[5] Limited activities may be conducted under this contract, including non-site-specific work associated with the development of the initial design for the MOX fuel fabrication facility and plans (paper studies) for outreach, long lead-time procurements, regulatory management, facility quality assurance, safeguards, security, fuel qualification, and deactivation. Under the contract options, no substantive design work or construction on the proposed MOX facility would begin before a SPD EIS ROD is issued, and any such work would depend on decisions in the ROD.

This SPD EIS analyzes a nominal 50 metric tons (t) (55 tons) of surplus weapons-usable plutonium, which is primarily in the form of pits (the core element of a nuclear weapon's fission component), metal, and oxides.[6] In addition to 38.2 t (42 tons) of weapons-grade plutonium already declared by the President as excess to national security needs, the material analyzed includes weapons-grade plutonium that may be declared surplus in the future, as well as weapons-usable, reactor-grade plutonium that is surplus to the programmatic and national defense needs of DOE. As depicted in Figure 1–1, there are seven locations of surplus plutonium within the DOE complex: the Hanford Site (Hanford) near Richland, Washington; Idaho National Engineering and Environmental Laboratory (INEEL) near Idaho Falls, Idaho; Lawrence Livermore National Laboratory in Livermore (LLNL), California;[7] Los Alamos National Laboratory (LANL) near Los Alamos, New Mexico; the Pantex Plant (Pantex) near Amarillo, Texas; the Rocky Flats Environmental Technology Site (RFETS) near Golden, Colorado; and the Savannah River Site (SRS) near Aiken, South Carolina.

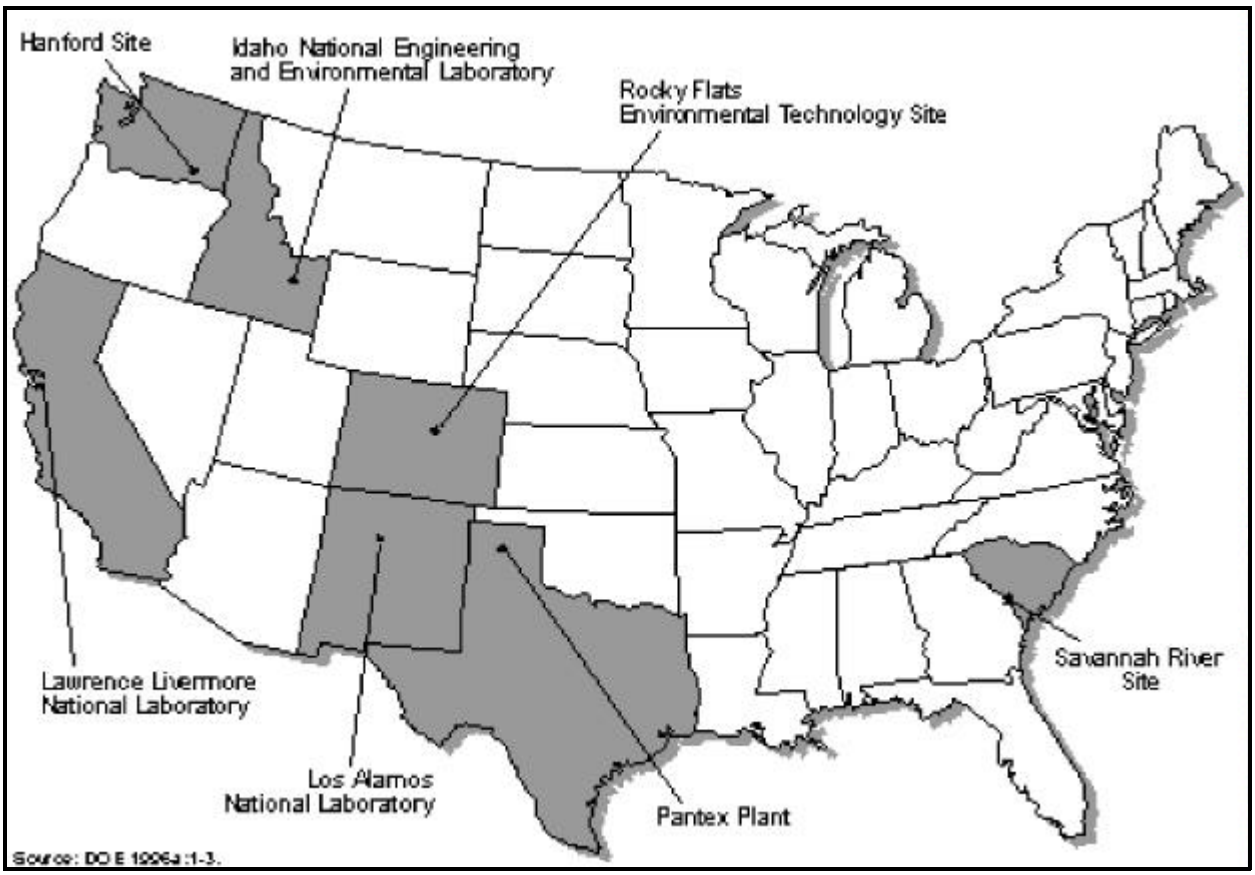

Figure 1–1. Locations of Surplus Plutonium

Under the hybrid alternatives, about 34 percent of the surplus plutonium analyzed in this SPD EIS is not suitable for fabrication into MOX fuel due to the complexity, timing, and cost that would be involved in purifying the materials. The *Storage and Disposition PEIS* ROD determined that DOE would immobilize at least 8 t (9 tons)

[6] Some materials are already in a final disposition form (i.e., irradiated fuel) and will not require further action before disposal. These materials, therefore, are not included in the 50 t (55 tons) analyzed in this SPD EIS.

[7] Some of the surplus plutonium originally stored at RFETS was shipped to LLNL, where special handling and disassembly processes occurred. The receipt and disassembly of these materials and future processing work will result in the recovery of approximately 1.7 t (1.9 tons) of surplus plutonium at LLNL.

of the current surplus plutonium. Since issuance of the ROD, further consideration has indicated that 17 t (19 tons) of the surplus plutonium is not suitable for use in MOX fuel and should be immobilized. Therefore, fabricating all 50 t (55 tons) of surplus plutonium into MOX fuel is not a reasonable alternative and is not analyzed. This SPD EIS does, however, analyze the immobilization of all the surplus plutonium. (See Section 2.3.2.1 for a discussion on the amounts of materials subject to disposition.) Given the variability in purity of the surplus plutonium to be dispositioned, some of the plutonium currently considered for MOX fabrication may also need to be immobilized. The incremental impacts that would be associated with a small shift in materials throughput are discussed in Section 4.30.

In the *Storage and Disposition PEIS* ROD, DOE retained the option to use some of the surplus plutonium as MOX fuel in Canadian Deuterium Uranium (CANDU) reactors, which would have been undertaken only in the event that a multilateral agreement were negotiated among Russia, Canada, and the United States. Since the SPD Draft EIS was issued, DOE determined that adequate reactor capacity is available in the United States to disposition that portion of the U.S. surplus plutonium suitable for MOX fuel and, therefore, while still reserving the CANDU option, DOE is no longer actively pursuing it. However, DOE, in cooperation with Canada and Russia, proposes to participate in a test and demonstration program using U.S. and Russian MOX fuel in a Canadian test reactor.[8] If Russia and Canada agree to disposition Russian surplus plutonium in CANDU reactors in order to augment Russia's disposition capability, shipments of the Russian MOX fuel would take place directly between Russia and Canada.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of and need for the proposed action is to reduce the threat of nuclear weapons proliferation worldwide by conducting disposition of surplus plutonium in the United States in an environmentally safe and timely manner. Comprehensive disposition actions are needed to ensure that surplus plutonium is converted to proliferation-resistant forms. In September 1993, President Clinton issued the *Nonproliferation and Export Control Policy* (White House 1993) in response to the growing threat of nuclear proliferation. Further, in January 1994, President Clinton and Russia's President Yeltsin issued a *Joint Statement by the President of the Russian Federation and the President of the United States of America on Non-Proliferation of Weapons of Mass Destruction and the Means of Their Delivery* (White House 1994). In accordance with these policies, the focus of the U.S. nonproliferation efforts includes ensuring the safe, secure, long-term storage and disposition of surplus weapons-usable fissile plutonium. Following publication of the SPD Draft EIS, the United States and Russia signed a 5-year agreement to provide the scientific and technical basis for decisions concerning how surplus plutonium will be managed and a statement of principles with the intention of removing approximately 50 t (55 tons) of plutonium from each country's stockpile (see Appendix A). The disposition activities proposed in this SPD EIS will enhance U.S. credibility and flexibility in negotiations on bilateral and multilateral reductions of surplus weapons-usable fissile materials inventories. [Text deleted.] The United States will retain the option to begin certain disposition activities, when appropriate, in order to encourage the Russians and set an international example.

This SPD EIS addresses both the immobilization and MOX approaches to surplus plutonium disposition, which include siting, construction, operation, and ultimate decontamination and decommissioning (D&D) of three types of facilities at one or two of four candidate DOE sites:

[8] A separate environmental review, the *Environmental Assessment for the Parallex Project Fuel Manufacture and Shipment* (DOE 1999a; Finding of No Significant Impact [FONSI], August 13, 1999), analyzes the fabrication and proposed shipment of MOX fuel rods for research and development activities involving the use of limited amounts of U.S. MOX fuel in a Canadian test reactor. The FONSI was announced in a press release on September 2, 1999, and made available to the public.

- A facility for disassembling pits (a weapons component) and converting the recovered plutonium, as well as plutonium metal from other sources, into plutonium dioxide suitable for disposition. This facility, the pit disassembly and conversion facility, is referred to in this document as the *pit conversion facility*. Candidate sites for this facility are Hanford, INEEL, Pantex, and SRS.

- A facility for immobilizing surplus plutonium for eventual disposal in a geologic repository pursuant to the Nuclear Waste Policy Act (NWPA), the plutonium conversion and immobilization facility, is referred to as the *immobilization facility*. This facility would include a collocated capability for converting nonpit plutonium materials into plutonium dioxide suitable for immobilization. The immobilization facility would be located at either Hanford or SRS. DOE identified SRS as the preferred site for an immobilization facility in the NOI to prepare the SPD EIS, which was issued in May 1997. Technologies for immobilization are also discussed in this SPD EIS.

- A facility for fabricating plutonium dioxide into MOX fuel, the MOX fuel fabrication facility, is referred to as the *MOX facility*. Candidate sites for this facility are Hanford, INEEL, Pantex, and SRS. Also included in this SPD EIS is a separate analysis of MOX lead assembly[9] activities at five candidate DOE sites: Argonne National Laboratory–West (ANL–W) at INEEL; Hanford; LLNL; LANL; and SRS. DOE would fabricate a limited number of MOX fuel assemblies, referred to as lead assemblies, for testing in a reactor before commencing fuel irradiation under the proposed MOX fuel program. Postirradiation examination activities at two sites, ANL–W and Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, are also analyzed in this SPD EIS.

This SPD EIS also analyzes a No Action Alternative, as required by the National Environmental Policy Act (NEPA). In the No Action Alternative, surplus weapons-usable plutonium in storage at various DOE sites would remain at those locations. The vast majority of pits would continue to be stored at Pantex, and the remaining plutonium in various forms would continue to be stored at Hanford, INEEL, LLNL, LANL, RFETS, and SRS.[10]

1.3 DECISIONS TO BE MADE

DOE will base the following decisions on the analytical results of this SPD EIS and other cost, schedule, and nonproliferation considerations:

- Whether to construct and operate a pit conversion facility, and if so, where.

- Whether to construct and operate an immobilization facility, and if so, where (including selection of a technology for immobilization and the amount of plutonium to be immobilized).

- Whether to construct and operate a MOX facility, and if so, where (including separate selection of a site for fabrication of lead assemblies; a site for postirradiation examination; and the amount of plutonium, if any, to be fabricated into MOX fuel).

1.4 ISSUES IDENTIFIED DURING THE SCOPING PERIOD

In mid-1997, DOE conducted a public scoping process to solicit comments on its NOI concerning the disposition of surplus plutonium. Written comments were requested from the public via U.S. mail, fax, and Web site, and

[9] A MOX lead assembly is a prototype reactor fuel assembly that contains MOX fuel.

[10] Should the No Action Alternative be chosen, the ROD pursuant to this SPD EIS would also address the movement of the remaining surplus nonpit plutonium from RFETS in support of its planned closure in 2006.

oral comments were collected via telephone and at four public scoping meetings. During June and July 1997, about 640 people attended the scoping meetings held near the candidate sites for disposition facilities. The specific locations of the meetings were Idaho Falls, Idaho (near INEEL); Amarillo, Texas (near Pantex); North Augusta, South Carolina (near SRS); and Richland, Washington (near Hanford). These meetings were designed to provide a forum in which participants could discuss issues directly with DOE program officials, and DOE could solicit relevant input from affected or interested local and regional stakeholders. The meetings were conducted in a workshop format, providing stakeholders with numerous opportunities to learn about the issues and express their comments and concerns. Each workshop consisted of a short plenary session, followed by discussion groups and summarizing remarks. The comments provided at the scoping meetings were documented and used in the development of this SPD EIS.

A database was created to track written and oral comments received during the scoping process. More than 1,400 individual documents, culminating in 2,000 comments, were received and recorded in the database. An analysis was conducted of the comments received during the scoping process. They were initially grouped in the following seven areas: *proposed action, alternatives, facilities/technologies, impact, costs, public involvement*, and *other*. Comments were further categorized into four major groups according to their relationship to the scope of this SPD EIS: *already intended for inclusion in this SPD EIS, needs to be addressed in this SPD EIS, needs to be or is already addressed elsewhere*, and *other*. The following summary describes some of the major issues identified during the scoping process.

Issues Already Intended for Inclusion in This SPD EIS. Many comments received during the scoping process concern issues that were already intended to be included in this SPD EIS. For example, many commentors expressed concern over the potential environmental impacts of the various technologies at the candidate sites and requested that an in-depth analysis be conducted to determine the potential impacts. A concern was also expressed that making can-in-canister the preferred immobilization technology without an evaluation of alternative technologies circumvents the NEPA process. Other commentors recommended that this SPD EIS include a detailed accounting of the wastes that will be generated and the location of their ultimate disposal. A number of commentors were concerned that existing legal agreements with State governments and other agencies (e.g., triparty agreements) would be overlooked and possibly ignored. Other commentors addressed the quantity of plutonium to be immobilized or fabricated into MOX fuel. DOE is addressing all of these issues in this SPD EIS.

Additional Issues That Need to Be Addressed in This SPD EIS. A few commentors suggested that additional issues be considered in this SPD EIS. [Text deleted.] Some commentors suggested that Pantex be considered as a candidate site for the pit conversion facility under all situations, including the 50-t (55-ton) immobilization option, because most of the surplus pits are currently located there. In response to these comments, DOE added two alternatives to the SPD Draft EIS for the option of immobilizing all 50 t (55 tons) of surplus plutonium. Initially, the alternatives included siting both the pit conversion and immobilization facilities at one site (i.e., Hanford or SRS). The two new alternatives include Pantex as a candidate site for the pit conversion facility.

Issues That Need to Be or Are Already Addressed Elsewhere. Many comments received during the scoping process concern issues that are beyond the scope of this SPD EIS but are being or will be addressed elsewhere. These issues include the relationship of plutonium disposition and tritium production, and use of the Fast Flux Test Facility (FFTF) at Hanford solely for surplus plutonium disposition. The SPD EIS does not address using FFTF because the current DOE proposals do not include the use of surplus plutonium as a fuel source for FFTF.[11]

[11] DOE announced in a Notice of Intent (NOI) published September 15, 1999 (64 FR 50064), that it will prepare a programmatic EIS to evaluate the environmental effects associated with, among other options, the restart and operation of FFTF to meet the need for a range of research and development activities, medical isotope production, and plutonium 238 production to fuel National Aeronautics and Space Administration spacecraft.

A question was raised as to the role of the U.S. Nuclear Regulatory Commission (NRC) licensing requirements in regard to plutonium disposition facilities. Suggestions were made to include NRC processes in the SPD EIS. The NRC is a "commenting" agency on the SPD EIS. DOE provided copies of the SPD Draft EIS, *Supplement*, and SPD Final EIS to NRC for review and comment, and DOE is conducting regular meetings with NRC on the MOX approach, including fuel design and qualification.[12] In addition, an NRC license would be sought for the MOX facility. Domestic, commercial reactors operate under NRC licenses, and their proposed use of MOX fuel would be subject to review by NRC.

Some questions and concerns were also raised about the MOX fuel fabrication and reactor irradiation services procurement. (See Section 2.1.3 for a discussion of the procurement process and associated NEPA activities.) Many commentors suggested that DOE, in either this SPD EIS or other program studies, analyze the total cost of each alternative, including facility construction and modification, operations, and D&D, as well as all related site infrastructure costs. At the same time the SPD Draft EIS was issued, DOE released a cost study (DOE 1998a) focusing on site-specific costs to support site selection. As a followup to this study, DOE prepared a second report (DOE 1999b) that compiles life-cycle costs for the Preferred Alternative and addresses cost-related public comments.[13] These cost studies will be considered, along with the SPD EIS analyses, in the DOE decisionmaking process. Some commentors suggested that the potential impacts of the disposal of spent nuclear fuel generated by MOX fuel use be included in this SPD EIS. This issue has already been addressed in the *Storage and Disposition PEIS*, and disposal of spent nuclear fuel is addressed in the *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE 1999c).[14]

Other. Many of the comments received were expressions of opinion or comments not directly related to issues addressed in this SPD EIS. For example, opposition was expressed by both U.S. and Canadian citizens to using CANDU reactors. Similarly, a number of commentors expressed their support for or opposition to immobilization and MOX technologies. Others expressed support for specific facilities or questioned the viability of site-specific facilities for pit conversion, immobilization, or MOX fuel fabrication. A number of commentors expressed their concern over the market viability of MOX fuel, even though MOX fuel would not be sold on the open market. Some commentors expressed their support for a hybrid disposition approach using both immobilization and MOX fuel fabrication.

1.5 SCOPE OF THIS SPD EIS

Site-specific issues associated with siting, construction, and operation of the three surplus plutonium disposition facilities are analyzed in this SPD EIS. The three facilities would be designed so that they could collectively accomplish disposition of up to 50 t (55 tons) of surplus plutonium over their operating lives, as shown in Figure 1–2. When the missions of the plutonium disposition facilities are completed, deactivation

[12] DOE did not receive any comments from NRC on the SPD Draft EIS or *Supplement*.

[13] These two cost reports are available on the Office of Fissile Materials Disposition Web site at http://www.doe-md.com, in the public reading rooms at the candidate sites, and upon request.

[14] For purposes of this SPD EIS, a potential geologic repository candidate site at Yucca Mountain, Nevada, was assumed to be the final disposal site for all immobilized plutonium and spent fuel. Currently, Yucca Mountain is the only site being characterized as a potential geologic repository. In August 1999, DOE issued a separate EIS, the *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D) (DOE 1999c), to analyze the site-specific environmental impacts from construction, operation and monitoring, and eventual closure of a potential geologic repository at Yucca Mountain.

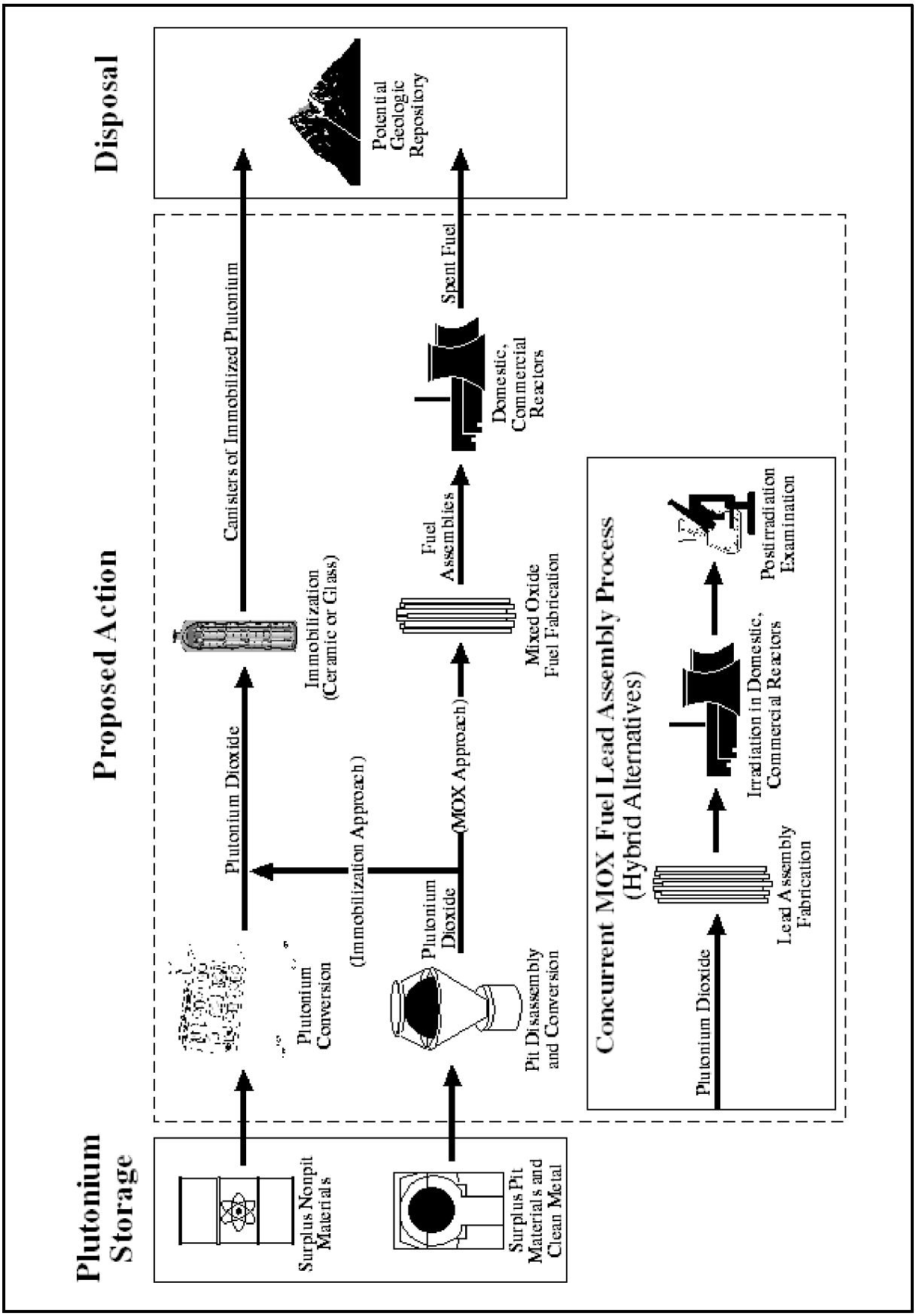

Figure 1–2. Proposed Surplus Plutonium Disposition Processes

and stabilization would be performed to reduce the risk of radiological exposure; reduce the need for and costs associated with long-term maintenance; and prepare the building for potential future use. (See Section 4.31.1 for a discussion on deactivation and stabilization.) At the end of the useful life of the facilities, DOE would evaluate options for D&D or reuse of the facilities. When DOE is ready for D&D of these facilities, an appropriate NEPA review will be conducted. (See Section 4.31.2 for a discussion of D&D.) This SPD EIS also analyzes transportation, including the following (see Section 2.4.4 for a more detailed discussion): plutonium from storage locations to the pit conversion facility or the immobilization facility, depending on the material and the alternative; plutonium dioxide from the pit conversion facility to the immobilization or MOX facility; recovered HEU from the pit conversion facility to Oak Ridge Reservation (ORR); depleted uranium hexafluoride from a representative DOE site to a representative commercial conversion facility (see Sections 2.4.4.2 and 2.4.4.3 for a more detailed discussion); uranium feed supply (uranium dioxide) from a representative commercial conversion facility to the immobilization and/or MOX fuel fabrication facilities and lead assembly facility; uranium fuel rods from a commercial fuel fabrication facility to the MOX facility and lead assembly facility; plutonium dioxide from LANL to the lead assembly facility; irradiated lead assemblies or rods from a reactor to the postirradiation examination site; spent fuel from the postirradiation examination site to INEEL for storage; MOX fuel to a commercial reactor; and immobilized plutonium to a potential geologic repository.[15] In addition to the various disposition alternatives, a No Action Alternative is also analyzed. In this alternative, disposition would not occur, and surplus plutonium would remain in long-term storage in accordance with the storage approach identified in the *Storage and Disposition PEIS* ROD.[16] For all alternatives analyzed in this SPD EIS, it is assumed that storage actions described in the *Storage and Disposition PEIS* ROD, as amended, have been accomplished.[17] Because this SPD EIS tiers from the analyses and decisions reached in association with the *Storage and Disposition PEIS*, information relevant to disposition options or candidate sites is incorporated by reference and summarized; it is not repeated here. [Text deleted.]

As part of the assessment of the MOX alternatives, this SPD EIS analyzes the fabrication of up to 10 lead assemblies that may be needed to support the MOX fuel program, although DOE plans to produce only 2. (See Sections 2.18.2 and 4.27 for a discussion of how impacts would be lower if only two lead assemblies were fabricated.) Existing DOE facilities at five candidate sites are analyzed, as is the transportation of feed materials to the lead assembly fabrication sites and the fabricated lead assemblies to a domestic, commercial reactor for test irradiation. Postirradiation examination may be required to support NRC licensing activities related to the use of MOX fuel in domestic, commercial reactors. This SPD EIS discusses postirradiation examination at two candidate sites, ANL–W and ORNL. These two sites are currently the only sites that possess the capability to conduct postirradiation activities without major modifications to facility and processing capabilities; only minor modifications for receipt of materials would be required. Other potential facilities, either within the DOE complex or in the commercial sector, would require significant modifications to meet expected requirements of the postirradiation examination.

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[15] Shipments of spent fuel are analyzed in the *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D) (DOE 1999c).

[16] Should the No Action Alternative be chosen, the ROD pursuant to this SPD EIS would also address the movement of the remaining surplus nonpit plutonium from RFETS in support of its planned closure in 2006.

[17] Recent studies indicated that cost savings could be realized from the transfer of nonpit materials from RFETS and Hanford to SRS earlier than specified in the *Storage and Disposition PEIS* ROD. A Supplement Analysis was prepared, and based on this analysis, DOE determined that a supplemental PEIS would not be needed; an amended ROD was issued in August 1998 (63 FR 43386) and included decisions to accelerate shipment of all nonpit surplus plutonium from RFETS to SRS and to relocate all Hanford surplus plutonium to SRS, if SRS is selected as the immobilization disposition site.

The ceramic immobilization, MOX fuel fabrication, and lead assembly processes require the use of uranium dioxide as a feed material, which can be obtained from either natural or depleted uranium. Because DOE has a large inventory of depleted uranium hexafluoride (the equivalent of 385,000 t [424,385 tons] of depleted uranium dioxide), this SPD EIS analyzes the use of a small amount of that inventory (about 137 t [151 tons] per year) to produce uranium dioxide (White 1997:1).[18, 19] Depleted uranium hexafluoride is currently stored at three DOE sites: the East Tennessee Technology Park in Oak Ridge, Tennessee; the Paducah Gaseous Diffusion Plant near Paducah, Kentucky; and the Portsmouth Gaseous Diffusion Plant (Portsmouth) near Piketon, Ohio. For purposes of analysis in this SPD EIS, Portsmouth is used as a representative site for a source of depleted uranium hexafluoride.[20] Included for evaluation in this SPD EIS are the activities necessary to package the depleted uranium hexafluoride for shipment to a representative commercial conversion facility (for purposes of analysis, this SPD EIS uses the General Electric Company's Nuclear Energy Production Facility in Wilmington, North Carolina) for conversion to uranium dioxide,[21] to transport the depleted uranium hexafluoride from Portsmouth to Wilmington, and to transport the uranium dioxide from Wilmington to the candidate immobilization, MOX fuel fabrication, and lead assembly sites (i.e., ANL–W, Hanford, INEEL, LLNL, LANL, Pantex, and SRS).

DOE's NOI announcing the preparation of this SPD EIS includes a table outlining 12 originally proposed disposition alternatives. Each alternative identifies the facilities, new or existing, at each candidate site that would be analyzed in this SPD EIS. [Text deleted.] Since the publication of the NOI, DOE further increased the number of alternatives for SPD EIS analysis to include a new MOX facility at Hanford, in addition to the alternative involving modifying the Fuels and Materials Examination Facility. For the option of immobilizing all 50 t (55 tons) of surplus plutonium, DOE also included Pantex as a candidate site for pit disassembly and conversion activities, making a total of four 50-t (55-ton) all-immobilization alternatives in the SPD Draft EIS. Previously, only Hanford and SRS had been considered as sites for pit disassembly and conversion activities for the 50-t (55-ton) all-immobilization case. Eight alternatives using a portion of Building 221–F at SRS for the immobilization facility that were analyzed in the SPD Draft EIS have been eliminated from this SPD Final EIS because the amount of space required for the immobilization facility would be significantly larger than originally planned. These eight alternatives are no longer considered reasonable because the new construction required for the proposed immobilization facility is now expected to be nearly the same whether the facility is entirely located in a new building or is built in addition to using a portion of Building 221–F at SRS. There are now 15 action alternatives presented as 11 sets of alternatives, plus the No Action Alternative. For a more detailed discussion of alternative development, see Section 2.3.

As indicated in the ROD for the *Storage and Disposition PEIS*, this SPD EIS analysis provides, in part, the basis for determining a specific immobilization technology. This SPD EIS analyzes in detail the proposed can-in-canister approach and compares the results with the impacts predicted in the *Storage and Disposition PEIS* for the homogenous immobilization approach in new ceramic immobilization and vitrification facilities.

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[18] The contractor chosen by DOE to conduct MOX fuel fabrication has the option of acquiring uranium dioxide from another source.

[19] Potential use of depleted uranium hexafluoride or facilities at the gaseous diffusion plants will be consistent with the *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (DOE/EIS-0269, April 1999; ROD, August 1999) and the *Final Plan for the Conversion of Depleted Uranium Hexafluoride, As Required by Public Law 105–204* (DOE, July 1999).

[20] The Portsmouth Gaseous Diffusion Plant is used as a representative site because it is the only one of the three DOE sites that is currently capable of transferring the depleted uranium hexafluoride from the 12.7-t (14-ton) tails cylinders in which it is currently stored to the 2.28-t (2.5-ton) feed cylinders that are compatible with the processing equipment at a commercial facility (White 1997:5). However, DOE has no preference as to where the depleted uranium is acquired.

[21] Possible existing sites for this conversion facility include nuclear fuel fabrication facilities in Missouri, North Carolina, South Carolina, Washington, or a uranium conversion facility in Illinois. For purposes of analysis in this SPD EIS, the commercial nuclear fuel fabrication facility in Wilmington, North Carolina, is used as a representative site. DOE has no preference as to where conversion would occur.

In addition, for the can-in-canister approach, this SPD EIS separately analyzes the effects of immobilizing plutonium into either a titanate-based ceramic material or a lanthanide borosilicate glass.

To further define the potential processes to be used for the disposition of surplus plutonium, several research and development (R&D) activities are ongoing. A discussion of these R&D activities is provided in the *Pit Disassembly and Conversion Demonstration Environmental Assessment and Research and Development Activities* (DOE 1998b; Finding of No Significant Impact [FONSI], August 1998). Several of these R&D activities are likely to continue after the ROD for this SPD EIS is issued.

1.6 PREFERRED ALTERNATIVES

DOE's Preferred Alternative for the disposition of surplus weapons-usable plutonium is Alternative 3: to disposition up to 50 t (55 tons)[22] of plutonium at SRS using a hybrid approach that involves both the ceramic can-in-canister immobilization approach and the MOX approach. Approximately 17 t (19 tons) would be immobilized in a ceramic form, placed in cans, and embedded in large canisters containing high-level vitrified waste for ultimate disposal in a potential geologic repository pursuant to the NWPA. Approximately 33 t (36 tons) would be used to fabricate MOX fuel, which would be irradiated in existing domestic, commercial reactors. The proposed reactors are the Catawba Nuclear Station near York, South Carolina; the McGuire Nuclear Station near Huntersville, North Carolina; and the North Anna Power Station near Mineral, Virginia.[23] The resulting spent fuel would be placed in a potential geologic repository pursuant to the NWPA.

Pursuing the hybrid approach provides the best opportunity for U.S. leadership in working with Russia to implement similar options for reducing Russia's excess plutonium in parallel. Further, it sends the strongest possible signal to the world of U.S. determination to reduce stockpiles of surplus weapons-usable plutonium as quickly as possible and in a manner that would make it technically difficult to use the plutonium in weapons again. Pursuing both immobilization and MOX fuel fabrication also provides important insurance against uncertainties of implementing either approach by itself. The construction of new facilities for the disposition of surplus U.S. plutonium would not take place unless there is significant progress on plans for plutonium disposition in Russia.

DOE's preference for siting plutonium disposition facilities is as follows:

- **Pit Disassembly and Conversion at SRS.** Construct and operate a new pit conversion facility at SRS for the purpose of disassembling nuclear weapons pits and converting the plutonium metal to a declassified oxide form suitable for international inspection and disposition using either immobilization or MOX/reactor approaches. SRS is preferred for the pit conversion facility because the site has extensive experience with plutonium processing, and the pit conversion facility complements existing missions and takes advantage of existing infrastructure.

  [Text deleted.]

[22] Some materials are already in a final disposition form (i.e., irradiated fuel) and will not require further action before disposal. These materials are not included in this SPD EIS.

[23] No facility construction or MOX fuel fabrication or irradiation is to occur until the SPD EIS ROD is issued. Additionally, no MOX fuel is to be irradiated until NRC amends the operating license of each selected reactor prior to the specific reactor receiving the MOX fuel. Such site-specific activities would depend on decisions in the ROD, and DOE's exercise of contract options to allow such activities would be contingent on the ROD.

- **Immobilization at SRS (new construction and Defense Waste Processing Facility).**[24] Construct and operate a new immobilization facility at SRS using the ceramic can-in-canister technology. This technology would immobilize plutonium in a ceramic form, seal it in cans, and place the cans in canisters filled with borosilicate glass containing radioactive high-level waste (HLW) at the existing Defense Waste Processing Facility (DWPF). This preferred can-in-canister approach at SRS complements existing missions, takes advantage of existing infrastructure and staff expertise, and enables DOE to use an existing facility (DWPF). SRS was previously designated to be part of DOE's Preferred Alternative for immobilization in the NOI issued in May 1997. The ceramic can-in-canister approach would involve slightly lower environmental impacts than the homogenous approach (wherein the plutonium is incorporated into a homogenous mixture of plutonium and fission products in a single waste form). The ceramic can-in-canister approach would involve better performance in a potential geologic repository due to the ceramic form's expected higher durability under repository conditions and its lower potential for long-term criticality. In addition, it would provide greater proliferation resistance than the glass can-in-canister approach because recovery of plutonium from the ceramic form would require a more chemically complex process than has yet been developed.

- **MOX Fuel Fabrication at SRS (new construction).** Construct and operate a new MOX facility at SRS and produce MOX fuel containing surplus weapons-usable plutonium for irradiation in existing, domestic, commercial reactors. SRS is preferred for the MOX facility because this activity complements existing missions and takes advantage of existing support infrastructure and staff expertise. [Text deleted.]

- **Lead Assembly Fabrication at LANL.** Based on the consideration of capabilities of the candidate sites and input from the contractor team chosen for the MOX approach (the MOX procurement process is discussed in Chapter 2), DOE prefers LANL for lead assembly fabrication. LANL is preferred because it already has fuel fabrication facilities that would not require major modifications, and takes advantage of existing infrastructure and staff expertise. Additionally, the surplus plutonium dioxide that would be used to fabricate the lead assemblies would already be in inventory at the site.

- **Postirradiation Examination at ORNL.** If postirradiation examination is necessary for the purpose of qualifying the MOX fuel for commercial reactor use, DOE prefers to perform that task at ORNL. ORNL has the existing facilities and staff expertise needed to perform postirradiation examination as a matter of its routine activities; no major modifications to facilities or processing capabilities would be required. In addition, because ORNL is about 500 km (300 mi) from the McGuire Nuclear Station, the reactor that would irradiate the fuel, it is the closest candidate site for postirradiation examination activities.

[Text deleted.]

[24] DOE is presently considering replacement alternatives for the In-Tank Precipitation (ITP) process at SRS. The ITP process was intended to separate soluble high-activity radionuclides from liquid HLW before vitrifying the high-level fraction in DWPF. Due to problems experienced with the operation of ITP as configured, DWPF is currently operating with sludge feed only. A supplemental EIS on DWPF operation is being prepared that analyzes three proposed alternatives: small tank precipitation, ion exchange, and direct grout. See Section 2.4.2.1 for a more detailed discussion of these alternatives.

1.7 SUMMARY OF MAJOR ISSUES IDENTIFIED DURING THE COMMENT PERIODS AND CHANGES TO THE SPD DRAFT EIS

1.7.1 Public Involvement Process for the SPD Draft EIS and the *Supplement to the SPD Draft EIS*

DOE issued the SPD Draft EIS in July 1998 and received public comments. The comment period ran from July 17, 1998, through September 16, 1998, although DOE considered all comments submitted after the close of the 60-day comment period. In August 1998, DOE held five public hearings at the following locations in the vicinity of the four candidate DOE sites and at one regional location:

Richland, Washington	August 4, 1998
Amarillo, Texas	August 11, 1998
North Augusta, South Carolina	August 13, 1998
Portland, Oregon	August 18, 1998
Idaho Falls, Idaho	August 20, 1998

DOE received comments on the SPD Draft EIS by mail, a toll-free telephone and fax line, the Office of Fissile Materials Disposition Web site, and at the public hearings. Altogether, DOE received approximately 3,400 comment documents from individuals and organizations. All comments are presented in Volume III, Parts A and B, of the Comment Response Document of this SPD Final EIS. Approximately 65 percent of the comments received consisted of mail-in postcard campaigns that expressed either support of or opposition to the use of various sites or technologies. About 12 percent were collected during public hearings, 10 percent were in letters received by mail, 10 percent were received by fax, 2 percent were received by telephone, and 1 percent were received through the Web site.

In April 1999, DOE issued the *Supplement* and received public comments. The comment period ran from May 14, 1999, through June 28, 1999, although DOE considered all comments received after the close of the 45-day comment period. On June 15, 1999, DOE held a public hearing in Washington, D.C. DOE received approximately 77 comment documents from individuals and organizations, which are presented in Volume III, Part B, of the Comment Response Document of this SPD Final EIS. Approximately 21 percent of the comments received were collected during the public hearing, 34 percent were in letters received by mail, 26 percent were received by fax, 5 percent were received by telephone, and 14 percent were received through the Web site.

1.7.2 Summary of Major Issues Raised on the SPD Draft EIS During the Public Comment Period

The following paragraphs highlight comments and issues that the public raised concerning information provided in the SPD Draft EIS. These comments were collected during the two separate public comment periods for the SPD Draft EIS and the *Supplement*. (Comments received on information specifically provided in the *Supplement* are summarized in Section 1.7.3.) Changes made to this SPD EIS in response to a comment are described.

Russian Disposition Program. A number of commentors expressed concern over Russian disposition activities and tying U.S. activities to Russian activities. The United States and Russia recently made progress in the management and disposition of plutonium. In July 1998, Vice President Gore and Russian Prime Minister Sergei Kiriyenko signed a 5-year agreement to provide the scientific and technical basis for decisions concerning how surplus plutonium will be managed. In September 1998, Presidents Clinton and Yeltsin held a Moscow summit and signed a statement of principles with the intention of removing approximately 50 t (55 tons) of plutonium from each country's stockpile. The United States does not currently plan to implement a unilateral program; however, it will retain the option to begin certain disposition activities in order to encourage the Russians and set an international example. DOE has updated this SPD EIS to reflect the agreement and statement of principles and included copies in Appendix A.

Site Selection. A large number of comments were received advocating one candidate site over another for various reasons, including the presence of existing facilities that could prove beneficial to plutonium disposition, skilled workers, safety records, reduced transportation, and perceived economic benefits. DOE has chosen SRS as its preferred site for the three surplus plutonium disposition facilities, as outlined in Section 1.6.

Approach to Plutonium Disposition. A number of commentors protested DOE's preference for the hybrid approach and the use of MOX fuel for surplus plutonium disposition. Among the comments received on this issue were many advocating the use of the immobilization approach for all of the surplus plutonium. Commentors argued that the immobilization approach was safer, cheaper, and faster. They also pointed out that the immobilization approach resulted in less transportation. Because specific reactors in North Carolina, South Carolina, and Virginia have been proposed for plutonium disposition, the transportation requirements associated with several hybrid alternatives that include the MOX facility at SRS and Pantex have decreased (because the proposed reactors are closer to these sites than the 4,000-km [2,500-mi] bounding distance analyzed in the SPD Draft EIS). As a result, these hybrid alternatives would require less transportation than some of the 50-t (55-ton) immobilization alternatives. Other commentors viewed the MOX approach as a Federal Government subsidy of the commercial nuclear power industry. Use of MOX fuel in domestic, commercial reactors is not proposed in order to subsidize the commercial nuclear power industry. Rather, the purpose is to safely and securely disposition surplus plutonium by meeting the Spent Fuel Standard.[25]

Safety and Health. Comments were received that questioned the safety and health aspects of operating the surplus plutonium disposition facilities. Commentors pointed out that DOE's safety record at other nuclear facilities had been poor in the past and questioned DOE's ability to safely operate the disposition facilities. The health and safety of workers and the public is a priority of the surplus plutonium disposition program, regardless of which approach is chosen. Operation of the disposition facilities would comply with applicable Federal, State, and local laws and regulations governing radiological and hazardous chemical releases. Within these limits, DOE believes that the radiation exposure and the level of contamination should be kept as low as is reasonably achievable.

Aqueous Processing of Plutonium. Some commentors questioned DOE's ability to produce clean plutonium dioxide that could be used in MOX fuel using the dry process proposed in the SPD Draft EIS. Questions were raised about the ability of this process to remove gallium and other pit materials from the plutonium before it is fabricated into MOX fuel. On the basis of public comments received on the SPD Draft EIS and the analysis performed as part of the MOX procurement, DOE has included plutonium polishing (a small-scale aqueous process) as a component of the MOX facility to ensure adequate impurity removal from the plutonium dioxide. Appendix N (which addressed plutonium polishing in the SPD Draft EIS) was deleted from this SPD Final EIS, and the impacts discussed therein were included in the impacts presented for the MOX facility in Chapter 4. Section 2.4.3 was also revised to include a discussion of plutonium polishing.

No attempt was made to evaluate the use of DOE's existing aqueous processing lines capable of dissolving pits, as advocated by some commentors. DOE determined that such aqueous processing, while a proven technology, is not a reasonable alternative for pit conversion because current aqueous processes using existing facilities would produce significant amounts of waste, and aqueous processing would complicate international inspection regimes because of classification issues.

[25] "Spent Fuel Standard" is a term coined by the National Academy of Sciences (NAS, 1994, *Management and Disposition of Excess Weapons Plutonium*, National Academy Press, Washington, D.C., pg.12.) and modified by DOE (glossary from Office of Fissile Materials Disposition Web site at http://www.doe-md.com) denoting the main objective of alternatives for the disposition of surplus plutonium: that such plutonium be made roughly as inaccessible and unattractive for weapons use as the much larger and growing stock of plutonium in civilian spent nuclear fuel.

Reprocessing. Several comments were received related to the reprocessing of plutonium and the civilian use of plutonium. The use of U.S. surplus plutonium in existing domestic, commercial reactors does not involve reprocessing. The proposed use of MOX fuel is consistent with the U.S. nonproliferation policy and would ensure that plutonium that was produced for nuclear weapons and subsequently declared excess to national security needs is never again used for nuclear weapons. The MOX facility would be built and operated subject to the following strict conditions: construction would take place at a secure DOE site, it would be owned by the U.S. Government, operations would be limited exclusively to the disposition of surplus plutonium, and the MOX facility would be shut down at the completion of the surplus plutonium disposition program. At the end of the useful life of the facility, DOE would evaluate options for D&D or reuse of the facility for other purposes.

Inclusion of Generic Reactor Information in the SPD Draft EIS. Many comments were received on the inclusion of generic reactor information in the SPD Draft EIS. At the time the Draft was released, DOE did not know which specific reactors would be proposed for the MOX program. Subsequently, the Catawba, McGuire, and North Anna reactors were chosen as part of the contractor team that would implement the MOX option should the decision be made in the SPD EIS ROD to go forward with the hybrid approach (i.e., both immobilization and MOX). Specific reactor information provided as part of the procurement process was evaluated by DOE in an Environmental Critique in accordance with DOE's NEPA regulations at 10 CFR 1021.216. The Environmental Critique was considered by DOE before awarding the contract. An Environmental Synopsis based on the Environmental Critique was prepared and released to the public for comment in the *Supplement*. The comments received on the *Supplement* are summarized and responded to in Volume III, Part B, of the Comment Response Document. An opportunity for public comment will also likely be provided by NRC during the reactor operating license amendment process.

Transportation Concerns. Commentors raised concerns about the transportation involved with moving the surplus plutonium from storage locations to disposition sites and, in some cases, MOX fuel to reactor sites. Requests were made to limit the transportation where possible, to present the transportation information in a more understandable manner, and to ensure that the transportation was conducted as safely as possible. Additional information has been added to Chapter 2 of this SPD Final EIS, which shows the total transportation associated with each alternative and gives a graphic depiction of the transportation needed for each disposition approach (immobilization and MOX). As discussed in this SPD EIS, safe transportation is a major concern of DOE. All shipments of surplus plutonium would be accomplished using the safe, secure trailer/SafeGuards Transport (SST/SGT) system.[26] Since the establishment of the DOE Transportation Safeguards Division in 1975, the SST/SGT system has transported DOE-owned cargo over more than 151 million km (94 million mi) with no accidents that resulted in a fatality or release of radioactive material.

Cost of Plutonium Disposition. Many commentors focused on the cost of various surplus plutonium disposition facilities. Because cost issues are beyond the scope of this SPD EIS, commentors are referred to DOE's *Cost Analysis in Support of Site Selection for Surplus Weapons-Usable Plutonium Disposition* (DOE 1998a) and *Plutonium Disposition Life-Cycle Costs and Cost-Related Comment Resolution Document* (DOE 1999b). Comments concerning the basis for DOE's cost estimates or requesting cost information were forwarded to DOE's cost analysis team.

[26] The SST/SGT is a specially designed component of an 18-wheel tractor-trailer vehicle. Although the details of the vehicle enhancements are classified, key characteristics are not, and include: enhanced structural supports and a highly reliable tie-down system to protect cargo from impact; heightened thermal resistance to protect the cargo in case of fire; deterrents to protect the unauthorized removal of cargo; couriers who are armed Federal officers and receive rigorous training and are closely monitored through DOE's Personnel Assurance Program; an armored tractor to protect the crew from attack; advanced communications equipment; specially designed escort vehicles containing advance communications and additional couriers; 24-hr-a-day real-time monitoring of the location and status of the vehicle; and significantly more stringent maintenance standards.

1.7.3 Summary of Major Issues Raised on the *Supplement to the SPD Draft EIS* During the Public Comment Period

Frequency of Reactor Accidents in Reactors Using MOX Fuel. A number of comments argued that the frequency of reactor accidents would be greater due to the use of MOX fuel. As reflected in the accident analysis included in Section 4.28, the consequences of a beyond-design-basis accident using MOX fuel are generally higher than those expected in the same reactor using low-enriched uranium (LEU) fuel. However, there is no basis for concluding that the frequency of these accidents would increase due to the use of MOX fuel. During the base contract period, the contractor team would work with the utilities to confirm the characteristics of the MOX fuel and whether any design modifications are necessary to maintain safety margins. No change in the frequencies of reactor accidents due to the use of MOX fuel has been made in this SPD Final EIS.

Risk Associated With Reactors Using MOX Fuel. Many commentors were concerned that there is an increase in accident risk from reactors using MOX fuel and that the plutonium in MOX fuel makes a reactor accident more dangerous to human health. There are differences in the expected risk of reactor accidents from the use of MOX fuel. Some accidents would be expected to result in lower consequences to the surrounding population, and thus, lower risks, while others would be expected to result in higher consequences and higher risks. The largest estimated increase in risk to the surrounding population due to the use of MOX fuel is an estimated 14 percent increase in the risk of latent cancer fatalities associated with an interfacing systems loss-of-coolant at North Anna. The likelihood of this accident occurring at North Anna is estimated to be one chance in 4.2 million per year. Before any MOX fuel is used for plutonium disposition, NRC would perform a comprehensive safety review that would include information prepared by the reactor plant operators as part of their license amendment applications. Expected risk is discussed in Section 4.28 of this SPD EIS.

Environmental Impacts Associated With Using MOX Fuel Versus LEU Fuel. Comments were received expressing a concern that the SPD Draft EIS failed to recognize avoided environmental impacts associated with using MOX fuel versus LEU fuel in existing commercial reactors. While the consequences of a beyond-design basis accident might be higher (as discussed above), and a slight increase in spent fuel could be expected by using MOX fuel instead of LEU fuel, the impacts associated with mining, milling, and enriching uranium are avoided. Section 4.28.3 has been added to this SPD Final EIS to address this issue.

Low-Level Waste. Comments were received on the isotopic breakdown of the low-level waste (LLW) that would be generated at the reactors using MOX fuel and the effect of this waste on existing burial grounds. There are differences in fission product inventories and activation products between an LEU and MOX core during a fuel cycle. However, the only time significant quantities of fission products could be released to the environment or end up in LLW would be in the event of a large-scale fuel leak. In regard to normal operations, experience with fabricating MOX fuel indicates a leakage rate of less than one-tenth of one percent. The use of MOX fuel would not be expected to result in any additional LLW because the reactors would continue to operate on the same schedule as if they were using only LEU fuel.

Public Hearings. A number of comments were received regarding the need to hold public hearings near the proposed reactor locations. DOE's NEPA regulations require that at least one public hearing be held to receive comments on a draft EIS (10 CFR Part 1021.313[b]). A public hearing was held in Washington, D.C., to collect public comments on the *Supplement*. No additional hearings were held near the specific reactor sites, but comments were solicited in the areas surrounding the proposed reactors. The *Supplement* was sent to interested groups and individuals near each of the reactors and an informational meeting about the proposed use of MOX fuel, sponsored by a South Carolina State Senator, was attended by DOE during the comment period. The transcript of this meeting is presented as Appendix A of the Comment Response Document.

1.7.4 Changes to the SPD Draft EIS and the *Supplement*

DOE revised the SPD Draft EIS and its *Supplement* in response to comments received from other Federal agencies; tribal, State, and local governments; nongovernmental organizations; the general public; and DOE reviews. The text was changed to provide additional environmental baseline information, reflect new technical data, make editorial corrections, respond to comments, and clarify text. Some of these changes involved recalculations of the impacts discussed in Chapter 4. In addition, DOE updated information due to events or decisions made since the SPD Draft EIS and *Supplement* were provided for public comment. Sidebars are used throughout this SPD Final EIS to indicate where changes have been made. Below is a brief discussion of significant (i.e., noneditorial) changes.

Revised Preferred Alternative. In the SPD Draft EIS, DOE's Preferred Alternative for siting the proposed disposition facilities was identified as either Alternative 3 (the pit conversion, immobilization, and MOX facilities at SRS) or Alternative 5 (the pit conversion facility at Pantex and the immobilization and MOX facilities at SRS). Under either alternative, the hybrid approach (i.e., immobilization and MOX) was preferred with the immobilization technology being the can-in-canister approach. No preference was identified in the SPD Draft EIS for the lead assembly or postirradiation examination activities, nor were the specific reactors that would use MOX fuel identified.

The *Supplement* identified SRS as the preferred site for the construction and operation of the pit conversion, immobilization, and MOX facilities. The *Supplement* also identified LANL as the preferred site for lead assembly activities and ORNL as the preferred site for postirradiation examination activities. Section 1.6 of this SPD Final EIS now identifies Alternative 3 as DOE's Preferred Alternative. In addition, Section 2.1.3 now identifies the three reactor sites that have been named as candidates for using MOX fuel subject to NRC license amendment. They are the Catawba Nuclear Station in York County, South Carolina; the McGuire Nuclear Station in Mecklenburg County, North Carolina; and the North Anna Power Station in Louisa County, Virginia.

Changes to the Immobilization Facility. Since the issuance of the SPD Draft EIS and as described in the *Supplement*, DOE has developed a more detailed conceptual design for the can-in-canister immobilization facility. Changes in the size of the immobilization facility have been reflected in Chapter 2 of this SPD Final EIS and the associated impact analyses throughout Chapter 4. No changes have been made to the basic processes proposed in the SPD Draft EIS for immobilization, to the amount of material being considered for immobilization, or to the rate of throughput.

As stated in the *Supplement*, the eight alternatives that included using portions of Building 221–F for immobilization (SPD Draft EIS Alternatives 3B, 5B, 6C, 6D, 7B, 9B, 12B, and 12D) were eliminated. These alternatives are no longer reasonable because the amount of new construction required for the proposed immobilization facility is now nearly the same whether the facility is located entirely in a new building or uses a portion of Building 221–F. Thus, there is no longer any advantage associated with the use of Building 221–F at SRS.

Changes Resulting From the MOX Procurement Process. As stated in the *Supplement*, information provided as part of the MOX procurement process relating to the MOX facility, including the addition of a plutonium-polishing module to the front end of the MOX facility, was analyzed by DOE in an Environmental Critique and summarized in an Environmental Synopsis prepared pursuant to DOE's NEPA regulations in 10 CFR 1021.216. The Synopsis was included in the *Supplement* and has been added to this SPD Final EIS as Appendix P. Appendix N, *Plutonium Polishing*, has been deleted from this SPD Final EIS, with the information in Appendix N incorporated into the body of the EIS. A description of the polishing module has been added to Section 2.4.3, and the impacts analysis has been incorporated into Chapter 4 of this SPD Final EIS. The polishing step is included in the MOX facility, so plutonium polishing is no longer considered as a contingency for the pit conversion facility.

As described in the *Supplement*, the size of the MOX facility has increased. The larger MOX facility is described in Chapter 2 of this SPD Final EIS, and the associated environmental impacts are presented throughout Chapter 4. No changes have been made in the amount of material proposed to be made into MOX fuel, the facility's throughput, or in the overall process to be used to fabricate the fuel.

Information related to the affected environment for the specific domestic commercial reactors that would irradiate the MOX fuel was provided in the *Supplement* and has been added to this SPD Final EIS as a new Section 3.7. Environmental impacts analyzed for the actual reactor sites was also provided in the *Supplement* and has been added to Section 4.28 of this SPD Final EIS.

Possible Delay of the Construction of the Actinide Packaging and Storage Facility. As stated in the *Supplement*, the schedule for the Actinide Packaging and Storage Facility (APSF) is uncertain at this time, and therefore, the disposition facilities at SRS analyzed in this SPD Final EIS were modified to disregard any benefit to the proposed facilities as a result of APSF being present. Chapter 4 of this SPD Final EIS presents the environmental impacts that would be associated with the construction and operation of surplus plutonium disposition facilities at SRS that are stand-alone and include no reliance on storage space or other functions at APSF. Throughout this SPD Final EIS, references to APSF have been qualified by the phrase "if built," and no credit has been taken in the environmental analyses for the presence of APSF.

Pit Repackaging Requirements. This SPD Final EIS was changed to reflect new decisions on the repackaging of pits at Pantex for long-term storage and the impacts of that decision on the need to repackage the pits for offsite transportation.

Pit repackaging for long-term storage. As discussed in the *Supplement*, work is currently under way to repackage all pits at Pantex from the AL–R8 container into the AL–R8 sealed insert (SI) container for long-term storage,[27] as described in the *Supplement Analysis for: Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components—AL–R8 Sealed Insert Container* (DOE 1998c). This effort would be completed over 10 years, and the estimated dose to involved workers received from this repackaging activity would be about 104 person-rem. The SPD Draft EIS analyzed repackaging of the pits in an AT–400A container. The change to the AL–R8 SI changes the undisturbed long-term storage period for pits from 50 to 30 years because of the need to replace a seal in the container after 30 years; the AT–400A does not require that activity. This change has been incorporated into Chapter 4.

Pit repackaging for offsite transportation. The AL–R8 SI is not an offsite shipping container as was the AT–400A analyzed in the SPD Draft EIS. Therefore, if the decision were made to site the pit conversion facility at a site other than Pantex, the surplus pits would have to be taken out of the AL–R8 SI and placed in a shipping container.[28] This operation would also require the replacement of some pit-holding fixtures to meet transportation requirements. It is expected that this change would result in a total repackaging dose to involved workers of 208 person-rem. If the decision were made to locate the pit conversion facility at Pantex, then the pits could be moved from their storage location to the pit conversion facility in the AL–R8 SI using onsite transportation

[27] DOE is considering leaving the repackaged surplus pits in Zone 4 at Pantex for long-term storage. An appropriate environmental review will be conducted when the specific proposal for this change has been determined (e.g., whether additional magazines need to be air-conditioned). The analysis in this document assumes that the surplus pits are stored in Zone 12 in accordance with the ROD for the *Storage and Disposition PEIS.*

[28] At the present time, DOE is using the FL container for the offsite shipment of pits. There are not enough of these containers to meet the plutonium disposition mission. No new FL containers can be manufactured because of certification restrictions. Further, the current FL containers cannot be certified for a specific type of surplus pit. The Defense Nuclear Facilities Safety Board, in its Recommendation 99–1 (August 1999), noted that there is no container suitable for shipping pits from Pantex. Should DOE make any decisions that would require shipment of pits from Pantex, DOE would ensure the availability of a certified shipping container in a timeframe that would support those decisions.

vehicles. Under this option, there would be no increased exposures due to repackaging. This change has been incorporated into Chapter 4.

Environmental Impacts Associated With MOX Fuel Versus LEU Fuel. Section 4.28.3 was added to this SPD Final EIS to address the impacts associated with using MOX fuel versus LEU fuel in existing commercial reactors.

Uranium Conversion Impacts. Section 4.30.3, Incremental Impacts Associated With Uranium Conversion, was added to address potential impacts of the conversion of depleted uranium hexafluoride to uranium dioxide. (See Sections 2.4.4.2 and 2.4.4.3 for a discussion on conversion.)

New/Revised Documents and Changes to Cumulative Impacts. Section 1.7 of the SPD Draft EIS, Relationship to Other Actions and Programs, (Section 1.8 in this Final) was updated to reflect new or revised planning documents and related NEPA documents, such as the *Environmental Assessment for the Parallex Project Fuel Manufacture and Shipment*, the *ROD for the Department of Energy's Waste Management Program: Treatment of Non-Wastewater Hazardous Waste*, the *Advanced Mixed Waste Treatment Project Final EIS* and ROD, and the *Final Environmental Impact Statement on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site* and RODs. The information in the most recent programmatic and site documents has been used to update the discussion of cumulative impacts in Section 4.32 of this SPD Final EIS. In addition, cumulative impacts information has been added for LLNL and LANL (two candidate sites for lead assembly fabrication), ORNL (a candidate site for postirradiation examination), and the three reactor sites (Catawba, McGuire, and North Anna).

Affected Environment. Information on the affected environment for ORNL, a candidate site for postirradiation examination, has been added to Chapter 3 of this SPD Final EIS.

Consultations. Appendix O was added to provide the correspondence related to ecological resources, cultural resources, and Native American consultations. Table 5–2 provides a summary of these consultations, and Section 4.26 discusses the results of the consultations.

FFTF. Appendix D of the SPD Draft EIS was deleted. This SPD Final EIS does not address using FFTF because the current DOE proposals do not include the use of surplus plutonium as a fuel source for FFTF.

Comment Response. Volume III, the Comment Response Document, was added to this SPD Final EIS. The comments received during the two comment periods and their responses are presented in a side-by-side-format.

1.8 RELATIONSHIP TO OTHER ACTIONS AND PROGRAMS

The proposed plutonium disposition actions would require coordination with other ongoing DOE programs. This section provides brief summaries of NEPA and other planning documents related to these ongoing programs. Section 1.8.1 includes documents that deal directly with other aspects of the surplus plutonium disposition program, as well as documents from other programs that may provide feed materials for disposition activities. Other documents in this section analyze material treatment or stabilization activities at DOE sites that could yield weapons-usable fissile materials that would be dispositioned pursuant to the analysis in this SPD EIS. Section 1.8.2 includes documents that analyze the management of the various waste types across the DOE complex. Waste generated by the construction and operation of the proposed surplus plutonium disposition facilities would be managed in accordance with decisions made pursuant to the NEPA RODs of these documents. Also, some of the waste planning documents will reflect the waste management and environmental implications of the decisions made as a result of this SPD EIS. Section 1.8.3 highlights some of the documents that deal with

activities currently under way or planned for the SPD EIS candidate sites. The information in the most recent and programmatic site documents are considered in the cumulative impact assessment in Section 4.32.

1.8.1 Materials and Disposition Options

The *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE/EIS-0229, December 1996) analyzes the environmental impacts of alternatives considered for the long-term storage of weapons-usable fissile materials (HEU and plutonium) and for the disposition of weapons-usable plutonium that has been declared surplus to national security needs. The ROD (January 1997) encompasses two categories of plutonium decisions: (1) the sites and facilities for the storage of nonsurplus plutonium and the storage of surplus plutonium pending disposition; and (2) the programmatic strategy for disposition of surplus plutonium. This ROD does not include the final selection of sites for plutonium disposition facilities or the extent to which the two plutonium disposition approaches (immobilization and MOX) will be ultimately implemented. (Those decisions will be based in part on the analysis in this tiered SPD EIS.) However, DOE does announce in the ROD that the list of candidate sites for plutonium disposition has been narrowed. It also announces the decision to store surplus and nonsurplus HEU in upgraded facilities at the Oak Ridge Reservation. DOE studies indicated that significant cost savings could be realized from the transfer of nonpit materials from RFETS and Hanford earlier than indicated in the *Storage and Disposition PEIS* ROD. DOE issued an amended ROD (August 1998) that supports the early closure of RFETS and the early deactivation of plutonium storage facilities at Hanford. The amended ROD includes decisions to accelerate shipment of all nonpit surplus plutonium from RFETS to SRS and the relocation of all Hanford surplus plutonium to SRS, if SRS were selected as the immobilization site. A supplement analysis to the *Storage and Disposition PEIS*, the *Supplement Analysis for Storing Plutonium in the Actinide Packaging and Storage Facility and Building 105–K at the Savannah River Site*, was issued in July 1998.

The *Pit Disassembly and Conversion Demonstration Environmental Assessment and Research and Development Activities* (DOE/EA-1207, August 1998; FONSI, August 1998) analyzes a proposed demonstration project at LANL to determine the feasibility of an integrated pit disassembly and conversion system as part of the surplus plutonium disposition strategy. This demonstration involves the disassembly of up to 250 pits and conversion of the recovered plutonium to plutonium metal ingots and plutonium oxide. The demonstration started in the fall of 1998 and will last up to 4 years. The results of the demonstration will help "fine-tune" the operational parameters of the pit conversion facility. The environmental assessment (EA) also describes ongoing R&D activities related to the disposition of surplus plutonium.

The *Environmental Assessment for the Parallex Project Fuel Manufacture and Shipment* (DOE/EA-1216, January 1999; FONSI, August 13, 1999) tiers from the *Storage and Disposition PEIS* and analyzes the fabrication and transport of a limited amount of U.S. MOX fuel to a Canadian reactor for test irradiation. Russian MOX fuel would also be irradiated as part of the experiment. The MOX fuel fabricated at LANL would be transported in U.S. Department of Transportation–approved containers by commercial carriers to a Canadian port of entry. At the Canadian border, Atomic Energy of Canada Limited (AECL) would take possession of the fuel and complete the shipment in the U.S. trucks to the National Research Universal (NRU) test reactor at Chalk River Laboratories in Chalk River, Ontario. The AECL would be responsible for conducting all subsequent fuel performance tests in the NRU reactor. All spent fuel resulting from the tests would be disposed of in Canada under the Canadian spent fuel program.

The *Final Environmental Impact Statement on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site* (DOE/EIS-0277F, August 1998; ROD, November 1998; ROD, February 1999; Amended ROD, September 1999) evaluates the potential environmental impacts associated with reasonable management alternatives for certain plutonium residues and all scrub alloy currently stored at RFETS near Golden, Colorado. DOE previously decided to stabilize, if necessary, and

repackage the plutonium residues for safe interim storage at RFETS, as discussed in the *Solid Residue Treatment, Repackaging, and Storage Environmental Assessment* (DOE/EA-1120, April 1996; FONSI, April 1996). The management alternatives analyzed in the EIS are no action (which includes the application of variances to safeguards termination limits), processing without plutonium separation, and processing with plutonium separation. The ROD (November 1998) determined that the preferred alternative would be implemented, which includes (1) processing and packaging plutonium residues at RFETS in preparation for disposal at the Waste Isolation Pilot Plant (WIPP); and (2) packaging and shipping sand, slag, crucible and plutonium fluoride residues, and scrub alloy to SRS, where the materials would be stabilized in F-Canyon by chemically separating the plutonium from the remaining materials in the residues and scrub alloy. In a second ROD (February 1999), DOE decided to implement the preferred alternative specified in the final EIS for the remaining categories of materials. In an amended ROD (September 1999), DOE decided to ship the sand, slag, and crucible residues directly to WIPP and not the residues to SRS.

The *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (DOE/EIS-0269, April 1999; ROD, August 1999) evaluates the environmental impacts of six alternative strategies for the long-term management of DOE-owned depleted uranium hexafluoride currently stored at the East Tennessee Technology Park in Oak Ridge, Tennessee; the Paducah Gaseous Diffusion Plant near Paducah, Kentucky; and the Portsmouth Gaseous Diffusion Plant near Piketon, Ohio. These alternatives involve cylinder technology and design; conversion of depleted uranium hexafluoride to another chemical form; and materials use, storage, disposal, and transportation. As indicated in its ROD, DOE selected the preferred alternative, which is to begin conversion of the depleted uranium hexafluoride as soon as possible, either to uranium oxide, uranium metal, or a combination of both, while allowing for future use of as much of this inventory as possible. This SPD EIS analyzes the conversion of depleted uranium hexafluoride, from a representative site (Portsmouth), to uranium dioxide, which would be used as feedstock for immobilization and MOX fuel and lead assembly fabrication.

[Text deleted.]

1.8.2 Waste Management

The *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (WM PEIS) (DOE/EIS-0200-F, May 1997; Transuranic [TRU] Waste ROD, January 1998; Hazardous Waste ROD, August 1998) examines the potential environmental and cost impacts of strategic alternatives for managing five types of radioactive and hazardous wastes that have resulted, and will continue to result, from nuclear defense and research activities at a variety of sites around the United States. The WM PEIS provides information on the impacts of various siting configurations that DOE will use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste configuration. Any waste resulting from actions taken in this SPD EIS would be treated, stored, and disposed of in accordance with the RODs and other decisions resulting from the WM PEIS. To date, three RODs have been issued: for the treatment and storage of TRU waste (January 1998), for the treatment of hazardous waste (August 1998), and for the storage of HLW (August 1999). The TRU waste ROD determined that those DOE sites that currently have or will generate TRU waste will prepare it for storage and store it on the site, the only exception being that Sandia National Laboratory will transfer its TRU waste to LANL. The Hazardous Waste ROD decided that DOE will continue use of offsite facilities for the treatment of nonwastewater hazardous waste based on analysis from the WM PEIS. The Oak Ridge Reservation and SRS will treat some of their own nonwastewater hazardous waste on the site. The HLW ROD decided that immobilized HLW will be stored at Hanford, INEEL, SRS, and the West Valley Demonstration Project in New York until a geologic repository is licensed by NRC.

The *Waste Isolation Pilot Plant Final Environmental Impact Statement* (DOE/EIS-0026, October 1980; ROD, January 1981) and associated supplements (DOE/EIS-0026-S-1, January 1990; ROD, June 1990; and DOE/EIS-0026-S-2, September 1997; ROD, January 1998) analyze the development, operation, and transportation activities associated with WIPP, a mined repository for TRU waste near Carlsbad, New Mexico. TRU waste produced as a result of surplus plutonium disposition activities would be required to meet the WIPP waste acceptance criteria and would ultimately be disposed of at WIPP. This EIS covers transportation from all the SPD EIS candidate sites except Pantex. Therefore, transportation of TRU waste from Pantex to WIPP is analyzed in this SPD EIS.

The *Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250D, July 1999) analyzes the construction, operation and monitoring, and eventual closure of a potential geologic repository at Yucca Mountain to dispose of commercial and DOE spent nuclear fuel, high-level radioactive waste, and materials that NRC determines by rule require the same degree of isolation. National transportation, Nevada transportation, and waste packaging are evaluated as part of the analysis. Three implementing design alternatives based on thermal load—low, intermediate, and high—are examined. High-level waste with immobilized plutonium and spent fuel produced from SPD EIS plutonium immobilization and MOX alternatives are included in the inventory analyzed in that EIS. This SPD EIS assumes for the purposes of analysis that Yucca Mountain is a potential geologic repository site.

The *Accelerating Cleanup: Paths to Closure* (DOE/EM-0362, June 1998) is DOE's blueprint for cleanup. It provides DOE's detailed projections on the scope, schedules, and costs for the cleanup of contaminated soil, groundwater, and facilities; treatment, storage, and disposal of waste; and effective management of nuclear materials and spent nuclear fuel. Included in the report are site waste and material disposition flow charts that describe each stream, the steps for processing or managing the wastes, and the permanent waste disposal sites that have been designated. This document is not a plan or a decisionmaking document; it describes the status and direction of DOE's draft cleanup strategy. Appropriate NEPA reviews will be conducted before any decisions are made. This SPD EIS reflects the proposals in *Paths to Closure* to the extent possible. Subsequent versions of *Paths to Closure* will reflect the waste management and environmental restoration implications of the decisions made as a result of this SPD EIS.

1.8.3 SPD EIS Candidate Sites

The *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement* (TWRS EIS) (DOE/EIS-0189, August 1996; ROD, February 1997) satisfies the DOE commitment made in the *Disposal of Hanford Defense High-Level, Transuranic and Tank Waste Final Environmental Impact Statement* (DOE/EIS-0113, December 1987; RODs, March and April 1988) to prepare a supplemental NEPA analysis. The TWRS EIS was prepared in response to several important changes subsequent to the ROD, including a revised strategy for managing and disposing of tank waste and encapsulated cesium and strontium. The TWRS EIS evaluates, as a part of the proposed action: continued operation and management of the tank farms; waste transfer system upgrades; and retrieval and treatment of the tank waste, which would include the construction and operation of a facility to vitrify HLW and vitrify or similarly immobilize the low-activity waste. DOE decided to implement the preferred alternative for retrieval, treatment, and disposal of tank waste and to defer a decision on the disposition of cesium and strontium capsules. Two supplement analyses to the EIS were prepared for the TWRS EIS. The first was the *Proposed Upgrades to the Tank Farm Ventilation, Instrumentation, and Electrical Systems under Project W-314 in Support of Tank Farm Restoration and Safe Operations* (DOE/EIS-0189-SA1, June 1997). Based on this supplement analysis, upgrades or planned upgrades to the tank farm do not pose any additional potential environmental impacts, and therefore no additional NEPA analysis is required. The second supplement analysis was for the *Tank Waste Remediation System* (DOE/EIS-0189-SA2, May 1998). The analysis provides information on the most recent inventory of chemical

and radiological constituents in the tanks and new waste that is to be sent to the tanks for treatment. Based on the new data, it was concluded that there would be minimal changes from the impacts identified in the TWRS EIS, and therefore, no additional NEPA analysis is required.

The *Plutonium Finishing Plant Stabilization Final Environmental Impact Statement* (DOE/EIS-0244F, May 1996; ROD, July 1996) analyzes the potential environmental impacts of alternative approaches to: (1) stabilization of residual plutonium-bearing materials at the Hanford Plutonium Finishing Plant (PFP) to a form suitable for long-term storage; (2) removal of readily retrievable plutonium-bearing materials left behind in process equipment, process areas, and air quality and liquid waste management systems as a result of historic uses; and (3) interim storage of stabilized fissile material in existing PFP vaults pending decisions on ultimate storage and disposition of the material. DOE decided to remove readily retrievable plutonium-bearing materials in holdup at PFP. Following their stabilization, plutonium-bearing materials will be in a form suitable for interim storage in existing vaults at PFP. These materials are included in the plutonium inventory addressed in this SPD EIS. Other plutonium-bearing material having low plutonium content (less than 50 percent by weight) and meeting criteria established by DOE may be treated at PFP using a cementation process.

The *Final Hanford Remedial Action Environmental Impact Statement and Comprehensive Land Use Plan*, (DOE/EIS-0222-F, September 1999) revises the scope of the EIS and alternatives in response to comments received on the original draft. The final EIS focuses on developing an overall strategy for future land use at Hanford and includes a proposed comprehensive land-use plan. The preferred alternative is to consolidate waste management operations in the Central Plateau, allow industrial development in the eastern and southern portions of the site, increase recreational access to the Columbia River, and expand Saddle Mountain National Refuge to include all of the Wahluke Slope, McGee Ranch, and Fitzner-Eberhardt Arid Lands Ecology Reserve.

The *Hanford Reach of the Columbia River Comprehensive River Conservation Study and Environmental Impact Statement* (Final, June 1994, National Park Service) evaluates protecting the Hanford Reach of the Columbia River in terms of its designation as a Wild and Scenic River, provisions for recreation access, and visitor interpretation and education.

The *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE/EIS-0203-F, April 1995; ROD, May 1995) is a complex-wide evaluation of alternatives for managing, through the year 2035, existing and reasonably foreseeable amounts of spent nuclear fuel within the DOE inventory. The EIS contains an analysis of the transportation of spent nuclear fuel, as well as sitewide alternatives for environmental restoration and waste management programs at the Idaho National Engineering Laboratory (INEL, now INEEL). The ROD designated Hanford, INEEL, and SRS for regional spent fuel storage and management, and made decisions for environmental restoration and waste management at INEEL. In March 1996, DOE issued an amendment to the May 1995 ROD to include a decision to regionalize the management of DOE-owned spent nuclear fuel by fuel type, including spent fuel currently stored at Hanford, INEEL, and SRS.

The *Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (DOE/EIS-0218F, February 1996; ROD, July 1996) evaluates the adoption of a joint DOE/Department of State policy to manage spent nuclear fuel from foreign research reactors, including HEU provided by the United States to other countries for research reactors. Management alternatives include a number of implementation options for port selection, transportation, and storage at DOE sites. The ROD selected a management policy that provided for the return to the United States of spent fuels from various research reactors, using two designated U.S. ports, and the management at INEEL and SRS. A supplement analysis (DOE/EIS-0218-SA-2, August 1998) was prepared to examine acceptance of foreign research reactor spent nuclear fuel under three scenarios not specifically examined in the EIS: (1)

accepting spent fuel not included in EIS-estimated inventories, (2) accepting spent fuel from countries in quantities greater than those identified in the EIS, and (3) transporting more than eight casks of spent fuel on a single ocean-going vessel. The supplement analysis concluded that the potential environmental impacts of these actions are bounded by the analysis performed in the EIS and, therefore, no supplement to the EIS need be prepared.

The DOE INEEL *Advanced Mixed Waste Treatment Project Final Environmental Impact Statement* (DOE/EIS-0290, January 1999; ROD, April 1999) evaluates four alternatives: (1) No Action Alternative under which existing waste management operations, facilities, and projects would continue; (2) the proposed action/preferred alternative under which BNFL, Inc., would build and operate an Advanced Mixed Waste Treatment Project (AMWTP) facility using proposed thermal and nonthermal treatment technologies for certification and shipment to WIPP or another acceptable disposal facility; (3) nonthermal treatment alternative under which some treatment of transuranic, alpha low-level mixed, and low-level mixed wastes would occur at an AMWTP facility at the same location as the proposed action, and wastes that require thermal treatment would be repackaged for storage; and (4) treatment and storage alternative, which would include the same processes as the proposed action/preferred alternative except treated waste would be placed in Resource Conservation and Recovery Act–permitted storage units at the onsite Radioactive Waste Management Complex for long-term storage. In the ROD, DOE selected the preferred alternative.

The *Final Environmental Impact Statement and Environmental Impact Report for Continued Operation of Lawrence Livermore National Laboratory and Sandia National Laboratories, Livermore* (DOE/EIS-0157, August 1992; ROD, January 27, 1993) evaluates the proposed action of ongoing and proposed facilities and activities at LLNL and Sandia National Laboratories, including near-term (within 5 to 10 years) proposed projects. Three other alternatives analyzed include no action, modification of operations, and shutdown and decommissioning. This EIS updates the sitewide EIS issued in 1982. A decision was made in the ROD to continue operations as outlined in the proposed action. A supplement analysis (DOE/EIS-0157-SA-01, March 1999) was prepared to examine current project and program plans and proposals for operations and identify new or modified projects or operations for the period 1998 to 2002 that were not considered in the 1992 EIS. The supplement analysis concluded that either the projected impacts are within the bounds of the 1992 EIS, the impacts were anticipated by mitigation measures established in the 1992 EIS, or the incremental differences in impacts are not significant; therefore, no supplementation to the 1992 EIS is needed.

The *Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory* (DOE/EIS-0238, January 1999; ROD, September 1999) evaluates ongoing and reasonably foreseeable new operations and facilities at LANL in support of DOE missions. This sitewide EIS updates the LANL sitewide EIS issued in 1979. Currently, small-scale R&D activities related to pit disassembly and conversion and MOX fuel fabrication are being conducted at LANL. Chapter 1, Section 1.8, of the sitewide EIS describes the SPD EIS as a related NEPA document. A description of the proposed MOX fuel lead assembly fabrication is included in Chapter 2, Background on Los Alamos National Laboratory Facilities and Activities, in Sections 2.2.2.2 and 2.2.2.15. Impacts of MOX fuel lead assembly fabrication are included in the cumulative impacts section of the LANL sitewide EIS, Sections 5.6.1.3, 5.6.1.7, 5.6.1.8, and 5.6.1.9. A decision was made in the LANL ROD to implement the preferred alternative, which includes expansion of operations, as the need arises, an increase in the level of existing operations to the highest reasonably foreseeable levels, and full implementation of the mission elements assigned to LANL.

The *Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE/EIS-0225, November 1996; ROD, January 1997) evaluates all current and proposed facilities and activities at Pantex, including weapons dismantlement and storage of the resulting nuclear materials and classified weapons components in the near term (over a 5- to 10-year period). This sitewide EIS addresses alternative interim storage sites for Pantex plutonium pits, some of which will

ultimately be disposed of as determined in this SPD EIS. A supplement analysis to the Pantex EIS was issued, *Supplement Analysis for: Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components—AL–R8 Sealed Insert Container* (August 1998), to determine the potential impacts associated with repackaging pits into AL–R8 SI containers as opposed to the AT–400A container originally considered. The analysis concluded that the AL–R8 SI met the requirements that were established in the EIS for pit storage at Pantex and that no further NEPA documentation would be required. However, the seals in the AL–R8 SI containers must be changed after 30 years of storage,[29] and the pit-holding fixture in many of the AL–R8 SI containers must be modified. New shipping containers are also required to augment the limited number of existing shipping containers.

The *Final Environmental Impact Statement, Construction and Operation of the Spallation Neutron Source* (DOE/EIS-0247, April 1999; ROD, June 1999) analyzes the potential environmental impacts of constructing and operating a state-of-the-art Spallation Neutron Source facility at one of four sites: ORNL (preferred alternative); Argonne National Laboratory in Argonne, Illinois; Brookhaven National Laboratory in Upton, New York; and LANL. The ROD designated ORNL as the chosen site for the facility.

The *Final Environmental Assessment for Wastewater Treatment Capability Upgrade* (DOE/EA-1190, April 1999; FONSI, May 27, 1999) analyzes a proposed action to design, build, and operate a new wastewater treatment facility at Pantex.

The *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE/EIS-0236, September 1996; ROD, December 1996) evaluates the potential environmental impacts resulting from activities associated with nuclear weapons research, design, development, and testing, as well as the assessment and certification of their safety and reliability. The stewardship portion of the document analyzes the development of three new facilities to provide enhanced experimental capabilities. The stockpile management portion of the EIS concerns producing, maintaining, monitoring, refurbishing, and dismantling the nuclear weapons stockpile at eight sites, including Pantex and SRS. A decision was made in the ROD to downsize a number of facilities for stockpile dismantlement, and to build experimental facilities at LLNL. A draft supplement analysis (DOE/EIS-0236-SA6, June 1999) was prepared to examine the plausibility of a building-wide fire at LANL's plutonium facility and to look at new studies regarding seismic hazards at LANL. The draft supplement analysis was issued for public comment, and a final supplement analysis was issued on September 2, 1999. The supplement analysis concluded that there is no need to prepare a supplemental EIS.

The *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE/EIS-0220, October 1995) analyzes the potential environmental impacts of the management of certain nuclear materials at SRS pending decisions on their future use or ultimate disposition. The EIS includes an analysis of the construction of the SRS Actinide Packaging and Storage Facility. Five RODs have been issued since the Final EIS was published. On December 12, 1995, DOE issued a ROD and Notice of Preferred Alternatives (60 FR 65300) on the interim management of several categories of nuclear materials at SRS. DOE decided to stabilize plutonium and uranium stored in vaults using a combination of management methods. On February 8, 1996, DOE issued a supplemental ROD (61 FR 6633) on the stabilization of two of the remaining categories of nuclear materials (Mark-16 and Mark-22 fuels and other aluminum-clad targets) analyzed in the Final EIS. After considering a DOE staff study and recommendation on canyon facility utilization, DOE issued a second supplemental ROD on September 6, 1996 (61 FR 48474) for stabilization of the neptunium 237 solutions, obsolete neptunium targets, and plutonium 239 solutions. On April 2, 1997, DOE issued a third supplemental ROD (62 FR 17790) on stabilization in the F-Canyon and FB-Line facilities of the remaining

[29] This means that the undisturbed storage period changes from 50 to 30 years. See Section 1.7.4 for additional details on the effect of the AL–R8 SI decision on the surplus plutonium disposition program.

Taiwan Research Reactor spent nuclear fuel. In October 1997, DOE issued a fourth supplemental ROD to add an additional method, processing and storage for vitrification in DWPF, to those being used in the management of plutonium and uranium stored in vaults; and to amend its September 6, 1996, ROD to provide for use of the H-Canyon facilities to stabilize, to oxide forms, the plutonium 239 and neptunium 237 solutions stored in H-Canyon and obsolete neptunium 237 targets stored in K-Reactor.

The *Savannah River Site Waste Management Final Environmental Impact Statement* (DOE/EIS-0217, July 1995; ROD, September 1995) analyzes future SRS waste management needs for all waste types over the next 30 years, including the treatment, storage, and disposal of high-level, low-level, mixed, hazardous, and TRU wastes generated from environmental restoration, facility operations, and D&D of buildings. In the ROD, DOE selected phased approaches to waste treatment, storage, and disposal facilities identified in the Final EIS.

The *Spent Nuclear Fuel Management Draft Environmental Impact Statement* (DOE/EIS-0279D, December 1998) evaluates processes for the safe and efficient management of spent nuclear fuel and targets at SRS, including placing these materials in forms suitable for ultimate disposition. Alternatives analyzed include new packaging, new processing, and conventional processing technologies, as well as the No Action Alternative. The preferred alternative for 97 percent of the volume is to use a melt and dilute treatment process. The remaining 3 percent would be managed using conventional processing.

The *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE/EIS-0240, June 1996; ROD, July 1996) addresses the disposition of a nominal 200 t (220 tons) of HEU declared surplus to the national security needs of the United States. Alternatives include several approaches to blending down the highly enriched material to make it nonweapons usable and suitable for fabrication into fuel for commercial nuclear reactors. The ROD calls for blending, over time, as much material as possible (up to 85 percent) for commercial use, and blending the remainder for disposal as LLW. Blending sites include SRS.

The *F-Canyon Plutonium Solutions at Savannah River Site Final Environmental Impact Statement* (DOE/EIS-0219, December 1994; ROD, February 1995) evaluates alternatives to stabilize plutonium solutions currently stored in F-Canyon at SRS before their disposition as determined in this SPD EIS. The alternatives examined are taking no action, processing the solutions to plutonium metal, processing the solutions to plutonium dioxide, and transferring the solutions to the HLW tanks for vitrification in DWPF. DOE has processed the plutonium solutions to a metal form using the F-Canyon and FB-Line facilities at SRS.

The *Final Supplemental Environmental Impact Statement, Defense Waste Processing Facility* (DOE/EIS-0082-S, November 1994; ROD, April 1995) assesses the environmental impacts of the construction and operation of DWPF at SRS as modified from the original design addressed in a 1982 EIS. DWPF includes the HLW pretreatment process, the vitrification facility, facilities for the manufacture and disposal of saltstone (LLW resulting from the pretreatment of HLW), radioactive glass waste storage facilities, and associated support facilities. DOE is currently preparing a second supplement, which was announced in the Federal Register on February 22, 1999 (64 FR 8558), on the proposed replacement of the In-Tank Precipitation (ITP) process at SRS. The ITP process as presently configured cannot achieve production goals and safety requirements. Three alternative processes are being evaluated: small tank precipitation, ion exchange, and direct grout. Because replacement of the ITP process constitutes a substantial change to the operation of DWPF as evaluated in the *1994 Supplemental EIS*, DOE is preparing a second supplemental EIS that addresses the potential environmental impacts of ITP process alternatives. DOE's preferred immobilization technology (can-in-canister) and immobilization site (SRS) are dependent on DWPF providing vitrified HLW with sufficient radioactivity.

The *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (DOE/EIS-0161, October 1995; ROD, December 5, 1995) evaluates the siting, construction, and operation of tritium supply technology alternatives and recycling facilities at five candidate sites, as well as the use of a commercial reactor

for producing tritium. The ROD determined that a dual-track approach would be used. One track explores the purchase of an operating or partially complete commercial light water reactor or the purchase of irradiation services from such a reactor. The second track would design, build, and test critical components of an accelerator system for production of tritium. The ROD states that DOE would select one of the alternatives at a later date to serve as the primary source of tritium for the nuclear weapons stockpile, with the other alternative developed as a back-up source, if feasible. SRS was selected as the location for the accelerator. (See Consolidated ROD discussion below.)

The *Final Environmental Impact Statement for Accelerator Production of Tritium at the Savannah River Site* (DOE/EIS-0270, March 1999; Consolidated ROD, May 1999) evaluates the siting, construction, and operation of a linear accelerator at SRS that would produce tritium, a gaseous radioactive isotope of hydrogen considered essential to the operation of U.S. thermonuclear weapons. DOE issued a Consolidated ROD that made the following decisions: (1) the use of commercial light water reactors is the primary source of tritium supply; (2) the accelerator at SRS is the backup tritium supply source, but will not be constructed; (3) the Tennessee Valley Authority's Watts Bar Unit 1 and Sequoyah Unit 1 and 2 reactors are the specific reactors that will provide irradiation services for tritium supply; (4) the H-Area location at SRS is the location for a new tritium extraction facility; and (5) the location and various technologies required to develop the accelerator as a backup to the commercial light water reactors are identified.

The *Final Environmental Impact Statement for the Production of Tritium in a Commercial Light Water Reactor* (DOE/EIS-0288, March 4, 1999; Consolidated ROD, May 1999) evaluates the production of tritium at one or more of five commercial light water reactors, including the transportation of irradiated tritium-producing burnable absorber rods from the reactors to the proposed tritium extraction facility at SRS. (See Consolidated ROD discussion above.)

The *Final Environmental Impact Statement for Construction and Operation of a Tritium Extraction Facility at the Savannah River Site* (DOE/EIS-0271, March 1999; Consolidated ROD, May 1999) evaluates the construction and operation of a facility for the extraction of tritium to support the DOE tritium production capability. (See Consolidated ROD discussion above.)

The *Final Environmental Impact Statement for Shutdown of the River Water System at Savannah River Site* (DOE/EIS-268, May 1997; ROD, January 1998) evaluates the shutdown of the River Water System used to pump large quantities of water from the Savannah River for cooling purposes within SRS. Alternatives for placing all or part of the system in standby mode are also considered. The ROD selected the No Action Alternative, that is, continuing the maintenance and operation of the Savannah River Water System for the foreseeable future.

The *Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y–12 Plant, Oak Ridge, Tennessee* (DOE/EA-0929, September 1994; FONSI, September 1995) analyzes the continued receipt, prestorage processing, and interim storage of enriched uranium in quantities that would exceed the historic maximum storage level. On the basis of this EA, DOE determined that Y–12 would store no more than 500 t (551 tons) of HEU and no more than 6 t (6.6 tons) of LEU. HEU recovered from the SPD EIS pit conversion facility would be shipped to Y–12 for interim storage pending disposition.

The *Notice of Intent to Prepare a Site-Wide Environmental Impact Statement for the Oak Ridge Y–12 Plant* (64 FR 13179) was published March 17, 1999. The EIS will analyze current levels of Y–12 operations and foreseeable new operations and facilities for approximately the next 10 years. The EIS will also provide a baseline of impacts associated with current activities, analyze the potential impacts of constructing a new enriched uranium storage facility, and address siting issues associated with other possible modernization projects. HEU

received from the pit conversion facility would be shipped to Y–12 for interim storage pending disposition. HEU storage at Y–12 could be affected by decisions made in the EIS.

1.8.4 Cooperating Agencies

In May 1997, DOE notified several agencies, including NRC and the U.S. Environmental Protection Agency (EPA), that this SPD EIS was being prepared. On November 10, 1997, NRC informed DOE that it would be a "commenting" rather than "cooperating" agency.[30] In keeping with this decision, DOE provided copies of the SPD Draft and Final EIS and *Supplement* to NRC for comment. No agencies other than EPA have decided to be a cooperating agency for this SPD EIS.

1.9 ORGANIZATION OF THIS SPD EIS

This SPD EIS consists of three volumes. Volume I contains the main text of the EIS. Volume II contains technical appendixes that provide supporting details for the analyses in Volume I, as well as additional project information. Volume III contains the comments received on the Draft EIS during the public review periods, along with the DOE responses to these comments. An EIS Summary is also available.

Volume I consists of Chapters 1 through 9. Chapter 2 describes the surplus plutonium disposition alternatives, how the alternatives were developed, and the proposed types of disposition facilities. It also provides a comparison of the alternatives. Chapter 3 describes the potentially affected environments at the candidate sites. Chapter 4 provides summary descriptions of the potential impacts of the proposed action and alternatives on 13 resource areas. This chapter also describes cumulative impacts, D&D and deactivation and stabilization, irreversible and irretrievable commitments of resources, and the relationship between short-term uses of the environment and long-term productivity. Chapter 5 provides a description of the environmental and health and safety compliance requirements governing implementation of the alternatives and includes the status of required consultations with Federal, State, and local agencies. References are included at the end of each chapter. Chapters 6, 7, 8, and 9 are the glossary of terms, the list of SPD EIS preparers, the SPD EIS distribution list, and the index, respectively.

Volumes II and III provide information that supports Volume I. Volume II consists of 16 appendixes and includes background documents, process descriptions, facility data, descriptions of methods used to estimate environmental impacts of the alternatives, and the detailed impact analysis. Volume III includes the comments received on the SPD Draft EIS and the *Supplement*, the responses to the comments, and a brief summary of changes made to the SPD Draft EIS and the *Supplement* in response to the comments.

1.10 REFERENCES

DOE (U.S. Department of Energy), 1996a, *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement*, DOE/EIS-0229, Office of Fissile Materials Disposition, Washington, DC, December.

DOE (U.S. Department of Energy), 1996b, *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement*, DOE/EIS-0240, Office of Fissile Materials Disposition, Washington, DC, June.

[30] A cooperating agency participates in the NEPA process at the request of the lead agency developing an EIS. The cooperating agency is involved in the scoping process and may develop information and prepare environmental analyses in its area of special expertise and make available staff support to the lead agency (40 CFR 1501.6, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act).* The lead agency may also request other agencies to comment on a draft EIS (40 CFR 1503.1).

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