POLICY ISSUE

(NEGATIVE CONSENT)

August 22, 1997 SECY-97-193

FOR: The Commissioners

FROM: L. Joseph Callan
Executive Director for Operations

SUBJECT: ASSISTANCE TO THE U.S. DEPARTMENT OF ENERGY'S FISSILE MATERIALS DISPOSITION PROGRAM

PURPOSE:

To provide a status report to the Commission on U.S. Nuclear Regulatory Commission assistance to the U.S. Department of Energy's (DOE's) plutonium disposition program and to inform the Commission of the staff's intent, unless otherwise directed by the Commission, to comment on DOE's plutonium-disposition site-specific environmental impact statement (EIS), rather than participate as a "cooperating agency."

BACKGROUND:

On March 11, 1995, President Clinton announced that 200 metric tons of U.S. weapons-grade fissile materials had been declared surplus to U.S. nuclear defense needs. The President's action demonstrated U.S. commitment to the policies and objectives of the January 1994 "Joint Statement between the United States and Russia on Nonproliferation of Weapons of Mass Destruction and Means of their Delivery." As reflected in the "Joint Statement" and the September 1993 "Nonproliferation and Export Control Policy," issued by President Clinton, the objectives of the U.S. nonproliferation program are to: (1) secure nuclear materials in the former Soviet Union; (2) ensure safe, secure, long-term storage and disposition of surplus fissile materials; (3) establish transparent and irreversible nuclear reductions; (4) strengthen the nuclear nonproliferation regime; and (5) control nuclear exports.

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NOTE: TO BE MADE PUBLICLY AVAILABLE WHEN THE FINAL SRM IS MADE AVAILABLE

In response to President Clinton's Nonproliferation and Export Control Policy, DOE initiated a program (hereafter, Disposition Program) in 1994, to address the storage and disposition of weapons-usable fissile materials. In the same timeframe, DOE requested NRC support for DOE activities related to the Disposition Program. In September 1995, NRC signed a reimbursable agreement with DOE to recover full costs for NRC efforts related to the Disposition Program by charging the license fee rate in effect at the time of the performed work. With the agreement in place, NRC recovers direct salary and benefits, travel, and an appropriate share of the Agency overhead costs. Information on NRC activities conducted under this agreement was reported in SECY-96-008, dated January 5, 1996.

In December 1996, DOE issued the "Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement" (PEIS), followed by issuance of a related Record of Decision (ROD) on January 14, 1997. DOE's January ROD, provided in Attachment 1, considers a dual approach for the disposition of the excess weapons plutonium, whereby some or all of the plutonium would be immobilized in glass or ceramic material for subsequent disposal in a geologic repository and the remainder converted into mixed oxide (MOX) reactor fuel in a once-through fuel cycle (no reprocessing). The reactor option includes the use of MOX fuel in existing U.S. commercial power reactors or possibly Canadian Deuterium Uranium reactors, in Canada, in the event of appropriate agreements between Russia, Canada, and the United States. DOE has also formally advised NRC that the reactor option does not preclude the potential use of the Fast Flux Test Facility, in Hanford, for burning the plutonium.

It is expected that DOE will take three fundamental steps to implement the ROD: 1) prepare the follow-on, site-specific EIS for surplus plutonium disposition, as a tiered analysis from the published PEIS; 2) publish a related decision on site selection; and 3) seek Congressional action for the overall funding of the Disposition Program and for needed legislative changes, including provisions for NRC to oversee/regulate some or all DOE facilities selected for the Disposition Program.

The follow-on EIS will determine the specific DOE sites for the following activities of the Disposition Program: 1) disassembly and conversion of surplus weapons plutonium pits; 2) immobilization of the resulting plutonium oxide; and 3) MOX fuel fabrication. Staff understands that DOE will be requesting Congress to authorize NRC to regulate the MOX fuel fabrication and will plan for NRC regulatory oversight of the other activities in the course of the "NRC External Regulation of DOE" program.

DISCUSSION:

After DOE briefed the Commission on January 27, 1997, the Commission requested that ". . . the staff, together with DOE, should explore ways of clarifying the respective responsibilities and future activities of the two agencies related to plutonium disposition, within the framework outlined in the NRC/DOE umbrella MOU recently signed by Chairman Jackson and former Secretary O'Leary and/or under the reimbursable agreement (DE-AI01-95MD10203) involving plutonium disposition" (Staff Requirements Memorandum (SRM) 970023, dated February 11, 1997). In response to the SRM, a modified reimbursable agreement, "Technical Support for the Preparation and Review of Licensing and Compliance Documents," DE-AI01-97MD10203, was recently signed by DOE and NRC and is provided in Attachment 2.

The previous agreement was modified primarily to: (1) extend the expiration date, (2) reflect a new statement of work, and (3) provide for an appropriate level of funding. The modified reimbursable agreement will enable NRC to continue to recover its full costs (including salary and benefits, but not the full-time equivalents (FTEs)) for technical support to DOE in assisting the Office of Fissile Materials Disposition in its implementation of the technologies selected by the ROD.

Considering the broad scope of the ROD implementation program, DOE decided not to provide specific details in the modified reimbursable agreement regarding NRC's support. Instead, as stated in Attachment B of the modified agreement, under "Scope of NRC Work," DOE will issue task orders related to specific needs that will result from developments supporting DOE's ROD. Staff has requested a meeting with DOE, as soon as practical, to discuss the tasks anticipated under the modified agreement.

To date, DOE has submitted only one formal task order under the reimbursable agreement. Under this task, NRC is to evaluate regulatory implications of the collocation of a licensed operation (MOX fuel fabrication), and non-licensed operations (pit disassembly and conversion, and plutonium immobilization), at the Fuels and Materials Examination Facility in Hanford. It is anticipated that NRC's response to the task order will be provided by September 30, 1997.

Informally, DOE has asked for NRC support regarding the "Nuclear Materials Stabilization Task Group," established by DOE to perform a trade-off analysis on alternative methods of storage for plutonium metals and oxides, pending disposition. Also, it is possible that DOE will issue a task order related to the DOE strategy for obtaining MOX fuel fabrication and irradiation services, which involves licensing and other matters under NRC's purview. A description of DOE's proposed approach is provided in Attachment 3. A Commission briefing on this subject is currently scheduled for September 17, 1997.

In addition, in a letter dated May 19, 1997, provided in Attachment 4, DOE requested NRC's comments on several issues related to a draft Notice of Intent (NOI). NRC's preliminary response to DOE is provided in Attachment 5. The objective of the NOI was to invite interested parties to participate in the preparation of the new EIS by commenting on its scope, content, and relevant environmental issues. In this regard, DOE requested clarification on whether NRC's participation in the EIS process will be as a "commenting agency" or a "cooperating agency." During the preparation of DOE's PEIS, which was published in December 1996, NRC's role was as a "commenting agency." If NRC's role were to change to a "cooperating agency," NRC would formally participate in preparing the EIS. This could create the appearance that NRC was prematurely judging issues that would be more appropriately addressed in the subsequent licensing process. In keeping with its role as a "commenting agency," NRC's functions are limited to providing comments on the draft EIS developed by DOE. In the capacity of a "commenting agency," NRC avoids the potential conflicts of interest that may subsequently arise from NRC's potential regulatory and licensing authority over the alternatives selected in DOE's ROD. The role of a "commenting agency" also reduces the resource burdens on NRC in terms of FTEs. In conclusion, staff intends, unless otherwise directed by the Commission, to continue the more limited role of a "commenting agency" rather than a "cooperating agency."

RECOMMENDATION:

Unless the Commission directs otherwise, within ten working days of the date of this paper, the Office of Nuclear Material Safety and Safeguards staff will provide a response to DOE indicating that NRC will continue in the role as a "commenting agency" in the context of DOE's plutonium-disposition site-specific EIS, rather than participating as a "cooperating agency."

RESOURCES:

NRC activities to support mutually agreed upon task orders will be conducted on a limited basis within the funding level provided by the attached reimbursable agreement. DOE will reimburse NRC for the full costs associated with activities conducted under the reimbursable agreement, so that the cost will not be borne by NRC licensees. However, DOE will not be transferring any FTEs to NRC and, at this time, staff does not plan to request any additional FTEs for fiscal years 1998 and 1999.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections. The Office of the International Programs concurs on this Commission Paper. The Office of the Chief Information Officer has reviewed this Commission Paper for information technology and information management implications and concurs on it. Additionally, the Office of the Chief Financial Officer has reviewed this Commission Paper for resource implications and has no objections.

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Executive Director
for Operations

Attachments:

1. DOE - Record of Decision, 01/14/97
2. Interagency Agreement , 07/02/97
3. PAS - DOE-Office of Fissile Mtrls. Disposition, 07/17/97
4. DOE ltr. from Mr. J. David Nulton to Mr. T. Sherr, 05/19/97
5. NRC's ltr. from Mr. T. Sherr to DOE, 07/11/97

SECY NOTE: In the absence of instructions to the contrary, SECY will notify the staff on Wednesday, September 24, 1997 that the Commission, by negative consent, assents to the action proposed in this paper.

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DEPARTMENT OF ENERGY

Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement

AGENCY: Department of Energy
ACTION: Record of Decision

SUMMARY: The Department of Energy (DOE) has decided to implement a program to provide for safe and secure storage of weapons-usable fissile materials (plutonium and highly enriched uranium [HEU]) and a strategy for the disposition of surplus weapons-usable plutonium, as specified in the Preferred Alternative in the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (S&D Final PEIS, DOE/EIS-0229, December 1996). The fundamental purpose of the program is to maintain a high standard of security and accounting for these materials while in storage, and to ensure that plutonium produced for nuclear weapons and declared excess to national security needs (now, or in the future) is never again used for nuclear weapons.

DOE will consolidate the storage of weapons-usable plutonium by upgrading and expanding existing and planned facilities at the Pantex Plant in Texas and the Savannah River Site (SRS) in South Carolina, and continue the storage of weapons-usable HEU at DOE's Y-12 Plant at the Oak Ridge Reservation (ORR) in Tennessee, in upgraded and, as HEU is dispositioned, consolidated facilities. After certain conditions are met, most plutonium now stored at the Rocky Flats Environmental Technology Site (RFETS) in Colorado will be moved to Pantex and SRS. Plutonium currently stored at the Hanford Site (Hanford), the Idaho National Engineering Laboratory (INEL), and the Los Alamos National Laboratory (LANL) will remain at those sites until disposition (or movement to lag storage at the disposition facilities).

DOE's strategy for disposition of surplus plutonium is to pursue an approach that allows **immobilization of surplus plutonium in glass or ceramic material for disposal in a geologic repository pursuant to** the Nuclear Waste Policy Act, **and burning of some of the surplus plutonium as mixed oxide (MOX) fuel in existing, domestic, commercial reactors, with subsequent disposal of the spent fuel in a geologic repository pursuant to the Nuclear Waste Policy Act. DOE may also burn MOX fuel in Canadian Deuterium Uranium [CANDU] reactors in the event of an appropriate agreement among Russia, Canada, and the United States, as discussed below.** The timing and extent to which either or both of these disposition approaches (immobilization or MOX) are ultimately deployed will depend upon the results of future technology development and demonstrations, follow-on (tiered) site-specific environmental review, contract negotiations, and detailed cost reviews, as well as nonproliferation considerations, and agreements with Russia and other nations. DOE's program will be subject to the highest standards of safeguards and security throughout all aspects of storage, transportation, and processing, and will include appropriate International Atomic Energy Agency verification.

Due to technology, complexity, timing, cost, and other factors that would be involved in purifying certain plutonium materials to make them suitable for potential use in MOX fuel, approximately 30 percent of the total quantity of plutonium (that has or may be declared surplus to defense needs) would require extensive purification to use in MOX fuel, and therefore will likely be immobilized. DOE will immobilize at least 8 metric tons (MT) of currently declared surplus plutonium materials that DOE has already determined are not suitable for use in MOX fuel. DOE reserves the option of using the immobilization approach for all of the surplus plutonium.

The exact locations for disposition facilities will be determined pursuant to a follow-on, site-specific disposition environmental impact statement (EIS) as well as cost, technical and nonproliferation studies. However, DOE has decided to narrow the field of candidate disposition sites. DOE has decided that a vitrification or immobilization facility (collocated with a plutonium conversion facility) will be located at either Hanford or SRS, that a potential MOX fuel fabrication facility will be located at Hanford, INEL, Pantex, or SRS (only one site), and that a "pit" disassembly and conversion facility will be located at Hanford, INEL, Pantex, or SRS (only one site). ("Pits" are weapons components containing plutonium.) The specific reactors, and their locations, that may be used to burn the MOX fuel will depend on contract negotiations, licensing, and environmental reviews. Because there are a number of technology variations that could be used for immobilization, DOE will also determine the specific immobilization technology based on the follow-on EIS, technology developments, cost information, and nonproliferation considerations. Based on current technological and cost information, DOE anticipates that the follow-on EIS will identify, as part of the proposed action, immobilizing a portion of the surplus plutonium using the "can-in-canister" technology at the Defense Waste Processing Facility (DWPF) at the Savannah River Site.

The use of MOX fuel in existing reactors would be undertaken in a manner that is consistent with the United States' policy objective on the irreversibility of the nuclear disarmament process and the United States' policy discouraging the civilian use of plutonium. To this end, implementing the MOX alternative would include government ownership and control of the MOX fuel fabrication facility at a DOE site, and use of the facility only for the surplus plutonium disposition program. There would be no reprocessing or subsequent reuse of spent MOX fuel. The MOX fuel would be used in a once-through fuel cycle in existing reactors, with appropriate arrangements, including contractual or licensing provisions, limiting use of MOX fuel to surplus plutonium disposition.

ATTACHMENT 1

The Department of Energy also retains the option of using MOX fuel in Canadian Deuterium Uranium (CANDU) reactors in Canada in the event a multilateral agreement is negotiated among Russia, Canada, and the United States to use CANDU reactors for surplus United States' and Russian plutonium. DOE will engage in a test and demonstration program for CANDU MOX fuel as appropriate and consistent with future cooperative efforts with Russia and Canada.

These efforts will provide the basis and flexibility for the United States to initiate disposition efforts either multilaterally or bilaterally through negotiations with other nations, or unilaterally as an example to Russia and other nations. Disposition of the surplus plutonium will serve as a nonproliferation and disarmament example, encourage similar actions by Russia and other nations, and foster multilateral or bilateral disposition efforts and agreements.

EFFECTIVE DATE:

The decisions set forth in this Record of Decision (ROD) are effective upon issuance of this document, in accordance with DOE's National Environmental Policy Act (NEPA) Implementing Procedures and Guidelines (10 CFR Part 1021) and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR Parts 1500-1508).

ADDRESSES:

Copies of the S&D Final PEIS, the *Technical Summary Report For Long-Term Storage of Weapons-Usable Fissile Materials*, the *Technical Summary Report for Surplus Weapons-Usable Plutonium Disposition*, the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Plutonium Disposition*, and this ROD may be obtained by writing to the U.S. Department of Energy, Office of Fissile Materials Disposition, MD-4, 1000 Independence Avenue, SW, Washington, DC 20585, or by calling (202) 586-4513. The 56-page Summary of the S&D Final PEIS, the other documents noted above (other than the full PEIS), and this ROD are also available on the Fissile Materials Disposition World Wide Web Page at:
http://web.fie.com/htdoc/fed/DOE/fsl/pub/menu/any/

FOR FURTHER INFORMATION CONTACT:

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

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

SUPPLEMENTARY INFORMATION:

I. Background

The end of the Cold War has created a legacy of surplus weapons-usable fissile materials both in the United States and the former Soviet Union. Further agreements on disarmament may increase the surplus quantities of these materials. The global stockpiles of weapons-usable fissile materials pose a danger to national and international security in the form of potential proliferation of nuclear weapons and the potential for environmental, safety, and health consequences if the materials are not properly safeguarded and managed.

In September 1993, President Clinton issued a *Nonproliferation and Export Control Policy* in response to the growing threat of nuclear proliferation. Further, in January 1994, President Clinton and Russia's President Yeltsin issued a *Joint Statement Between the United States and Russia on Nonproliferation of Weapons of Mass Destruction and the Means of Their Delivery*. In accordance with these policies, the focus of the U.S. nonproliferation efforts in this regard is five-fold: (i) to secure nuclear materials in the former Soviet Union; (ii) to assure safe, secure, long-term storage and disposition of surplus weapons-usable fissile materials; (iii) to establish transparent and irreversible nuclear arms reductions; (iv) to strengthen the nuclear nonproliferation regime; and (v) to control nuclear exports. The policy also states that the United States will not encourage the civil use of plutonium and that the United States does not engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes.

To demonstrate the United States' commitment to these objectives, President Clinton announced on March 1, 1995, that approximately 200 metric tons of U.S.-origin weapons-usable fissile materials, of which 165 metric tons are HEU and 38 metric tons are weapons-grade plutonium, had been declared surplus to the United States' defense needs.[1] The safe and secure storage of weapons-usable plutonium and HEU, and the disposition of surplus weapons-usable plutonium, consistent with the Preferred Alternative in the S&D Final PEIS and the decisions described in section V of this ROD, are consistent with the President's nonproliferation policy.

II. Decisions Made in This ROD

This ROD encompasses two categories of decisions: 1) the sites and facilities for storage of non-surplus weapons-usable plutonium and

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[1] The Secretary of Energy's *Openness Initiative* announcement of February 6, 1996, announced that the United States has about 213 metric tons of surplus fissile materials, including the 200 metric tons the President announced in March, 1995. Of the 213 metric tons of surplus materials, the *Openness Initiative* announcement indicated that about 174.3 metric tons are HEU and about 38.2 metric tons are weapons-grade plutonium. Additional quantities of plutonium may be declared surplus in the future; therefore, the S&D Final PEIS analyzes the disposition of a nominal 50 metric tons of plutonium, as well as the storage of 89 metric tons of plutonium and 994 metric tons of HEU.

HEU, and storage of surplus plutonium and HEU pending disposition; and 2) the programmatic strategy for disposition of surplus weapons-usable plutonium. This ROD does not encompass the final selection of sites for plutonium disposition facilities, nor the extent to which the two plutonium disposition approaches (immobilization or MOX) will ultimately be implemented. Those decisions will be made pursuant to a follow-on EIS. However, DOE does announce in this ROD that the slate of candidate sites for plutonium disposition has been narrowed. This ROD does not include decisions about the disposition of surplus HEU, which were made in July 1996 in the separate ROD for the *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement*, 61 Fed. Reg. 40619 (Aug. 5, 1996).[2]

III. NEPA Process

A. S&D Draft PEIS

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

DOE published an implementation plan (IP) for the S&D PEIS in March 1995 (DOE/EIS-0229-IP). The IP recorded the issues identified during the scoping process, indicated how they would be addressed in the S&D PEIS, and provided guidance for the preparation of the S&D PEIS. DOE issued the *Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement* (S&D Draft PEIS, DOE/EIS-0229-D) for public comment in February 1996. On March 8, 1996, both DOE and the Environmental Protection Agency (EPA) published Notices of Availability of the S&D Draft PEIS in the *Federal Register* (61 Fed. Reg. 9443 and 61 Fed. Reg. 9450), announcing a public comment period from March 8 until May 7, 1996. In response to requests from the public, DOE on May 13, 1996 published another Notice in the *Federal Register* (61 Fed. Reg. 22038) announcing an extension of the comment period until June 7, 1996. Eight public meetings on the S&D Draft PEIS were held during March and April 1996 in Washington, DC and in the vicinity of the DOE sites under consideration for the proposed actions.

During the 92-day public comment period, the public was encouraged to provide comments via mail, toll-free fax, electronic bulletin board (Internet), and toll-free telephone recording device. By these means, DOE received 8,442 comments from 6,543 individuals and organizations for consideration. In addition, 250 oral comments were recorded from some of the 734 individuals who attended the eight public meetings. All of the comments received, and the Department's responses to them, are presented in Volume IV (the Comment Response Document) of the S&D Final PEIS. All of the comments were considered in preparation of the S&D Final PEIS, and in many cases resulted in changes to the document. The Notice of Availability for the S&D Final PEIS was published by EPA in the Federal Register on December 13, 1996 (61 Fed. Reg. 65572). DOE published its own Notice of Availability for the S&D Final PEIS in the Federal Register on December 19, 1996 (61 Fed. Reg. 67001).

B. Alternatives Considered

The S&D PEIS analyzes the reasonable action alternatives in addition to the Preferred Alternative and the No Action Alternative. The Preferred Alternative, which is described below in section V, Decisions, and which DOE has decided to implement, represents a combination of alternatives for both storage and disposition.

1. The Proposed Action

The proposed action, as described in the S&D PEIS, would involve the following actions for U.S. weapons-usable fissile materials:

- Storage—provide a long-term storage system (for up to 50 years) for nonsurplus plutonium and HEU that meets the Stored Weapons Standard[3] and applicable environmental, safety, and health standards while reducing storage and infrastructure costs.

- Storage Pending Disposition—provide storage that meets the Stored Weapons Standard for inventories of weapons-usable plutonium and HEU[4] that have been or may be declared surplus.

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[2] The material considered in the S&D Final PEIS, and covered by the decisions in this ROD, does not include spent nuclear fuel, irradiated targets, uranium-233, plutonium-238, plutonium residues of less than 50-percent plutonium by weight, or weapons program materials-in-use.

[3] The "Stored Weapons Standard" for weapons-usable fissile materials storage was initially defined in *Management and Disposition of Excess Weapons Plutonium*, National Academy of Sciences, 1994. DOE defines the Stored Weapons Standard as follows: The high standards of security and accounting for the storage of intact nuclear weapons should be maintained, to the extent practical, for weapons-usable fissile materials throughout dismantlement, storage, and disposition.

[4] The S&D PEIS covers long-term storage of nonsurplus HEU and storage of surplus HEU pending disposition. Until storage decisions are implemented, surplus HEU that has not gone to disposition will continue to be stored pursuant to, and not to exceed the 10-year interim storage time period evaluated in, the *Environmental Assessment for the Proposed Interim Storage of*

(continued...)

- Disposition—convert surplus plutonium and plutonium that may be declared surplus in the future to forms that meet the Spent Fuel Standard,[5] thereby providing evidence of irreversible disarmament and setting a model for proliferation resistance.

2. Long-term Storage Alternatives and Related Activities

a. No Action

Under the No Action Alternative, all weapons-usable fissile materials would remain at existing storage sites. Maintenance at existing storage facilities would be done as required to ensure safe operation for the balance of the facility's useful life. Sites covered under the No Action Alternative included Hanford, INEL, Pantex, the ORR, SRS, RFETS, and LANL. Although there are no weapons-usable fissile materials within the scope of the S&D PEIS stored currently at Nevada Test Site (NTS), it was also analyzed under No Action to provide an environmental baseline against which impacts of the storage and disposition action alternatives were analyzed.

b. Upgrade at Multiple Sites

Under this alternative for storage, DOE would either modify certain existing facilities or build new facilities, depending on the site's ability to meet standards for nuclear material storage facilities, and would utilize existing site infrastructure to the extent possible. These modified or new facilities would be designed to operate for up to 50 years. Plutonium materials currently stored at Hanford, INEL, Pantex, and SRS would remain at those four sites (in upgraded or new facilities), and HEU would remain at ORR (in upgraded, consolidated facilities). This alternative does not apply to NTS because NTS does not currently store weapons-usable fissile materials.

A sub-alternative of relocating portions of the plutonium inventory (a total of 14.4 metric tons according to DOE's Openness Initiative announcements of December 7, 1993, and February 6, 1996, respectively) from RFETS and LANL to one or more of the four existing plutonium storage sites is analyzed. Storage of surplus materials without strategic reserve and weapons research and development (R&D) materials is also included as a sub-alternative. Within some of the five candidate storage sites under this alternative, there are also multiple storage options.

c. Consolidation of Plutonium

Under this alternative, plutonium materials at existing sites would be removed, and the entire DOE inventory of plutonium would be consolidated at one site, while the HEU inventory would remain at ORR. Again, Hanford, INEL, Pantex and SRS would be candidate sites for plutonium consolidation. In addition, NTS would be a candidate site for this alternative. Consolidation of plutonium at ORR would result in a situation in which inventories of plutonium and HEU were collocated at one site; this alternative was therefore analyzed as one option under the Collocation Alternative (see below). A sub-alternative to account for the separate storage of surplus materials without strategic reserve and weapons R&D materials was also included.

d. Collocation of Plutonium and Highly Enriched Uranium

Under the Collocation Alternative, the entire DOE inventory of plutonium and HEU would be consolidated and collocated at the same site. The six candidate sites would be Hanford, NTS, INEL, Pantex, ORR, and SRS. A sub-alternative for the separate storage of surplus materials without strategic reserve and weapons R&D materials was also included.

3. Plutonium Disposition Alternatives and Related Activities

The disposition technologies analyzed in the S&D PEIS were those that would convert surplus plutonium into a form that would meet the Spent Fuel Standard. For the purpose of environmental impact analyses of the various disposition alternatives, both generic and specific sites were used to provide perspective on these alternatives. Under each alternative, there are various ways to implement the alternative. These "variants" (such as the can-in-canister[6] approach) are shown in Table 1 to provide a range of available options for consideration.

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[4](...continued)
Enriched Uranium Above the Maximum Historical Storage Level at the Y–12 Plant, Oak Ridge, Tennessee (Y–12 EA) (DOE/EA-0929, September 1994) and Finding of No Significant Impact (FONSI).

[5] The "Spent Fuel Standard" for disposition was also initially defined in *Management and Disposition of Excess Weapons Plutonium*, National Academy of Sciences, 1994. DOE defines the Spent Fuel Standard as follows: The surplus weapons-usable plutonium should be made as inaccessible and unattractive for weapons use as the much larger and growing quantity of plutonium that exists in spent nuclear fuel from commercial power reactors.

[6] In the can-in-canister variant, cans of plutonium in a glass or ceramic matrix would be placed in a canister. This canister would then be filled with borosilicate glass containing high-level radioactive waste (HLW) or highly radioactive material such as cesium. This variant, at an existing facility (the Defense Waste Processing Facility [DWPF] at SRS), is described in Appendix O of the S&D Final PEIS.

Table 1. Description of Variants under Plutonium Disposition Alternatives

Alternatives Analyzed	Possible Variants
• Deep Borehole Direct Disposition	• Arrangement of plutonium in different types of emplacement canisters.
• Deep Borehole Immobilized Disposition	• Emplacement of pellet-grout mix. • Pumped emplacement of pellet-grout mix. • Plutonium concentration loading, size and shape of ceramic pellets.
• New Vitrification Facilities	• Collocated pit disassembly/conversion, plutonium conversion, and immobilization facilities. • Use of either Cs-137 from capsules or HLW as a radiation barrier. • Wet or dry feed preparation technologies. • An adjunct melter adjacent to the DWPF at SRS, in which borosilicate glass frit with plutonium (without highly radioactive radionuclides) is added to borosilicate glass containing HLW from the DWPF. • A can-in-canister approach at SRS in which cans of plutonium glass (without highly radioactive radionuclides) are placed in DWPF canisters which are then filled with borosilicate glass containing HLW in the DWPF (See Appendix O of the Final PEIS). • A can-in-canister approach similar to above but using new facilities at sites other than SRS.
• New Ceramic Immobilization Facilities	• Collocated pit disassembly/plutonium conversion, and immobilization facilities. • Use of either Cs-137 from capsules or HLW as a radiation barrier. • Wet or dry feed preparation technologies. • A can-in-canister approach at SRS in which the plutonium is immobilized without highly radioactive radionuclides in a ceramic matrix and then placed in the DWPF canisters that are then filled with borosilicate glass containing HLW (See Appendix O of the Final PEIS). • A can-in-canister approach similar to above but using new facilities at sites other than SRS.
• Electrometallurgical Treatment (glass-bonded zeolite form)	• Immobilize plutonium into metal ingot form. • Locate at DOE sites other than ANL-W at INEL.
• Existing LWR With New MOX Facilities	• Pressurized or Boiling Water Reactors. • Different numbers of reactors. • European MOX fuel fabrication. • Modification/completion of existing facilities for MOX fabrication. • Collocated pit disassembly/conversion, plutonium conversion, and MOX facilities. • Reactors with different core management schemes (plutonium loadings, refueling intervals).
• Partially Completed LWR With New MOX Facilities	• Same as for existing LWR (except that MOX fuel would not be fabricated in Europe).
• Evolutionary LWR With New MOX Facilities	• Same as for partially completed LWR.
• Existing CANDU Reactor With New MOX Facilities	• Different numbers of reactors. • Modification/completion of existing facilities for MOX fabrication. • Collocated pit disassembly/conversion, plutonium conversion, and MOX facilities. • Reactors with different core management schemes (plutonium loadings, refueling intervals).

Note: ANL-W=Argonne National Laboratory-West; Cs-137=cesium-137; HLW=high-level waste; LWR=light water reactor

The first step in plutonium disposition is to remove the surplus plutonium from storage, then process this material in a pit disassembly/conversion facility (for pits) or in a plutonium conversion facility (for non-pit materials). The processing would convert the plutonium material into a form suitable for each of the disposition alternatives described in the following sections. The pit disassembly/ conversion facility and the plutonium conversion facility would be built at a DOE site. The six candidate sites for long-term storage were evaluated for the potential environmental impacts of constructing and operating these facilities.

a. No Disposition Action

A "No Plutonium Disposition" action means disposition would not occur, and surplus plutonium-bearing weapon components (pits) and other forms, such as metal and oxide, would remain in storage in accordance with decisions on the long-term storage of weapons-usable fissile materials.

b. Deep Borehole Category

Under this category of alternatives, surplus weapons-usable plutonium would be disposed of in deep boreholes that would be drilled at least 4 kilometers (km) (2.5 miles [mi]) into ancient, geologically stable rock formations beneath the water table. The deep borehole would provide a geologic barrier against potential proliferation. A generic site was evaluated for the construction and operation of a borehole complex where the surplus plutonium would be prepared for emplacement in the borehole. This complex would consist of five major facilities: processing; drilling; emplacing/sealing; waste management; and support (security, maintenance, and utilities).

1) Direct Disposition (Borehole)

Under the Direct Disposition Alternative, surplus plutonium would be removed from storage, processed as necessary, converted to a form suitable for emplacement, packaged, and placed in a deep borehole. The deep borehole would be sealed to isolate the plutonium from the accessible environment. Long-term performance of the deep borehole would depend on the stability of the geologic system. A generic site was used for the borehole complex to analyze the environmental impact of this alternative.

2) Immobilized Disposition (Borehole)

Under the Immobilized Disposition Alternative, the surplus plutonium would be removed from storage, processed, and converted to a suitable form for shipment to a ceramic immobilization facility. The output of this facility would be spherical ceramic pellets containing plutonium, facilitating handling during transportation and emplacement. The ceramic pellets (about 2.54 centimeters [cm] [1 inch {in}] in diameter and containing 1 percent plutonium by weight) would then be placed in drums and shipped to the borehole complex. At the deep borehole site, the ceramic pellets would be mixed with non-plutonium ceramic pellets and fixed with grout during emplacement. The deep borehole would be sealed to isolate the plutonium from the accessible environment. Long-term performance of the deep borehole would depend on the stability of the geologic system.

Although a generic site was used for analyses of the borehole complex in this alternative, the ceramic immobilization facility would be built at a DOE site. Therefore, the six candidate sites for long-term storage were used to evaluate the environmental impacts of the borehole immobilization facility.

c. Immobilization Category

Under this category of alternatives, surplus plutonium would be immobilized to create a chemically stable form for disposal in a geologic repository pursuant to the *Nuclear Waste Policy Act* (NWPA).[7] The plutonium material would be mixed with or surrounded by high-level waste (HLW) or other radioactive isotopes and immobilized to create a radiation field that could serve as a proliferation deterrent, along with safeguards and security comparable to those of commercial spent nuclear fuel, thereby achieving the Spent Fuel Standard. All immobilized plutonium would be encased in stainless steel canisters and would remain in onsite vault-type storage until a geologic repository pursuant to the NWPA is operational.

1) Vitrification

Under the Vitrification Alternative, surplus plutonium would be removed from storage, processed, packaged, and transported to the vitrification facility. In this facility, the plutonium would be mixed with glass frit and highly radioactive cesium-137 (Cs-137) or HLW to produce borosilicate glass logs (a slightly different process, using HLW, would be used for the can-in-canister variant, as discussed in Appendix O of the S&D Final PEIS). The Cs-137 isotope could come from the cesium chloride (CsCl) capsules currently stored at Hanford or from existing HLW if the site selected for vitrification already manages HLW. Each glass log produced from the vitrification facility would contain about 84 kilograms (kg) (185 pounds [lb]) of plutonium. The vitrification facility would be built at a DOE site. The six candidate sites for long-term storage were analyzed for this alternative.

[7] Also referred to as a permanent, or HLW repository. Pursuant to the *Nuclear Waste Policy Act*, DOE is currently characterizing the Yucca Mountain Site in Nevada as a potential repository for spent nuclear fuel and HLW. Legislative clarification, or a determination by the Nuclear Regulatory Commission that the immobilized plutonium should be isolated as HLW, may be required before the material could be placed in Yucca Mountain should DOE and the President recommend, and Congress approve, its operation. No Resource Conservation and Recovery Act (RCRA) wastes would be immobilized unless the immobilization would constitute adequate treatment under RCRA. The immobilized product would be consistent with the repository's waste acceptance criteria.

2) Ceramic Immobilization

Under the Ceramic Immobilization Alternative, surplus plutonium would be removed from storage, processed, packaged, and transported to a ceramic immobilization facility. In this facility, the plutonium would be mixed with nonradioactive ceramic materials and Cs-137 or HLW to produce ceramic disks (a slightly different process, using HLW, would be used for the can-in-canister variant, as discussed in Appendix O of the S&D Final PEIS). Each disk would be approximately 30 cm (12 in) in diameter and 10 cm (4 in) thick, and would contain approximately 4 kg (9 lb) of plutonium. The Cs-137 or HLW would be provided as previously described. The ceramic immobilization facility would be built at a DOE site. The six candidate sites for long-term storage were analyzed for this alternative.

3) Electrometallurgical Treatment

Under the Electrometallurgical Treatment Alternative, surplus plutonium would be removed from storage, processed, packaged, and transported to new or modified facilities for electrometallurgical treatment. This process could immobilize surplus fissile materials into a glass-bonded zeolite (GBZ) form. With the GBZ material, the plutonium would be in the form of a stable, leach-resistant mineral that is incorporated in durable glass materials.[8] Existing electrometallurgical facilities at INEL were used as a representative site for analysis of potential environmental impacts.

d. Reactor Category

Under the reactor alternatives considered in the S&D PEIS, DOE would fabricate surplus plutonium into MOX fuel for use in reactors. The irradiated MOX fuel would reduce the proliferation risks of the plutonium material, and the reactors would also generate electricity. MOX fuel would be used in a once-through fuel cycle, with no reprocessing or subsequent reuse of spent fuel. The spent nuclear fuel generated by the reactors would then be sent to a geologic repository pursuant to the NWPA.

Because the United States does not have a MOX fuel fabrication facility or capability, a new dedicated MOX fuel fabrication facility would be built at a DOE or commercial site.[9] The surplus plutonium from storage would be processed, converted to plutonium dioxide (PuO_2), and transferred to the MOX fuel fabrication facility. In this facility, PuO_2 and uranium dioxide (UO_2) (from existing domestic sources) would be blended and fabricated into MOX pellets, loaded into fuel rods, and assembled into fuel bundles suitable for use in the reactor alternatives under consideration.

1) Existing Light Water Reactors

Under the Existing Light Water Reactor (LWR) Alternative, the MOX fuel containing surplus plutonium would be fabricated and transported to existing commercial LWRs in the United States, where the MOX fuel would be used instead of conventional UO_2 fuel. The LWRs employed for domestic electric power generation are pressurized water reactors (PWRs) and boiling water reactors (BWRs). Both types of reactors use the heat produced from nuclear fission reactions to generate steam that drives turbines and generates electricity. Three to five reactor units would be needed.[10]

2) Partially Completed Light Water Reactors

Under the Partially Completed LWR Alternative, commercial LWRs on which construction has been halted would be completed. The completed reactors would use MOX fuel containing surplus plutonium. The characteristics of these LWRs would be the same as those of the existing LWRs discussed in the Existing LWR Alternative. The Bellefonte Nuclear Plant located along the west bank of the Tennessee River in Alabama was used as a representative site for the environmental analysis of this alternative. Two reactor units (such as those at the Bellefonte Nuclear Plant) would be needed to implement this alternative.

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[8] In May 1996, the Department issued a Finding of No Significant Impact (FONSI) (61 Fed. Reg. 25647) and decision to proceed with the limited demonstration of the electrometallurgical treatment process at Argonne National Laboratory-West (ANL-W) at INEL for processing up to 125 spent fuel assemblies from the Experimental Breeder Reactor II (100 driver and 25 blanket assemblies). Although this alternative could be conducted at other DOE sites, ANL-W is described in the S&D PEIS as the representative site for analysis.

[9] Although a generic commercial site was evaluated in the S&D PEIS, it is not part of the Preferred Alternative or the decisions in this ROD.

[10] It is possible that an existing LWR can be configured to produce tritium, consume plutonium as fuel, and generate revenue through the production of electricity. This configuration is called a multipurpose reactor. Environmental analysis of the multipurpose reactor is included in Chapter 4 of the *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (TSR PEIS) (DOE/EIS-0161, October 1995) and Appendix N of the S&D PEIS. In the TSR PEIS ROD (December 1995), the multipurpose reactor was preserved as an option for future consideration. The Fast Flux Test Facility (FFTF) at Hanford has been under consideration for tritium production, and could also use surplus plutonium as reactor fuel if it were shown to be useful for tritium production. This ROD does not preclude use of the FFTF for tritium production or the potential use of surplus plutonium as fuel for the FFTF.

3) Evolutionary Light Water Reactors

The evolutionary LWRs are improved versions of existing commercial LWRs. Two design approaches were considered in the S&D PEIS. The first is a large PWR or BWR similar to the size of the existing PWR and BWR. The second is a small PWR approximately one-half the size of the large PWR. Two large or four small evolutionary LWRs would be needed to implement this alternative.

Under each design approach for this alternative, evolutionary LWRs would be built at a DOE site. Therefore, the six candidate sites for long-term storage were used to evaluate the environmental impacts of this alternative.

4) Canadian Deuterium Uranium Reactor

Under the CANDU Reactor Alternative, the MOX fuel containing surplus plutonium would be fabricated in a U.S. facility, then transported for use in one or more commercial heavy water reactors in Canada. The Ontario Hydro Bruce-A Nuclear Generating Station identified by the Government of Canada was used as a representative site for evaluation of this alternative. This station is located on Lake Huron about 300 km (186 mi) northeast of Detroit, Michigan. Environmental analysis of domestic activities up to the U.S./Canadian border is presented in the S&D PEIS. The use of CANDU reactors would be subject to the policies, regulations, and approval of the Federal and Provincial Canadian Governments. Pursuant to Section 123 of the Atomic Energy Act, any export of MOX fuel from the United States to Canada must be made under the agreement for cooperation between the two countries. Spent fuel generated by a CANDU reactor would be disposed under the Canadian spent fuel program.

C. Preferred Alternative

The S&D Final PEIS presented the Department's Preferred Alternative for both storage and disposition. DOE has decided to implement the Preferred Alternative as described in the S&D Final PEIS. Thus, the Preferred Alternative is described in Section V of this ROD, Decisions.

D. Environmental Impacts

Chapter 4 and the appendices of the S&D Final PEIS analyzed the potential environmental impacts of the storage and disposition alternatives in detail. The S&D Final PEIS also evaluated the maximum site impacts that would result at Hanford, INEL, Pantex, and SRS from combining the Preferred Alternative for storage with the Preferred Alternative for disposition. Consistent with the Preferred Alternative, Hanford, INEL, Pantex, and SRS are each a possible location for all or some plutonium disposition activities. The siting, construction, and operation of disposition facilities will be covered in a separate, follow-on EIS. The S&D Final PEIS described the total life cycle impacts that would result from the Preferred Alternative at the DOE sites identified for potential placement of the disposition facilities.

Based on analyses in the S&D Final PEIS, the areas where impacts might be significant are as follows:

- The use of groundwater at the Pantex Plant for storage and disposition facilities could contribute to the overall declining water levels of the Ogallala Aquifer. The projected No Action Alternative water usage at Pantex in the year 2005 reflects a reduction from current usage due to planned downsizing over the next few years. The Preferred Alternative would require a 72-percent increase in the projected No Action Alternative water use; the total amount (428 million liters per year) is considerably less than what is currently being withdrawn (836 million liters per year) at Pantex.

- A set of postulated accidents was used for each plutonium disposition alternative over the life of the campaign to obtain potential radiological impacts at the four DOE sites where disposition facilities could be built. The PEIS analyzes the risk of latent cancer fatalities (reflecting the probability of accident occurrence and the latent cancer fatalities potentially caused by the accident) for accidents that have low probabilities of occurrence and severe consequences, as well as those that have higher probabilities and low consequences. For potential severe accidents, the risk of latent cancer fatalities to the population located within 80 kilometers (50 miles) of the accident for the "front-end" disposition process campaign would range from 4.5×10^{-16} (that is, approximately 1 chance in 2 quadrillion) to 1.7×10^{-4} (approximately 1 chance in 6,000) for the pit disassembly/conversion facility, and from 1.5×10^{-16} to 1.3×10^{-4} for the plutonium conversion facility. This risk would range from 2.8×10^{-14} to 1.8×10^{-5} for the vitrification facility, from 7.0×10^{-16} to 1.9×10^{-7} for the ceramic immobilization facility, and from 4.6×10^{-16} to 4.3×10^{-4} for the MOX fuel fabrication facility. To estimate the change in risk associated with using MOX fuel instead of uranium fuel in existing LWRs, the severe accident scenarios assumed a large population distribution near a generic existing LWR and extreme meteorological conditions for dispersal, leading to large doses that were not necessarily reflective of actual site conditions. The resultant change in risk of cancer fatalities to a generic population located within 80 km (50 mi) of the severe accidents was estimated to range from -2.0×10^{-4} to 3.0×10^{-5} per year[11], reflecting a postulated risk of using MOX fuel that ranges from seven percent lower to eight percent higher than the risk of using uranium fuel. Under the Preferred Alternative, the estimated risk of cancer fatalities under severe accident conditions using MOX fuel in existing LWRs ranges from 0.01 to 0.098 for an 11-year campaign.

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[11] Accidents severe enough to cause a release of plutonium involved combinations of events that are highly unlikely. Estimates and analyses presented in Chapter 4 and summarized in Table 2.5-3 of the PEIS indicate a range of latent cancer fatalities of 5,900 to 7,300 and a risk of 0.016 to 0.15 of a fatality in the population for the 17-year campaign analyzed under the Existing LWR Alternative.

- Under the Preferred Alternative, HEU would continue to be stored at the Y-12 Plant at ORR in existing facilities that would be upgraded to meet requirements for withstanding natural phenomena, including earthquakes and tornadoes. This upgrade would reduce the expected risk for the design basis accidents analyzed in the Y-12 EA (for example, Building 9212) by approximately 80 percent, resulting in a latent cancer fatality risk of 7.4×10^{-6} (approximately 7 in a million) to the maximally exposed individual, 5.7×10^{-8} (approximately 6 in 100 million) to a non-involved worker, and 5.1×10^{-7} (approximately 5 in 10 million) to the 80-km offsite population.

- Under the Preferred Alternative, safe, secure storage would continue for materials at Hanford, INEL, and ORR, pending disposition. Therefore, there would be no transportation impact at these sites until disposition. The storage transportation impact would come from movement of the RFETS materials to Pantex and SRS. If, following the EIS for construction and operation of plutonium disposition facilities, potential plutonium disposition activities were added to Hanford, INEL, Pantex, and SRS, the estimated total health effects for the life of the project from transportation of surplus plutonium (including transportation of those materials from RFETS to Pantex and SRS) would range from 0.193 fatalities for transportation to Pantex, to 1.87 fatalities for transportation to SRS (primarily from normal expected traffic accidents, not from radiological releases). In addition to the disposition activities at DOE sites, there would be transportation of the MOX fuel from the DOE fuel fabrication site to existing LWRs. The location of the LWRs and the destination of the MOX fuel could be either the eastern or western United States. For 4,000 km (2,486 mi) of such transportation, there could be up to an additional 3.61 potential fatalities (primarily from normal expected traffic accidents, not from radiological releases) for the life of the campaign, assuming 100 per cent of the surplus plutonium would be used in commercial reactors. The actual amount would be smaller, and therefore potential fatalities would be lower, under the Preferred Alternative.

- At Hanford, INEL, Pantex, and SRS the Preferred Alternative would slightly increase regional employment and income. At RFETS, phaseout of plutonium storage would result in the loss of approximately 2,200 direct jobs. Compared to the total employment in the area, the loss of these jobs and the impacts to the regional economy would not be severe.

DOE has fully considered all of the environmental analyses in the S&D Final PEIS in reaching the decisions set forth in Section V, below.

E. Avoidance/Minimization of Environmental Harm

For the long-term storage of fissile material, there are four sites (Hanford, NTS, INEL, and LANL) where the Preferred Alternative is "no action"; that is, no plutonium would be stored at NTS, and at Hanford, INEL, and LANL, DOE would continue storage at existing facilities, using proven nuclear materials safeguards and security procedures, until disposition. These existing facilities would be maintained to ensure their safe operation and compliance with applicable environmental, safety and health requirements. At RFETS, the Preferred Alternative is to phase out storage of weapons-usable fissile materials, thus mitigating environmental impacts at RFETS. There are three sites (Pantex, ORR, and SRS) where the Preferred Alternative is to upgrade existing and planned new facilities. Site-specific mitigation measures for storage at these sites have been described in the S&D Final PEIS, and are summarized as follows:

- At Pantex, to alleviate the effects from using groundwater from the Ogallala Aquifer, the city of Amarillo is considering supplying treated wastewater to Pantex from the Hollywood Road Wastewater Treatment Plant for industrial use; the Department will use such treated wastewater to the extent possible. Radiation doses to individual workers will be kept low by maintaining comprehensive badged monitoring and programs to keep worker exposures "as low as reasonably achievable" (ALARA).

- At ORR, radiation doses to individual workers will be kept low by maintaining comprehensive badged monitoring and ALARA programs, including worker rotations. Upgrades for HEU storage to meet performance requirements will include seismic structural modifications as documented in *Natural Phenomena Upgrade of the Downsized/Consolidated Oak Ridge Uranium/Lithium Plant Facilities*. These modifications will reduce the risk of accidents to workers and the public.

- At SRS, to minimize soil erosion impacts during construction, storm water management and erosion control measures will be employed. Mitigation measures for potential Native American resources will be identified through consultation with the potentially affected tribes. Radiation doses to individual workers will be kept low by maintaining comprehensive badged monitoring and ALARA programs including worker rotations. The modified Actinide Packaging and Storage Facility (APSF) will be designed and operated in accordance with contemporary DOE Orders and regulations to reduce risks to workers and the public.

From a nonproliferation standpoint, the highest standards for safeguards and security will be employed during transportation, storage, and disposition. With respect to transportation, DOE will coordinate the transport of plutonium and HEU with State officials, consistent with current policy. Although the actual routes will be classified, they will be selected to circumvent populated areas, maximize the use of interstate highways, and avoid bad weather. DOE will continue to coordinate emergency preparedness plans and responses with involved states through a liaison program. The packaging, vehicles, and transport procedures being used are specifically designed and tested to prevent a radiological release under all credible accident scenarios.

For the Preferred Alternative for disposition, site-specific mitigation measures will be addressed in the follow-on, site-specific EIS. In the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Plutonium Disposition Alternatives*, measures are proposed to reduce the possibility of the theft or loss of material. For both immobilization and MOX fuel fabrication, bulk processing is the point in the disposition process when the material is most vulnerable to covert attempts to steal or divert it. A variety of opportunities for improving safeguards, some of which are already implemented at large, modern facilities, include near real-time accounting, increased automation in the process design, and improved containment and surveillance. The security risks posed by transportation can be reduced by minimizing the amount of transportation required (for example, putting the plutonium processing and MOX fabrication operations at the same site), minimizing the number of sites to which material has to be shipped, and minimizing the distance between those sites.

F. Environmentally Preferable Alternatives

The environmental analyses in Chapter 4 of the S&D Final PEIS indicate that the environmentally preferable alternative (the alternative with the lowest environmental impacts over the 50 years considered in the PEIS) for storage of weapons-usable fissile materials would be the Preferred Alternative, which consists of No Action at Hanford, NTS, INEL, and LANL pending disposition, phaseout of storage at RFETS, and upgrades that would ultimately reduce environmental vulnerabilities at ORR, SRS, and Pantex.

For disposition of surplus plutonium, the environmentally preferable alternative would be the No Disposition Action alternative, because the plutonium would remain in storage in accordance with decisions on the long-term storage of weapons-usable fissile materials, and there would be no new Federal actions that could impact the environment. For normal operations, analyses show that immobilization would be somewhat preferable to the existing LWR and preferred alternatives, although these alternatives, with the exception of waste generated, would be essentially environmentally comparable.[12]

Severe facility accident considerations indicate that immobilization options would be environmentally preferable to the existing reactor and preferred alternatives, although the likelihood of occurrence of severe accidents and the risk to the public are expected to be fairly low. Although No Disposition Action would be environmentally preferable, it would not satisfy the purpose and need for the Proposed Action, because the stockpile of surplus plutonium would not be reduced, and the Nonproliferation and Export Control Policy would not be implemented.

The hybrid approach (pursuing both reactors/MOX and immobilization) is being chosen over immobilization alone because of the increased flexibility it will provide by ensuring that plutonium disposition can be initiated promptly should one of the approaches ultimately fail or be delayed. Establishing the means for expeditious plutonium disposition will also help provide the basis for an international cooperative effort that can result in reciprocal, irreversible plutonium disposition actions by Russia. (See discussion in sections IV and V, below.)

IV. Non-Environmental Considerations

A. Technical Summary Reports

To assist in the preparation of this ROD, DOE's Office of Fissile Materials Disposition prepared and in July 1996 issued a *Technical Summary Report for Surplus Weapons-Usable Plutonium Disposition* and a *Technical Summary Report for Long-Term Storage of Weapons-Usable Fissile Materials*. These Technical Summary Reports (TSRs) summarize technical, cost, and schedule data for the storage and disposition alternatives that are considered in the S&D PEIS. After receiving comments on each of the TSRs, DOE issued revised versions of the reports in October and November, 1996, respectively.

1. Storage Technical Summary Report

This report provides technical, cost and schedule information for long-term storage alternatives analyzed in the S&D PEIS. The cost information for each alternative is presented in constant 1996 dollars and also discounted or present value dollars. It identifies both capital costs and life cycle costs. The following costs are in 1996 dollars.

The cost analyses show that the combination (preferred) alternative for the storage of plutonium would provide advantages to the Department with respect to implementing disposition technologies and would be the least expensive compared to other storage alternatives. The cost of the combination (preferred) alternative would be approximately $30 million in investment and $360 million in operating costs from inception until disposition occurs.* The cost of the upgrade at multiple sites alternative would be approximately $380 million in investment and $3.2 billion in operating costs for 50 years. The costs for the consolidation alternative could range from approximately $40 million to $360 million in investment and $600 million to $1.1 billion for operating costs for 50 years, depending on the extent to which existing facilities and capabilities can be shared with other programs at the sites.

The schedule analysis shows that the upgraded storage facilities for plutonium under the combination (preferred) alternative could be operational by 2004 at Pantex (Zone 12), and by 2001 at SRS. The upgrade for the storage of HEU could be completed by 2004 (or earlier). RFETS pits could be received at Pantex beginning in 1997 in Zone 4 on a temporary basis until Zone 12 upgrades are com-

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[12] The potential risk of latent cancer fatality for a maximally exposed individual of the public from lifetime accident-free operation under the various alternatives are: 1.2×10^{-9} to 1.2×10^{-7} for boreholes, 1.2×10^{-9} to 1.2×10^{-7} for immobilization (vitrification or ceramic immobilization), 1.3×10^{-6} to 2.6×10^{-6} for existing LWRs, and 9.0×10^{-7} to 1.7×10^{-6} for the Preferred Alternative.

pleted. The other analyzed alternatives (upgrade and consolidation) would require about six years to complete.

2. Disposition Technical Summary Report

This report provides technical viability, cost, and schedule information for plutonium disposition alternatives and variants analyzed in the S&D PEIS. The variants analyzed in the report are based on pre-conceptual design information in most cases.

a. Technical Viability Estimates

The report indicates that each of the alternatives appears to be technically viable; although each is currently at a different level of technical maturity. There is high confidence that the technologies are sufficiently mature to allow procurement and/or construction of facilities and equipment to meet plutonium disposition technical requirements and to begin disposition in about a decade.[13]

Reactor Alternatives—Light water reactors (LWRs) can be readily converted to enable the use of MOX fuels. Many European LWRs currently operate on MOX fuel cycles. Although some technical risks exist, they are all amenable to engineering resolution. Sufficient existing domestic reactor capacity exists, unless significant delays occur in the disposition mission. CANDU reactors appear to be capable of operating on MOX fuel cycles, but this has never been demonstrated on any industrial scale. Therefore, additional development would be required to achieve the level of maturity for the CANDU reactors that exists for light water reactors. Partially complete and evolutionary LWRs would involve increased technical risk relative to existing LWRs, as well as the need to complete or build (and license) new reactor facilities. The spent MOX fuel waste form that results from reactor disposition of surplus plutonium will have to satisfy waste acceptance criteria for the geologic repository.

Immobilization Alternatives—All vitrification alternatives require additional research and development prior to implementation of immobilization of weapons-usable plutonium. However, a growing experience base exists relating to the vitrification of high-level waste. These existing technologies can be adapted to the plutonium disposition mission, though different equipment designs and glass formulations will generally be necessary due to criticality considerations and chemical differences between plutonium and HLW that may affect the stability of the glass matrix. Vitrification and ceramic immobilization alternatives are similar with regard to the technical maturity of incorporating plutonium in their respective matrices. The technical viability of electrometallurgical treatment has not yet been established for the plutonium disposition mission. The experimental data base for this alternative is limited, and critical questions on waste form performance are not yet resolved. This alternative is considered practical only if the underlying technology is further developed for spent nuclear fuels.[14] All of the immobilization alternatives will require qualification (to meet acceptance criteria) of the waste form for the geologic repository, and may require legislative clarification or NRC rulemaking.

Deep Borehole Alternatives—Uncertainties for the deep borehole alternatives relate to selecting and qualifying a site; additional legislation and regulations, or legislative and regulatory clarification, may be required. The front-end feed processing operations for the deep borehole alternatives are much simpler than for other alternatives because no highly radioactive materials are processed, thus avoiding the need for remote handling operations. Emplacement technologies are comprised of largely low-technology operations which would be adaptations from existing hardware and processes used in the oil and gas industry.

Hybrid Approaches—Two hybrid approaches that combine technologies were considered as illustrative examples, using existing LWR or CANDU reactors in conjunction with a can-in-canister (immobilization) approach. Hybrids provide insurance against technical or institutional hurdles which could arise for a single technology approach for disposition. If any significant roadblock is encountered in any one area of a hybrid, it would be possible to simply divert the feed material to the more viable technology. In the case of a single technology, such roadblocks would be more problematic.

b. Cost Estimates

The following discussion is in constant 1996 dollars unless otherwise stated.

1) Investment Costs

- The investment costs for existing reactor variants tends to be about $1 billion; completing or building new reactors increases the investment costs to between $2 billion and $6 billion.
- The investment cost for the immobilization alternatives ranges from approximately $0.6 billion for the can-in-canister variants to approximately $2 billion for new greenfield variants.[15]
- Hybrid alternatives (combining both immobilization and reactor alternatives) require approximately $200 million additional

[13] Actual timing would depend on technical demonstrations, follow-on site-specific environmental review, detailed cost estimates, and international agreements.

[14] A recent study by the National Research Council concludes that the electrometallurgical treatment technology is not sufficiently mature to provide a reliable basis for timely plutonium disposition. "An Evaluation of the Electrometallurgical Approach for Treatment of Excess Weapons Plutonium" (National Academy Press, Washington, D.C., 1996).

[15] "Greenfield" means a variant involving a new facility, with no existing plutonium-handling infrastructure.

investment over the existing light water reactor stand-alone alternatives.

- Investment costs for the deep borehole alternatives range from about $1.1 billion for direct emplacement to about $1.4 billion for immobilized emplacement.
- Alternatives that utilize existing facilities for plutonium processing, immobilization, or fuel fabrication would realize significant investment cost savings over building new facilities for the same function.
- Large uncertainties in the cost estimates exist, relating to both engineering and institutional factors.
- A significant fraction of the investment cost for an alternative/variant is related to the front-end facilities for the extraction of the plutonium from pits and other plutonium-bearing materials and for other functions that are common to all alternatives.

2) Life Cycle Costs

- The life cycle costs for hybrid alternatives are similar to the stand-alone reactor alternatives. For the existing LWR/immobilization hybrid alternative (preferred alternative), the cost is $260 million higher than the stand-alone reactor alternative; for the CANDU/immobilization hybrid alternative, the cost is $70 million higher.
- The combined investment and net operating costs for MOX fuel are higher than for commercial uranium fuel; thus, the cost of MOX fuel cannot compete economically with low-enriched uranium fuel for LWRs or natural uranium fuel for CANDU reactors.
- The can-in-canister approaches are the most attractive variants for immobilization based on cost considerations.
- The deep borehole alternatives are more expensive than the can-in-canister and existing reactor alternatives. The immobilized borehole alternative life cycle cost is $1 billion greater than that for the direct emplacement alternative ($3.6 billion vs. $2.6 billion).
- Large uncertainties in the cost estimates exist, relating to engineering, regulatory, and policy considerations.

c. Schedule Estimates

The key conclusions of the Disposition Technical Summary Report with respect to schedules are as follows:

- Significant schedule uncertainties exist, relating to both engineering and institutional factors.
- Opportunities for compressing or expanding schedules exist.

1) Reactor Alternatives

- The rate at which MOX fuel is consumed in reactors will depend on the rate that MOX fuel is provided and fabricated, and the rate that plutonium oxide is provided to the MOX fuel fabrication facility.
- The time to attain production scale operation in existing LWRs and CANDU reactors could be about 8–12 years, depending on the need for and source of test assemblies that might be required.
- The time to complete the disposition mission is a function of the number of reactors committed to the mission, among other factors. For the variants considered, the time to complete varies from about 24 to 31 years.

2) Immobilization Alternatives

- The time to start the disposition mission ranges from 7 to 13 years, depending on the technology used and whether existing facilities are used.
- The operating campaign for the immobilization alternatives at full-scale operation would be about 10 years; it is possible to compress or expand the operating schedule by several years, if desired, by resizing the immobilization facility designs selected for analysis in this study. The overall mission duration (including research and development, construction, and operation) is expected to be about 18 to 24 years.
- Potential delays for start-up of the immobilization alternatives involve completing process development and demonstration, and qualifying the waste form for a geologic repository.

3) Deep Borehole Alternatives

- The time to start-up is expected to be 10 years.
- The operating duration of the mission would be about 10 years, although completing all burial operations at the borehole site in 3 years is possible. Therefore, the overall mission duration is estimated to be 20 years with accelerated emplacement reducing the duration by about 7 years.
- The schedule for the deep borehole alternatives would depend in part on selecting and qualifying a site, and obtaining legislative and regulatory clarification as well as any necessary permits.

4) Hybrid Approaches

- In general, the schedule data that apply to the component technologies apply to the hybrid alternatives as well.

- Confidence in an early start-up and an earlier completion can both be improved with a hybrid approach, relative to stand-alone alternatives.

- Hybrid alternatives provide an inherent back-up technology approach to enhance confidence in attaining schedule goals.

B. Nonproliferation Assessment

To assist in the development of this ROD, DOE's Office of Arms Control and Nonproliferation, with support from the Office of Fissile Materials Disposition, prepared a report, *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Plutonium Disposition Alternatives*. The report was issued in draft form in October 1996, and following a public comment period, was issued in final form in January 1997. It analyzes the nonproliferation and arms reduction implications of the alternatives for storage of plutonium and HEU, and disposition of excess plutonium. It is based in part on a *Proliferation Vulnerability Red Team Report* prepared for the Office of Fissile Materials Disposition by Sandia National Laboratory. The assessment describes the benefits and risks associated with each option. Some of the "options" and "alternatives" discussed in the Nonproliferation Assessment are listed as "variants" (such as can-in-canister) in the S&D Final PEIS. The key conclusions of the report, as presented in its Executive Summary, are reproduced below.

1. Storage

- Each of the options under consideration for storage of U.S. weapons-usable fissile materials has the potential to support U.S. nonproliferation and arms reduction goals, if implemented appropriately.

- Each of the storage options could provide high levels of security to prevent theft of nuclear materials, and could provide access to excess materials for international monitoring.

- Making excess plutonium and HEU available for bilateral U.S.-Russian monitoring and International Atomic Energy Agency (IAEA) safeguards, while protecting proliferation-sensitive information, would help demonstrate the U.S. commitment never to return this material to nuclear weapons, providing substantial arms reduction and nonproliferation benefits in the near-term.

2. Disposition of U.S. Excess Plutonium

a. In General

- Each of the options for disposition of excess weapons plutonium that meets the Spent Fuel Standard would, if implemented appropriately, offer major nonproliferation and arms reduction benefits compared to leaving the material in storage in directly weapons-usable form. Taking into account the likely impact on Russian disposition activities, the no-action alternative appears to be by far the least desirable of the plutonium disposition options from a nonproliferation and arms reduction perspective.

- Carrying out disposition of excess U.S. weapons plutonium, using options that ensured effective nonproliferation controls and resulted in forms meeting the Spent Fuel Standard, would:
  - reduce the likelihood that current arms reductions would be reversed, by significantly increasing the difficulty, cost, and observability of returning this plutonium to weapons;
  - increase international confidence in the arms reduction process, strengthening political support for the nonproliferation regime and providing a base for additional arms reductions, if desired;
  - reduce long-term proliferation risks posed by this material by further helping to ensure that weapons-usable material does not fall into the hands of rogue states or terrorist groups; and
  - lay the essential foundation for parallel disposition of excess Russian plutonium, reducing the risks that Russia might threaten U.S. security by rebuilding its Cold War nuclear weapons arsenal, or that this material might be stolen for use by potential proliferators.

- Choosing the "no-action alternative" of leaving U.S. excess plutonium in storage in weapons-usable form indefinitely, rather than carrying out disposition:
  - would represent a clear reversal of the U.S. position seeking to reduce excess stockpiles of weapons-usable materials worldwide;
  - would make it impossible to achieve disposition of Russian excess plutonium;
  - could undermine international political support for nonproliferation efforts by leaving open the question of whether the United States was maintaining an option for rapid reversal of current arms reductions; and
  - could undermine progress in nuclear arms reductions.

- The benefits of placing U.S. excess plutonium under international monitoring and then transforming it into forms that met the Spent Fuel Standard would be greatly increased, and the risks of these steps significantly decreased, if Russia took comparable steps with its own excess plutonium on a parallel track. The two countries need not use the same plutonium disposition technologies, however.

- As the 1994 NAS committee report[16] concluded, options for disposition of U.S. excess weapons plutonium will provide maximum nonproliferation and arms control benefits if they:
  - minimize the time during which the excess plutonium is stored in forms readily usable for nuclear weapons;
  - preserve material safeguards and security during the disposition process, seeking to maintain to the extent

[16] See footnote 3, above.

possible the same high standards of security and accounting applied to stored nuclear weapons (the Stored Weapons Standard);
- result in a form from which the plutonium would be as inaccessible and unattractive for weapons use as the larger and growing quantity of plutonium in commercial spent fuel (the Spent Fuel Standard).

- In order to achieve the benefits of plutonium disposition as rapidly as possible, and to minimize the risks and negative signals resulting from leaving the excess plutonium in storage, it is important for disposition options to begin, and to complete the mission as soon as practicable taking into account nonproliferation, environment, safety, and health, and economic constraints. Timing should be a key criterion in judging disposition options. Beginning the disposition quickly is particularly important to establishing the credibility of the process, domestically and internationally.

- Each of the options under consideration for plutonium disposition has its own advantages and disadvantages with respect to nonproliferation and arms control, but none is clearly superior to the others.

- Each of the options under consideration for plutonium disposition can potentially provide high levels of security and safeguards for nuclear materials during the disposition process, mitigating the risk of theft of nuclear materials.

- Each of the options under consideration for plutonium disposition can potentially provide for effective international monitoring of the disposition process.

- Plutonium disposition can only reduce, not eliminate, the security risks posed by the existence of excess plutonium, and will involve some risks of its own:
  - Because all plutonium disposition options would take decades to complete, disposition is not a near-term solution to the problem of nuclear theft and smuggling. While disposition will make a long-term contribution, the near-term problem must be addressed through programs to improve security and safeguarding for nuclear materials, and to ensure adequate police, customs, and intelligence capabilities to interdict nuclear smuggling.
  - All plutonium disposition options under consideration would involve processing and transport of plutonium, which will involve more risk of theft in the short term than if the material had remained in heavily guarded storage, in return for the long-term benefit of converting the material to more proliferation-resistant forms.
  - Both the United States and Russia will still retain substantial stockpiles of nuclear weapons and weapons-usable fissile materials even after disposition of the fissile materials currently considered excess is complete. These weapons and materials will continue to pose a security challenge regardless of what is done with excess plutonium.
  - None of the disposition options under consideration would make it impossible to recover the plutonium for use in nuclear weapons, or make it impossible to use other plutonium to rebuild a nuclear arsenal. Therefore, disposition will only reduce, not eliminate, the risk of reversal of current nuclear arms reductions.
  - A U.S. decision to choose reactor alternatives for plutonium disposition could offer additional arguments and justifications to those advocating plutonium reprocessing and recycle in other countries. This could increase the proliferation risk if it in fact led to significant additional separation and handling of weapons-usable plutonium. On the other hand, if appropriately implemented, plutonium disposition might also offer an opportunity to develop improved procedures and technologies for protecting and safeguarding plutonium, which could reduce proliferation risks and would strengthen U.S. efforts to reduce the stockpiles of separated plutonium in other countries.

- Large-scale bulk processing of plutonium, including processes to convert plutonium pits to oxide and prepare other forms for disposition, as well as fuel fabrication or immobilization processes, represents the stage of the disposition process when material is most vulnerable to covert theft by insiders or covert diversion by the host state. Such bulk processing is required for all options, however; in particular, initial processing of plutonium pits and other forms is among the most proliferation-sensitive stages of the disposition process, but is largely common to all the options. More information about the specific process designs is needed to determine whether there are significant differences between the various immobilization and reactor options in the overall difficulty of providing effective assurance against theft or diversion during the different types of bulk processing involved, and if so, which approach is superior in this respect.

- Transport of plutonium is the point in the disposition process when the material is most vulnerable to overt armed attacks designed to steal plutonium.. With sufficient resources devoted to security, however, high levels of protection against such overt attacks can be provided. International, and particularly overseas, shipments would involve greater transportation concerns than domestic shipments[17].

[17] International shipments would be involved (from the United States to Canada) if the CANDU option were pursued as a result of international agreements among the U.S., Canada, and Russia. Overseas shipments would be involved if European MOX fuel fabrication were utilized in the interim before a domestic MOX fabrication facility were completed. The Preferred Alternative and the decisions in this ROD do not involve European MOX fuel fabrication.

b. Conclusions Relating to Specific Disposition Options

- The reactor options, homogeneous immobilization[18] options, and deep borehole immobilized emplacement option can all meet the Spent Fuel Standard. The can-in-canister options are being refined to increase the resistance to separation of the plutonium cans from the surrounding glass, with the goal of meeting the Spent Fuel Standard. The deep borehole direct emplacement option substantially exceeds the Spent Fuel Standard with respect to recovery by sub-national groups, but could be more accessible and attractive for recovery by the host state than spent fuel.

- The reactor options have some advantage over the immobilization options with respect to perceived irreversibility, in that the plutonium would be converted from weapons-grade to reactor-grade, even though it is possible to produce nuclear weapons with both weapons and reactor-grade plutonium. The immobilization and deep borehole options have some advantage over the reactor options in avoiding the perception that they could potentially encourage additional separation and civilian use of plutonium, which itself poses proliferation risks.

- Options that result in accountable "items" (for purposes of international safeguards) whose plutonium content can be accurately measured (such as fuel assemblies or immobilized cans without fission products in the "can-in-canister" option) offer some advantage in accounting to ensure that the output plutonium matches the input plutonium from the process. Other options (such as homogeneous immobilization or immobilized emplacement in deep boreholes) would require greater reliance on containment and surveillance to provide assurance that no material was stolen or diverted—but in some cases could involve simpler processing, easing the task of providing such assurance.

- The principal uncertainty with respect to using excess weapons plutonium as MOX in U.S. LWRs relates to the potential difficulty of gaining political and regulatory approvals for the various operations required.

- Compared to the LWR option, the CANDU option would involve more transport, and more safeguarding issues at the reactor sites themselves (because of the small size of the CANDU fuel bundles and the on-line refueling of the CANDU reactors). Demonstrating the use of MOX in CANDU reactors by carrying out this option for excess weapons plutonium disposition could somewhat detract from U.S. efforts to convince nations operating CANDU reactors in regions of proliferation concern not to pursue MOX fuel cycles, but these nations are likely to base their fuel cycle decisions primarily on factors independent of disposition of this material. Disposing of excess weapons plutonium in another country long identified with disarmament could have significant symbolic advantages, particularly if carried out in parallel with Russia. Disposition of Russian plutonium in CANDU reactors, however, would require resolving additional transportation issues and additional questions relating to the likely Russian desire for compensation for the energy value of the plutonium.

- The immobilization options have the potential to be implemented more quickly than the reactor options. They face somewhat less political uncertainty but somewhat more technical uncertainty than the reactor options.

- The likelihood of very long delays in gaining approval for siting and construction of deep borehole sites represents a very serious arms reduction and nonproliferation disadvantage of the borehole option, in either of its variants. While the deep borehole direct-emplacement option requires substantially less bulk processing than the other disposition options, that option may not meet the Spent Fuel Standard for retrievability by the host state, as mentioned above. Any potential advantage from the reduced processing is small compared to the large timing uncertainty and the potential retrievability disadvantage.

- Similarly, the electrometallurgical treatment option, because it is less developed than the other immobilization options, involves more uncertainty in when it could be implemented, which represents a significant arms reduction and nonproliferation disadvantage. It does not appear to have major compensating advantages compared to the other immobilization options.

- The "can-in-canister" immobilization options have a timing advantage over the homogeneous immobilization options, in that, by potentially relying on existing facilities, they could begin several years sooner. As noted above, however, modified systems intended to allow this option to meet the Spent Fuel Standard are still being designed.

C. Comments on the S&D Final PEIS

After issuing the Final PEIS, DOE received approximately 100 letters from organizations and individuals commenting on the alternatives addressed in the PEIS. Many of these letters expressed opposition to the MOX fuel approach for surplus plutonium disposition. The major concern raised in these letters was the contention that the use of MOX fuel is associated with proliferation risk as well as additional delays, costs, and safety and environmental risks. One of these letters was from a coalition of 14 national organizations recommending that the Department decide to utilize immobilization for the disposition of all surplus plutonium and that MOX be retained for use, if at all, only as an "insur-

[18] The term "homogeneous immobilization" refers to mixing of solutions of plutonium and either HLW or cesium in liquid form, followed by solidification of the mixture in either glass or ceramic matrices. This contrasts with the "can-in-canister" variant, in which the plutonium and HLW or cesium materials are never actually mixed together.

ance policy" if immobilization should prove infeasible. Several of those 14 organizations also wrote separately making similar points. Conversely, many of the letters provided comments in support of the use of MOX fuel and/or the dual path, while a few expressed opposition to the immobilization alternatives.

Seven of the letters received suggested the use of disposition approaches that were not analyzed in the PEIS. Three of these approaches (dropping plutonium into volcanoes, burying it in the sea at the base of a volcano, and storing it in large granite or marble structures) are similar to options that were either considered (but found to be unreasonable) in a screening process that preceded the PEIS, or were addressed in the PEIS Comment Response Document. These approaches were considered to be potentially damaging to the environment, among other things, and were therefore dismissed as unreasonable. Three other alternatives (plasma technology, binding and neutralizing plutonium with a new organic material, and use in rocket engines) recommended in these letters would require a substantial amount of development and could not be accomplished in the same time frame as alternatives analyzed in the PEIS. One commentor suggested adding the plutonium to the radioactive sludge being stored at Hanford for eventual disposal. The Department views this as unreasonable because of delays and increased costs that would be incurred in the program to manage the wastes in the Hanford tanks. One commentor was opposed to the utilization of Hanford's Fuels and Materials Examination Facility for MOX fuel fabrication and the Fast Flux Test Facility for MOX fuel burning.

All of the issues raised in these letters are covered in the body of the Final PEIS, in the Comment Response Document, the *Summary Report of the Screening Process* (DOE/MD-0002, March 19, 1995), the *Technical Summary Report for Surplus Weapons-Usable Plutonium Disposition*, or the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Plutonium Disposition Alternatives*, which have each been considered in reaching this ROD.

The Department's decision for surplus plutonium disposition is to pursue both the existing LWR (MOX fuel) and immobilization approaches. DOE recognizes that the estimated life-cycle cost of immobilization alone would be less than that of the hybrid approach (pursuing both), but the additional expense would be warranted by the increased flexibility should one of the approaches ultimately fail, and the increased ability to influence Russian plutonium disposition actions. (The lowest cost approach would be the No Disposition Action alternative; however, as noted in section III.F, above, that option would not satisfy the purpose and need for this program.) DOE also recognizes that analyses in the PEIS indicated that, for normal operation, the environmental and health impacts would be somewhat lower for immobilization, although, with the exception of waste generation, impacts for the preferred, immobilization, and existing LWR (MOX) alternatives would be essentially comparable (see prior discussion). Potential latent cancer fatalities for members of the public under the MOX approach would be significantly higher than under the immobilization approach only under highly unlikely facility accident scenarios; the risk (taking into account accident probabilities) to the public of latent cancer fatalities from accidents would be fairly low for both approaches.

From the nonproliferation standpoint, results of the *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Plutonium Disposition Alternatives* (see section IV.B) indicated that each of the options under consideration for plutonium disposition has its own advantages and disadvantages, and each can potentially provide high levels of security and safeguards for nuclear materials during the disposition process, mitigating the risk of theft of nuclear materials. Initial processing of plutonium pits and other forms is among the most proliferation-sensitive stages of the disposition process, but is largely common to all the options. Although the Assessment also concluded that none of the approaches is clearly superior to the others, both the Nonproliferation Assessment and a letter from the Secretary of Energy Advisory Board Task Force on the Nonproliferation and Arms Control Implications of Weapons-Usable Fissile Materials Disposition Alternatives (included as Appendix B to the Nonproliferation Assessment) concluded that the hybrid approach (both reactors/MOX and immobilization) is preferable because of uncertainties in each approach and because it would minimize potential delays should problems develop with either approach. Numerous comment letters have made similar points.

One such letter was received from five individuals who were the U.S. participants on the U.S.-Russian Independent Scientific Commission on Disposition of Excess Weapons Plutonium. This letter supported the dual-track approach on the grounds that "ruling out reactors and thus depending solely on vitrification as the only approach to plutonium disposition that might be implementable anytime soon, would have far bigger nonproliferation liabilities then would the two-track approach." These commentors argued that designating only immobilization as the preferred approach, with MOX as a back-up, would have essentially all the nonproliferation and arms reduction liabilities of a one-track approach, which would weaken the U.S. position and have severe consequences for the likely success of programs to carry out permanent disposition of weapons plutonium in Russia; and therefore jeopardize the success of programs to carry out U.S. disposition. These commentors stated that without the dual-track approach, the U.S. will lose any leverage it might have over the conditions and safeguards accompanying the use of Russian plutonium in their reactors. They also pointed out that pursuing both the MOX option and immobilization in the U.S. may be the best way to convince Russia, which currently favors converting its own plutonium to MOX fuel, of the value of immobilization for a portion of its excess plutonium. These commentors argued that the dual-track approach would not undermine U.S. nonproliferation policy, would not increase the risk of nuclear theft and terrorism, and would not lead to a new domestic plutonium recycle industry since it would not significantly affect the huge economic barriers to using MOX fuel on a commercial basis.

Two commentors expressed opposition to plutonium recycling (reprocessing), citing the *Final Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors* (GESMO), NUREG-0002, which was issued by the NRC in 1976, and President Carter's decision to ban plutonium recycling. DOE notes that plutonium recycling is not part of the plutonium disposition program or the decisions in this ROD; on the contrary, this ROD includes conditions on the use of MOX fuel that are intended to prevent the use of recycled plutonium.

The use of MOX fuel in existing reactors would be undertaken in a manner that is consistent with the United States' policy objective on the irreversibility of the nuclear disarmament process and the United States' policy discouraging the use of plutonium for civil purposes. To this end, implementing the MOX alternative would include government ownership and control of the MOX fuel fabrication facility at a DOE site, and use of the facility only for the surplus plutonium disposition program. There would be no reprocessing or subsequent reuse of spent MOX fuel. The MOX fuel would be used in a once-through fuel cycle in existing reactors, with appropriate arrangements, including contractual or licensing provisions, limiting use of MOX fuel to surplus plutonium disposition.

One commentor, who opposed MOX fuel use, urged DOE not to use European MOX fuel fabrication capability if the MOX approach is pursued. In this ROD, DOE has not decided to use European MOX fuel fabrication.

V. Decisions

A. Storage of Weapons-Usable Fissile Materials

Consistent with the Preferred Alternative in the S&D Final PEIS, the Department has decided to reduce, over time, the number of locations where the various forms of plutonium are stored, through a combination of storage alternatives in conjunction with a combination of disposition alternatives. DOE will begin implementing this decision by moving surplus plutonium from RFETS as soon as possible, transporting the pits to Pantex beginning in 1997, and non-pit plutonium materials to SRS upon completion of the expanded Actinide Packing and Storage Facility (APSF), anticipated in 2001. Over time, DOE will store this plutonium in upgraded facilities at Pantex and in the expanded APSF. Surplus and non-surplus HEU will be stored in upgraded facilities at ORR. Storage facilities for the surplus HEU will also be modified, as needed, to accommodate international inspection requirements consistent with the President's *Nonproliferation and Export Control Policy*. Accordingly, DOE has decided to pursue the following actions for storage:

- Phase out storage of all weapons-usable plutonium at RFETS beginning in 1997; move pits to Pantex, and non-pit materials to SRS upon completion of the expanded APSF. At Pantex, DOE will repackage pits from RFETS in Zone 12, then place them in existing storage facilities in Zone 4, pending completion of facility upgrades in Zone 12. At SRS, DOE will expand the planned new APSF, and move separated and stabilized non-pit plutonium materials from RFETS to the expanded APSF upon completion. The small number of pits currently at RFETS that are not in shippable form will be placed in a shippable condition in accordance with existing procedures prior to shipment to Pantex. Additionally, some pits and non-pit plutonium materials from RFETS could be used at SRS, LANL, and Lawrence Livermore National Laboratory (LLNL) for tests and demonstrations of aspects of disposition technologies (see disposition decision, below). All non-pit weapons-usable plutonium materials currently stored at RFETS are surplus.

The Department's decision to remove plutonium from RFETS is based on the cleanup agreement among DOE, EPA, and the State of Colorado for RFETS, the proximity of RFETS to the Denver metropolitan area, and the fact that some of the RFETS plutonium is currently stored in buildings 371 and 376, two of the most vulnerable facilities as defined by and identified in DOE's *Plutonium Working Group Report on Environmental, Safety, and Health Vulnerabilities Associated With the Department's Plutonium Storage* (DOE/EH-0414, November, 1994).

- Upgrade storage facilities at Zone 12 South (to be completed by 2004) at Pantex to store those surplus pits currently stored at Pantex, and surplus pits from RFETS, pending disposition. Storage facilities at Zone 4 will continue to be used for these pits prior to completion of the upgrade.
- In accordance with the preferred alternative in the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (Stockpile Stewardship and Management PEIS), store Strategic Reserve pits at Pantex in other upgraded facilities in Zone 12.

The Department's decision to consolidate pit storage at Pantex places the pits at a central location where most of the pits already reside and where the expertise and infrastructure are already in place to accommodate pit storage.[19] Pantex has more than 40 years of experience with the handling of pits. Zone 12 facilities would be modified for long-term storage of the Pantex plutonium inventory and the small number of pits transferred from RFETS and SRS for a modest cost (about $10 million capital cost). Pursuant to the *Final EIS for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE/EIS-0225), DOE is proposing to continue nuclear weapons stockpile management operations and related activities at the Pantex Plant, including

[19] A small number of research and development pits located at RFETS that have been and will continue to be packaged and returned to LANL and LLNL are outside the scope of the S&D PEIS and this ROD.

interim storage of up to 20,000 pits.[20] Consequently, the storage of surplus pits at Pantex would offer the opportunity to share trained people and other resources, and a decreased cost could be realized over other sites without similar experience. Using the Pantex Plant for pit storage would also involve the lowest cost and the least new construction relative to other sites.

- Expand the planned APSF at SRS (Upgrade Alternative) to store those surplus, non-pit plutonium materials currently at SRS and surplus non-pit plutonium materials from RFETS, pending disposition (see disposition decision, below). DOE analyzed the potential impacts of constructing and operating the APSF in the *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE/EIS-0220) and announced the decision to build the facility in the associated ROD (60 Fed. Reg. 65300, December 19, 1995). DOE, pursuant to the decisions announced here to store surplus non-pit plutonium at SRS, will likely design and build the APSF and the expanded space to accommodate the RFETS material as one building,[21] which DOE plans to complete in 2001. The RFETS surplus non-pit plutonium materials[22] will be moved to SRS after stabilization is performed at RFETS under corrective actions in response to Defense Nuclear Facilities Safety Board Recommendation 94-1; and after the material is packaged in DOE-approved storage and shipping containers pursuant to existing procedures. The surplus plutonium already on-site at SRS and the movement of separated and stabilized non-pit plutonium from RFETS would result in the storage of a maximum of 10 metric tons of surplus plutonium in the new, expanded APSF at SRS. In addition, shipment of the non-pit plutonium from RFETS to SRS, after stabilization, would only be implemented if the subsequent ROD for a plutonium disposition site (see Section V.B, below) calls for immobilization of plutonium at SRS. Placement of surplus, non-pit plutonium materials in a new storage facility at SRS will allow utilization of existing expertise and plutonium handling capabilities in a location where disposition activities could occur (see disposition decision, below). The decision to store non-pit plutonium from RFETS at SRS places most non-pit material at a plutonium-competent site with the most modern, state-of-the-art storage and processing facilities, and at a site with the only remaining large-scale chemical separation and processing capability in the DOE complex.[23] Pits currently located at SRS will be moved to Pantex for storage consistent with the Preferred Alternative in the Stockpile Stewardship and Management PEIS. There are no strategic non-pit materials currently located at SRS.

- Continue current storage (No Action) of surplus plutonium at Hanford and INEL, pending disposition (or movement to lag storage[24] at disposition facilities when selected).[25] This action will allow surplus plutonium to remain at the sites with existing expertise and plutonium handling capabilities, and where potential disposition activities could occur (see disposition decision, below). There are no non-surplus weapons-usable plutonium materials currently stored at either site.

- Continue current storage (No Action) of plutonium at LANL, pending disposition (or movement to lag storage at the disposition facilities). This plutonium will be stored in stabilized form with the non-surplus plutonium in the upgraded Nuclear Material Storage Facility pursuant to the No Action alternative for the site.

- Take No Action at the NTS. DOE will not introduce plutonium to sites that do not currently have plutonium in storage.

- Upgrade storage facilities at the Y-12 Plant (Y-12) (to be completed by 2004 or earlier) at ORR to store non-surplus HEU and surplus HEU pending disposition. Existing storage facilities at Y-12 will be modified to meet natural phenomena requirements, as documented in *Natural Phenomena Upgrade of the Downsized/Consolidated Oak Ridge Uranium/Lithium Plant Facilities* (Y/EN-5080, 1994). Storage facilities will be consolidated, and the storage footprint will be reduced, as surplus HEU is dispositioned and blended to low-enriched uranium, pursuant to

[20] The pits that are to be moved to Pantex pursuant to this ROD fall within the 20,000 pit limit.

[21] Building the APSF in this way, rather than as originally configured plus an expansion, will not increase the potential impacts of constructing and operating the facility beyond those analyzed in the S&D Final PEIS in conjunction with the analyses in the *Final Environmental Impact Statement, Interim Management of Nuclear Materials*.

[22] This decision does not include residues at RFETS that are less than 50-percent plutonium by weight, or scrub alloys. The management and disposition of those materials has been or is being considered in separate NEPA reviews. See *Environmental Assessment for Solid Residue Treatment, Repackaging, and Storage* (DOE/EA-1120, April 1996); Notice of Intent to Prepare an EIS on the *Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site* (61 Fed. Reg. 58866, November 19, 1996).

[23] SRS is one of the preferred candidate sites for plutonium disposition facilities, including the potential for the early start of disposition by immobilization using the can-in-canister option at the DWPF.

[24] Lag storage is temporary storage at the applicable disposition facility.

[25] Lawrence Livermore National Laboratory (LLNL) currently stores 0.3 metric tons of plutonium, which are primarily research and development and operational feedstock materials not surplus to government needs. Adequate storage facilities for this material currently exist at LLNL, where it will be stored and used for research and development activities. None of the plutonium stored at LLNL falls within the scope of the disposition alternatives in the S&D Final PEIS or the disposition decisions in this ROD.

the ROD for the *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (61 Fed. Reg. 40619, August 5, 1996). Consistent with the Preferred Alternative in the Stockpile Stewardship and Management PEIS, HEU strategic reserves will be stored at the Y-12 Plant.

B. Plutonium Disposition

Consistent with the Preferred Alternative in the S&D Final PEIS, DOE has decided to pursue a strategy for plutonium disposition that allows for immobilization of surplus weapons plutonium in glass or ceramic forms and burning of the surplus plutonium as mixed oxide fuel (MOX) in existing reactors. The decision to pursue disposition of the surplus plutonium using these approaches is supported by the analyses in the Disposition Technical Summary Report (section IV.A.2 above) and the Nonproliferation Assessment (section IV.B above), as well as the S&D Final PEIS. The results of additional technology development and demonstrations, site-specific environmental review, detailed cost proposals, nonproliferation considerations, and negotiations with Russia and other nations will ultimately determine the timing and extent to which MOX as well as immobilization is deployed. These efforts will provide the basis and flexibility for the United States to initiate disposition efforts either multilaterally or bilaterally through negotiations with other nations, or unilaterally as an example to Russia and other nations.

Pursuant to this decision, the United States policy not to encourage the civil use of plutonium and, accordingly, not to itself engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes, does not change. Although under this decision some plutonium may ultimately be burned in existing reactors, extensive measures will be pursued (see below) to ensure that federal support for this unique disposition mission does not encourage other civil uses of plutonium or plutonium reprocessing. The United States will maintain its commitments regarding the use of plutonium in civil nuclear programs in western Europe and Japan.

The Disposition Technical Summary Report (section IV.A.2 above) concluded that the lowest cost option for plutonium disposition would be immobilization using the can-in-canister variant and existing facilities to the maximum extent possible, with a net life-cycle cost of about $1.8 billion. The Disposition Technical Summary Report also estimated that the net life-cycle cost of the hybrid immobilization/MOX approach would be about $2.2 billion. The additional expense of pursuing the hybrid approach would be warranted by the increased flexibility it would provide, as noted in the Nonproliferation Assessment, to ensure that plutonium disposition could be initiated promptly should one of the approaches ultimately fail or be delayed. Establishing the means for expeditious plutonium disposition will also help provide the basis for an international cooperative effort that can result in reciprocal, irreversible plutonium disposition actions by Russia. This disposition strategy signals a strong U.S. commitment to reducing its stockpile of surplus plutonium, thereby effectively meeting the purpose of and need for the Proposed Action.

To accomplish the plutonium disposition mission, DOE will use, to the extent practical, new as well as modified existing buildings and facilities for portions of the disposition mission. DOE will analyze and compare existing and new buildings and facilities, and technology variations, in a subsequent, site-specific EIS. In addition, all disposition facilities will be designed or modified, as needed, to accommodate international inspection requirements consistent with the President's *Nonproliferation and Export Control Policy*. Accordingly, DOE has decided to pursue the following strategy and supporting actions for plutonium disposition:

- Immobilize plutonium materials using vitrification or ceramic immobilization at either Hanford or SRS, in new or existing facilities. Immobilization could be used for pure or impure forms of plutonium. In the subsequent EIS (referenced above), DOE anticipates that the preferred alternative for vitrification or ceramic immobilization will include the can-in-canister variant, utilizing the existing HLW and the DWPF at SRS (see below). Alternatively, new immobilization facilities could be built at Hanford or SRS. The immobilized material would be disposed of in a geologic repository. Pursuant to appropriate NEPA review, DOE will continue the research and development leading to the demonstration of the can-in-canister variant at the DWPF using surplus plutonium and the development of vitrification and ceramic formulations.

- Convert surplus plutonium materials into mixed oxide (MOX) fuel for use in existing reactors. Pure surplus plutonium materials including pits, pure metal, and oxides could be converted without extensive processing into MOX fuel for use in existing commercial reactors. Other, already separated forms of surplus plutonium would require additional purification. (This purification would not involve reprocessing of spent nuclear fuel.) The Government-produced MOX fuel (from plutonium declared surplus to defense needs) would be used in existing LWRs with a once-through fuel cycle, with no reprocessing or subsequent reuse of the spent fuel. In addition, DOE will explore appropriate contractual limits to ensure that any reactor license modification for use of the MOX fuel is limited to governmental purposes involving the disposition of surplus, weapons-usable plutonium, so as to discourage general civil use of plutonium-based fuel. The spent MOX fuel would be disposed of in a geologic repository. If partially completed LWRs were to be completed by other parties, they would be considered for this mission. The MOX fuel would be fabricated in a domestic, government-owned facility at one of four DOE sites (SRS, Hanford, INEL, or Pantex).

The Department reserves as an option the potential use of some MOX fuel in CANDU reactors in Canada in the event that a multilateral agreement to deploy this option is negotiated among Russia, Canada, and the United States. DOE will engage in a test and demonstration program for CANDU MOX fuel consistent with ongoing and potential future cooperative efforts with Russia and Canada. The test and demonstration activities could occur at LANL and at sites in Canada, potentially beginning in

1997, and will be based on appropriate NEPA review. Fabrication of MOX fuel for CANDU reactors would occur in a DOE facility, as would be true in the case of domestic LWRs. Strict security and safeguards would be employed in the fabrication and transport of MOX fuel to CANDU reactors, as well as domestic reactors. Whether, and the extent to which, the CANDU option is implemented will depend on multi-national agreements and the results of the test and demonstration activities.

Due to technology, complexity, timing, cost, and other factors that would be involved in purifying certain plutonium materials to make them suitable for potential use in MOX fuel, approximately 30 percent of the total quantity of plutonium that has been or may be declared surplus to defense needs would require extensive purification for use in MOX fuel, and therefore will likely be immobilized. Of the plutonium that is currently surplus, DOE will immobilize at least 8 metric tons that it has determined are not suitable for use in MOX fuel.[26] DOE reserves the option of using the immobilization approach for all of the surplus plutonium.

The timing and extent to which either option is ultimately utilized will depend on the results of international agreements, future technology development and demonstrations, site-specific environmental review, detailed cost proposals, and negotiations with Russia and other nations. In the event both technologies are utilized, because the time required for plutonium disposition using reactors would be longer than that for immobilization, it is probable that some surplus plutonium would be immobilized initially, prior to completion of reactor irradiation for other surplus plutonium. Implementation of this strategy will involve some or all of the following supporting actions:

- Construct and operate a plutonium vitrification facility or ceramic immobilization facility at either Hanford or SRS. DOE will analyze alternative locations at these two sites for constructing new buildings or using modified existing buildings in subsequent, site-specific NEPA review. SRS has existing facilities (the DWPF) and infrastructure to support an immobilization mission, and at Hanford, DOE has proposed constructing and operating immobilization facilities for the wastes in Hanford tanks.[27] DOE will not create new infrastructure for immobilizing plutonium with HLW or cesium at INEL, NTS, ORR, or Pantex. Due to the substantial timing and cost advantages associated with the can-in-canister option, as discussed in the *Technical Summary Report For Surplus Weapons-Usable Plutonium Disposition* and summarized in section IV.A.2, above, DOE anticipates that the proposed action for immobilization in the follow-on plutonium disposition EIS will include the use of the can-in-canister option at the DWPF at SRS for immobilizing a portion of the surplus, non-pit plutonium material.[28]

- Construct and operate a plutonium conversion facility for non-pit plutonium materials at either Hanford or SRS. DOE will collocate the plutonium conversion facility with the vitrification or ceramic immobilization facility discussed above. In subsequent, site-specific NEPA review, DOE will analyze alternative locations at Hanford and SRS for constructing new buildings or using modified existing buildings for the plutonium conversion facility.

- Construct and operate a pit disassembly/conversion facility at Hanford, INEL, Pantex, or SRS (only one site). DOE will not introduce plutonium to sites that do not currently have plutonium in storage. Therefore, two sites analyzed in the S&D PEIS, NTS and ORR, will not be considered further for plutonium disposition activities. DOE will analyze alternative locations at Hanford, INEL, Pantex, and SRS for constructing new buildings or using modified existing buildings in subsequent, site-specific NEPA review. Based on appropriate NEPA review, DOE anticipates demonstrating the Advanced Recovery and Integrated Extraction System (ARIES) concept at LANL for pit disassembly/conversion beginning in fiscal year 1997.

- Construct and operate a domestic, government-owned, limited-purpose MOX fuel fabrication facility at Hanford, INEL, Pantex, or SRS (only one site). As noted above, NTS and ORR will not be considered further for plutonium disposition activities. In follow-on NEPA review, DOE will analyze alternative locations at Hanford, INEL, Pantex, and SRS, for constructing new buildings or using modified existing buildings. The MOX fuel fabrication facility will serve only the limited mission of fabricating MOX fuel from plutonium declared surplus to U.S. defense

[26] The S&D Final PEIS, for purposes of analysis of impacts of the preferred alternative (using both reactors and immobilization), assumed that about 30 percent (approximately 17 MT) of the surplus plutonium materials might be immobilized because they are impure. DOE's decision here that immobilization will be used for at least 8 MT currently located at SRS and RFETS is based on DOE's current assessment that that quantity of material is so low in quality that its purification for use in MOX fuel would not be cost-effective. This decision does not preclude immobilizing all of the surplus plutonium, but it does preclude using the MOX/reactor approach for all of the material.

[27] See *Final Environmental Impact Statement for the Tank Waste Remediation System, Hanford Site, Richland, Washington* (DOE/EIS-0189, August 1996); ROD expected early in 1997.

[28] DOE expects to issue a Notice of Intent to prepare the follow-on EIS shortly following this ROD. Reasonable alternatives for the proposed action will be considered in the follow-on disposition EIS.

needs, with shut-down and decontamination and decommissioning of the facility upon completion of this mission.[29]

DOE's program for surplus plutonium disposition will be subject to the highest standards of safeguards and security for storage, transportation, and processing (particularly during operations that involve the greatest proliferation vulnerability, such as during MOX fuel preparation and transportation), and will include International Atomic Energy Agency verification as appropriate. Transportation of all plutonium-bearing materials under this program, including the transportation of prepared MOX fuel to reactors, will be accomplished using the DOE Transportation Safeguards Division's "Safe Secure Transports" (SSTs), which affords these materials the same level of transportation safety, security, and safeguards as is used for nuclear weapons.

Pursuant to appropriate NEPA review(s), DOE will continue research and development and engage in further testing and demonstrations of plutonium disposition technologies which may include: dissolution of small quantities of plutonium in both glass and ceramic formulation; experiments with immobilization equipment and systems; fabrication of MOX fuel pellets for demonstrations of reactor irradiation at INEL; mechanical milling and mixing of plutonium and uranium feed; and testing of shipping and storage containers for certification, in addition to the testing and demonstrations previously described for the can-in-canister immobilization variant, the ARIES system, and other plutonium processes.

DOE has decided not to pursue several disposition alternatives that were evaluated in the S&D PEIS: two deep borehole alternatives, electrometallurgical treatment, evolutionary reactors, and partially-completed reactors (unless they were completed by others, in which case they would qualify as existing reactors). Although the deep borehole options are technically attractive, the institutional uncertainties associated with siting of borehole facilities make timely implementation of this alternative unlikely. To implement the borehole alternatives, new legislation and regulations, or clarification of existing regulations, may be necessary. DOE has decided not to pursue the electrometallurgical treatment option for immobilization because its technology is less mature than vitrification or ceramic immobilization.[30] DOE has decided not to pursue evolutionary reactors or partially-completed reactors because they offer no advantages over existing reactors for plutonium disposition and would involve higher costs, greater regulatory uncertainties, higher environmental impacts from construction, and less timely commencement of disposition actions.

VI. Conclusion

DOE has decided to implement a program to provide for safe and secure storage of weapons-usable fissile materials and for disposition of weapons-usable plutonium that is declared excess to national security needs (now or in the future), as specified in the Preferred Alternative in the S&D Final PEIS. DOE will consolidate the storage of weapons-usable plutonium by upgrading and expanding existing facilities at the Pantex Plant in Texas and SRS in South Carolina, continuing storage of surplus plutonium currently onsite at Hanford, LANL, and INEL pending disposition, and continuing storage of weapons-usable HEU at DOE's Y-12 Plant in Tennessee, in upgraded and, as surplus HEU is down-blended under the ROD for *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement*, consolidated facilities. DOE will provide for disposition of surplus plutonium by pursuing a strategy that allows: **1) immobilization of surplus plutonium for disposal in a repository pursuant to the Nuclear Waste Policy Act, and 2) fabrication of surplus plutonium into MOX fuel, for use in existing domestic commercial reactors (and potentially CANDU reactors, depending on future agreements with Russia and Canada).** The timing and extent to which each of these disposition technologies is deployed will depend upon the results of future technology development and demonstrations, site-specific environmental review, detailed cost proposals, and the results of negotiations with Russia, Canada, and other nations. This programmatic decision is effective upon being made public, in accordance with DOE's regulations implementing NEPA (10 CFR § 1021.315). The goals of this program are to support U.S. nuclear weapons nonproliferation policy by reducing global stockpiles of excess fissile materials so that they may never be used in weapons again. This program will demonstrate the United States' commitment to its nonproliferation goals, as specified in the President's Nonproliferation and Export Control Policy of 1993, and provide an example for other nations, where stockpiles of surplus weapons-usable fissile materials may be less secure from potential theft or diversion than those in the United States, to encourage them to take similar actions.

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[29] DOE supports external regulation of its facilities, and in the *Report of Department of Energy Working Group on External Regulation* (DOE/UF-0001, December 1996), DOE proposed to seek legislation that would generally require NRC licenses for new DOE facilities. Therefore, DOE anticipates seeking an NRC license for the MOX fuel fabrication facility, which would be limited to a license to fabricate MOX fuel from plutonium declared surplus to defense needs. DOE may also seek legislation that would by statute limit the MOX fuel fabrication facility to disposition of surplus plutonium.

[30] An evaluation by the National Research Council in a recent report (see footnote 12, above) concluded that the electrometallurgical treatment process is not sufficiently mature to provide a reliable basis for timely plutonium disposition.

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

Issued in Washington, D.C., January 14, 1997.

Hazel R. O'Leary

Hazel R. O'Leary
Secretary

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Record of Decision

for the

Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement

Table of Contents

U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

January 14, 1997

List of Acronyms and Abbreviations

ALARA	as low as reasonably achievable
ANL-W	Argonne National Laboratory-West
APSF	Actinide Packaging and Storage Facility
ARIES	Advanced Recovery and Integrated Extraction System
BWR	boiling water reactor
CANDU	Canadian deuterium uranium
CEQ	Council on Environmental Quality
DOE	Department of Energy
DWPF	Defense Waste Processing Facility
EIS	environmental impact statement
EPA	Environmental Protection Agency
FFTF	Fast Flux Test Facility
FONSI	Finding of No Significant Impact
GBZ	Glass-bonded zeolite
Hanford	Hanford Site
HEU	highly enriched uranium
HLW	high-level waste
IAEA	International Atomic Energy Agency
INEL	Idaho National Engineering Laboratory
IP	Implementation Plan
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
LWR	Light Water Reactor
MEI	maximally exposed individual
MOX	mixed oxide
NEPA	*National Environmental Policy Act*
NOI	Notice of Intent
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NWPA	*Nuclear Waste Policy Act*
ORR	Oak Ridge Reservation
Pantex	Pantex Plant
PWR	pressurized water reactor
R&D	research and development
RCRA	*Resource Conservation and Recovery Act*
RFETS	Rocky Flats Environmental Technology Site
ROD	Record of Decision
S&D PEIS	*Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement*
SRS	Savannah River Site
SST	safe secure transport
TSR PEIS	*Tritium Supply and Recycling Programmatic Environmental Impact Statement*
TSRs	Technical Summary Reports
Y-12	Y-12 Plant
Y-12 EA	*Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Level at the Y-12 Plant, Oak Ridge, Tennessee*

Chemicals and Units of Measure

cm	centimeter
Cs-137	cesium-137
CsCl	cesium chloride
in	inch
kg	kilogram
km	kilometer
lb	pound
mi	mile
MT	metric ton
PuO_2	plutonium dioxide
UO_2	uranium dioxide

DOE F 1270.1
(08-92)

U.S. DEPARTMENT OF ENERGY
INTERAGENCY AGREEMENT FACE PAGE

FUNDS-OUT INTERAGENCY AGREEMENT (IA)
Pursuant to
Authority of the Economy Act of 1932
as amended by (31 U.S.C. 1535), P.L. 95-91

2. TYPE OF ACTION:
☐ New Award ☒ Modification ☐ Extension ☐ Other

1. IDENTIFICATION:
a. DOE IA No.: DE-AI01-97MD10203
b. Other agency IA No.:
c. Modification No.: M005
d. Task order No.:
e. PR# 01-97MD10203.002

3. PROJECT TITLE/DESCRIPTION:
Technical Support for the Preparation and Review of Licensing and Compliance and Documents

4. AGREEMENT PERIOD (month, day, year)
From: 09/01/95 To: 08/31/99

5. FINANCIAL
a. Accounting and Appropriation Data:
Not Applicable

b. Funding sources
Previous DOE Funding $128,000
$
$
DOE $
Agency $ 0
Total Funding $128,000

c. Method of Payment:
☐ Advance ☒ Reimbursement ☐ Progress

d. Amount obligated this action: $ 0

e. Invoices, if any, submit to:
Department of Energy
Office of the Controller
P.O. 2500, Germantown, MD 20767

f. Voucher Form to be used:
OPAC (ALC 89000001)

6. DOE PROGRAM OFFICER
Name: Andre Cygelman, Director, Materials and Immobilization Group
Address: Office of Fissile Materials Disposition
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
Telephone Number: (202) 586-8814

7. PERFORMING AGENCY
a. Name: U.S. Nuclear Regulatory Commission
Division of Fuels Cycle Safety and Safeguards
b. Address: M.S. T-8-A-33
Washington, D.C. 20555
Attention: Vanice Perin

c. Program Director
Name: Vanice Perin
Address: Nuclear Regulatory Commission
Washington, D.C. 20555
Telephone Number: (301) 415-8143

8. ISSUING AGENCY:
Department of Energy (DOE) Calvin Lee, HR-542
Office of Placement and Administration
1000 Independence Avenue, S.W.
Washington, D.C. 20585

9. PERFORMING AGENCY ACCEPTANCE:
Carl J. Paperiello (signature) 7/2/97 (date)
Name (typewritten): Carl J. Paperiello
Title (typewritten): Director, NMSS
Telephone: (301) 415-7800

10. DOE CONTRACTING OFFICER:
John T. Harris (signature) JUN 12 1997 (date)
Name (typewritten): John T. Harris
Title (typewritten): Contracting Officer

ATTACHMENT 2

The purpose(s) of this modification are to (1) revise the schedule, (2) revise the terms and conditions (3) revise the statement of work and incorporate a revised reporting requirement checklist under the exisiting interagency agreement DE-AI01-97MD10203.

Accordingly:

(1) appended hereto is the revised Schedule. In addition, Attachment A - General Terms and Conditions.

(2) Attachment B - Statement of Work, and Attachment C - Reporting Requirement Checklist, are hereby incorporated in the existing Interagency Agreement.

All other terms and conditions remain unchanged and in full force and effect.

DOE FUNDS-OUT INTERAGENCY AGREEMENT (IA)

CONTENTS

SCHEDULE OF DEPARTMENT OF ENERGY (DOE) FUNDS-OUT INTERAGENCY AGREEMENT (IA) BETWEEN DOE AND U.S. NUCLEAR REGULATORY COMMISSION (NRC)

I. PURPOSE

The purpose of this effort is to assist the Office of Fissile Materials Disposition in the review of licensing and compliance plans for technologies and associated facilities under consideration for the disposition of fissile materials. These technologies include nuclear reactors consuming mixed oxide fuel and immobilization of fissile materials in glass or ceramic forms. This effort conforms with the January 15, 1997 MOU between NRC and DOE for Cooperation in Support of Significant Projects and Activities.

II. STATEMENT OF WORK

The Scope of Work is contained in Attachment B to this agreement.

III. COST

The total estimated cost for accomplishing the Statement of Work requirements is $800,000. Costs will be billed in accordance with NRC policy for charging full costs for reimbursable work. NRC policy requires charging for direct staff time based upon the hourly rate as established in 10 CFR Part 170, in addition to any contractor costs incurred in order to perform services specified in the Statement of Work.

IV. DELIVERABLES/REPORTS

See Attachment C, Reporting Requirements Checklist.

V. DURATION OF AGREEMENT

The period of performance shall be for forty-eight (48) months from September 1, 1995.

VI. PROJECT OFFICERS

DOE: Andre Cygelman, Materials and Immobilization Group
Office of Fissile Materials Disposition
U.S. Department of Energy, MD-3/Rm 6G092
Washington, D.C. 20585
Telephone: (202) 586-8814
Facsimile: (202) 586-3883

NRC: Vanice Perin
U.S. Nuclear Regulatory Commission
Division of Fuel Cycle Safety & Safeguards
M.S. T-8-A-33
Washington, D.C. 20555
Telephone: (301) 415-8143
Facsimile: (301) 415-5390

VII. OBLIGATION OF FUNDS

Total amount obligated by DOE: Cumulative $128,000

VIII. PAYMENT

a. Voucher form to be used, see block 5(f), face page.
b. DOE Accounting Appropriation Data, see block 5(a), face page.
c. DOE Interagency Agreement Number, see block 1(a), face page.
d. DOE Mailing Address, see block 5(e), face page.
e. Method of Payment, see block 5(c), face page.

IX. DOCUMENTS ATTACHED AND PART OF THIS AGREEMENT

a. General Provisions for DOE Interagency Agreement, Attachment A.
b. Statement of Work, Attachment B.
c. Reporting Requirements Checklist, Attachment C.

X. DOCUMENT INCORPORATED BY REFERENCE

Documents incorporated by reference in any of the above documents have the same force and effect as if physically included within the Agreement.

XI. OTHER

The DOE Contract Specialist's address and phone number are as follows:

U.S. Department of Energy
Office of Placement and Administration
Attn: Calvin Lee, HR-561.22
1000 Independence Ave., S.W.
Washington, D.C. 20585

XII. REAL PROPERTY AND FACILITIES

There is no real property or facilities under this Agreement.

XIII. MODIFICATIONS

Adjustments to the amount of funds obligated on the Face Page and in paragraph VII of this Schedule require formal modifications to this agreement. Formal modifications are executed by issuance of DOE Form 1270.1, or equivalent, signed by both a DOE contracting officer and an NRC official authorized to accept the modification.

ATTACHMENT A

GENERAL PROVISIONS
FOR DOE INTERAGENCY AGREEMENT (IA)

1. Definitions. For purposes of this agreement, "DOE" means the United States Department of Energy or any duly authorized representative thereof, and "Agency" means the performing agency stated in the agreement or any duly authorized representative thereof.

2. Cost Chargeable to DOE Funds. Direct costs are those that can be directly identified with and charged to the work under the agreement and within the limitations set forth below. Examples of such costs are salaries, wages, technical services, materials, travel and transportation, communications, and any facilities and equipment expressly approved or purchased under the interagency agreement.

   a. Foreign travel is allowable only when the trip has received the advance approval of the DOE Contracting Officer.

   b. Direct reimbursement for expenditures at technical meetings and seminars at which attendance is not required by DOE shall be allowable without prior written approval of the DOE Contracting Officer.

3. Financing. DOE will finance programs on a reimbursable basis when acceptable to the other agency. If the reimbursable basis is not acceptable, however, then DOE will finance the work by a Consolidated Working Fund Advance, preferably on a quarterly basis, or by an appropriation transfer or transfer appropriation. DOE will reimburse or will make available, in advance, the amount specified in the Interagency Agreement incorporating these general provisions. Requests for funds shall show separately the amount required for (a) operating costs, (b) capital equipment (as defined in 9 below), and (c) acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction or expansion.

   a. Vouchers for payment will be submitted on the agreed upon form.

   b. Any funds which are expected to remain beyond the original period of performance for a project which is incomplete, or for which there is an increased statement of work, will remain available to the agency if the IA is amended by the DOE to extend the period of performance for the research project or any other work beyond the original completion date. Request for such time extensions should be made to the DOE by the agency at least 30 days prior to the end of the performance period.

   c. When applicable, funds obligated by DOE for a continuing project remain available for the entire performance period of the project, unless there is a date specified as a required completion date after which no further funds shall be expended.

   d. Any funds remaining after the completion of a project shall be returned to the DOE.

4. Notice of Costs Approaching Total Estimated Costs. Whenever the agency has reason to believe that the total costs of the work under this agreement will be substantially greater or less than the presently estimated cost of the work, the agency shall promptly notify the DOE in writing. The agency shall also notify the DOE, in writing, when the aggregate cost incurred and outstanding commitments allowable under this agreement equal 90 percent (or such other percentage as the DOE may from time to time establish by notice to the agency) of the presently estimated

total costs under this agreement. When the costs incurred and outstanding commitments equal 100 percent of such estimated total costs, the agency shall make no further commitments or expenditures (except to meet existing commitments) and shall be excused from further performance of the work unless and until the DOE shall increase the total estimated costs to be incurred with respect to this agreement.

5. Excess Funds. The agency shall take prompt action to return to the DOE any funds determined to be excess to the work during the performance of the work and any unobligated funds after the completion of the agreement, unless the agreement has been extended and any unused balances have been carried forward in the extension. In a joint venture project where the performing agency deposits the advance in any annual consolidated working funds, any unobligated balances shall be returned to the DOE before the cutoff date at the close of each fiscal year.

6. Financial Reports. The agency shall furnish the DOE, not later than 15 days after the close of each quarter, cost or financial reports in such form and detail as may be required by the DOE. Any costs incurred for capital equipment or other assets shall be supported by a list showing the description, make, any serial number, and the cost of each item acquired.

7. Accounting Records. The agency shall accumulate and account for obligations and costs incurred in connection with the work being performed under this agreement in such form and detail as may be required by the DOE.

8. Termination. The DOE may terminate this agreement upon 90 days written notice of such termination addressed to the agency. In the event of such termination the agency shall be reimbursed, to the extent permitted, for obligations actually incurred to the effective date of termination and for commitments extending beyond the effective date of termination to a date not later than the date upon which the agreement would have expired if not terminated under this paragraph, which the agency, in the exercise of due diligence, is unable to cancel. Payments under this agreement, including payments under this article, shall not exceed the ceiling amount elsewhere specified in this agreement.

9. Capital Equipment.

   a. "Capital Equipment" means each item of equipment which is expected to have an extended period of service, generally a year or more, and has sufficient monetary value, generally of $500 or more, to justify continuing accounting records for the item.

   b. Unless expressly authorized by the Contracting Officer in advance, the agency shall not be reimbursed or use funds made available under this agreement for the procurement or fabrication of capital equipment.

   c. If capital equipment is purchased or otherwise acquired pursuant to an authorization under paragraph (b) above, except as may be otherwise agreed by the DOE and the agency.

      (1) the title thereto shall vest in the DOE,

      (2) the agency shall be responsible for the maintenance and safeguarding thereof, and

      (3) the agency shall maintain a record in such a manner as to insure adequate control and accounting satisfactory to the DOE, of capital equipment procured or fabricated.

10. Real Property and Facilities.

a. Unless expressly authorized by the Contracting Office in advance, the agency shall not be reimbursed or use funds made available under this agreement for the acquisition or condemnation of any real property of any facility or for plant or facility acquisition, construction or expansion.

b. If the agency acquires or condemns any real property or any facility or acquires, constructs, or expands any plant or facility pursuant to an authorization under (a) above, except as may be otherwise agreed by the DOE and the agency.

(1) title thereto shall vest in the DOE, and property accountability and control shall become the responsibility of the DOE,

(2) the agency shall be responsible for the maintenance and safeguarding thereof, and

(3) the agency shall maintain a record thereof in such a manner as to insure adequate control and accounting satisfactory to the DOE.

11. Security of Restricted Data.

a. CONTRACTING AGENCY'S DUTY TO SAFEGUARD RESTRICTED DATA, FORMERLY RESTRICTED DATA, AND OTHER CLASSIFIED INFORMATION. The agency shall, in accordance with DOE security regulations and requirements, be responsible for safeguarding restricted data, formerly restricted data, and other classified information, and protecting against sabotage, espionage, loss and theft of the classified documents and material in the agency's possession in connection with the performance of work under this agreement.

Except as otherwise expressly provided in this agreement, the agency shall upon completion or termination of this agreement, transmit to DOE any classified matter in the possession of the agency or any person under the agency's control in connection with performance of this agreement. If retention by the agency of any classified matter is required after the completion or termination of the agreement and such retention is approved by the DOE, the agency will complete a certificate of possession to be furnished to DOE specifying the classified matter to be retained. The certification shall identify the items and types or categories of matter retained, the conditions governing the retention of the matter and the period of retention, if known. If the retention is approved by the DOE, the security provisions of the agreement will continue to apply to the matter retained.

b. REGULATIONS. The agency agrees to conform to all security regulations and requirements of DOE.

c. DEFINITION OF RESTRICTED DATA. The term "restricted data," as used in this clause, means all data concerning (1) design, manufacture, or utilization of atomic weapons, (2) the production of special nuclear material, (3) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the restricted data category pursuant to Section 142 of the Atomic Energy Act of 1954.

d. DEFINITION OF FORMERLY RESTRICTED DATA. The term "formerly restricted data," as used in this clause, means all data removed from the restricted data category under Section 142d of the Atomic Energy Act of 1954, as amended.

e. SECURITY CLEARANCE OF PERSONNEL. The agency shall not permit any individual to have access to restricted data, formerly restricted data, or other classified information, except in accordance with the Atomic Energy Act of 1954, as amended, and the DOE's regulations or requirements which apply to the particular type or category of classified information to which access is required.

f. CRIMINAL LIABILITY. It is understood that disclosure of restricted data, formerly restricted data, or other classified material relating to the work or services hereunder to any person not entitled to receive it, or failure to safeguard any restricted data, formerly restricted data, or other classified material that control in connection with the work under this agreement, may subject any representatives of the agency, its agents, employees or subcontractors to criminal liability under the laws of the United States. (See the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2100 et seq., 18 U.S.C. 793 and 794, and Executive Order 11652.)

g. CONTRACTS AND PURCHASE ORDERS. Except as otherwise authorized in writing by DOE, the agency shall insert provisions similar to the foregoing in all contracts and purchase orders under this agreement.

h. SECURITY REQUIREMENTS FOR PROPRIETARY ENERGY DATA. The agency shall safeguard DOE limited official use information, or other proprietary or sensitive data (including material relating to patents), from unauthorized access, disclosure, modification or destruction in accordance with applicable DOE security regulations, orders and directives.

i. COMPUTER SECURITY REQUIREMENTS. In the event that this agreement involves utilization of a DOE computer system, the agency will establish administrative, technical and physical security procedures in accordance with DOE regulations to ensure against access to DOE information to individuals not formally authorized by DOE to possess such information.

12. CLASSIFICATION. In the performance of the work under this agreement, the agency shall assign or obtain classifications to all documents, material, and equipment originated or generated by the agency in accordance with classification guidance furnished to the agency by the DOE. Every subcontract and purchase order issued hereunder involving the origination or generation of classified documents, material, or equipment shall include a provision to the effect that in the performance of such subcontract or purchase order, the subcontractor or supplier shall assign classifications to all such documents, material, and equipment in accordance with classification guidance furnished to each subcontractor or supplier by the agency.

13. TECHNICAL PROGRESS REPORTS - PUBLICATION. The agency will make such reports to the DOE on the progress of the work under this agreement as may be mutually agreed upon.

It is the policy of DOE to make the results of the research, development and demonstration work contemplated under interagency agreements broadly available to the scientific, technical and engineering community and others through the timely publication of reports or journal articles. All publications and engineering materials prepared under the IA will be freely exchanged and made available for public sale unless classified, and a minimum of two copies sent to the DOE Technical Information Center (TIC), P.O. Box 62, Oak Ridge, Tennessee 37830. Each IA technical report issued and each task order technical report issued pursuant to a master IA will be accompanied by a DOE Form 537 and a statement describing the technical reports delivered and will be sent to TIC for incorporation into the Technical Information Management System (TIMS).

14. ENVIRONMENTAL, SAFETY AND HEALTH REQUIREMENTS. DOE will not assume responsibility for prescribing and/or enforcing environmental safety and health requirements for operators of other agency facilities engaged in the performance of DOE work.

ATTACHMENT B

Statement of Work for NRC
in Support of
DOE Fissile Materials Disposition Program

Purpose of NRC Support:

To provide review and advice to DOE on licensing and permitting strategies and plans being developed by DOE addressing the implementation of technologies selected for disposition of surplus fissile materials. Early interactions with the NRC are needed to assure that the information being developed to support DOE's plans for implementation is correct and that the licensing strategies being considered by DOE have the potential to succeed.

Background:

DOE decided on January 14, 1997, in a Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement to implement a program to provide for safe and secure storage of weapons-usable fissile materials and a strategy for the disposition of surplus weapons-usable plutonium. DOE's strategy for disposition of surplus plutonium is to pursue an approach that allows immobilization of surplus plutonium in glass or ceramic for disposal in a geologic repository pursuant to the Nuclear Waste Policy Act, and burning of some of the surplus plutonium as mixed-oxide (MOX) fuel in existing, domestic, commercial reactors, with subsequent disposal of the spent fuel in a geologic repository pursuant to the Nuclear Waste Policy Act.

Under the immobilization approach, surplus plutonium would be immobilized to create a chemically stable form for disposal. The plutonium material would be surrounded by high-level waste to create a radiation field that could serve as a proliferation deterrent. Under the reactor approach, DOE would have surplus plutonium fabricated into MOX fuel for use in existing commercial LWRs in the United States, where the MOX fuel would be used instead of conventional UO2 fuel. The irradiated fuel would reduce the proliferation risks of the plutonium material, and the reactors would also generate electricity. MOX fuel would be used in a once-through fuel cycle, with no reprocessing or subsequent reuse of spent fuel. An option to use some of the MOX fuel in the Canadian Deuterium Uranium reactors would depend on a multilateral agreement to deploy this option.

As part of the implementation process, DOE is developing strategies and plans for the immobilization and reactor approaches that address licensing and compliance activities in the areas of safety, domestic and international safeguards that could affect implementation schedules and cost estimates. These areas would also include design, construction and operation of facilities, as well as transportation and plutonium material qualification issues. These plans will need to consider the specific steps needed to obtain a license and identification of the information needed to support each of the licensing steps including questions of legislative authority. The information developed will be used to support the selection of implementation strategies and the development of more detailed cost and schedule plans.

Scope of NRC Work:

The scope of work includes NRC comments to DOE strategies and plans. The principal technical effort will be in NRC review of information provided by DOE and interaction among NRC and DOE/DOE contractors to discuss regulatory strategies and associated plans, schedule and related questions. A one-page Task Order shall be issued for work to be performed by NRC, which includes the minimum information as required by Management Directive II.7, "NRC Procedures for Placement and Monitoring of Work with the Department of Energy," Exhibit 8, Statement of Work Format and Instructions. Meetings will be open to the public, except when discussing proprietary, classified, and any other information protected by provisions of the Atomic Energy Act.

Specific Activities will Include:

- NRC preparation for meetings with DOE and DOE contractors. Preparation will involve coordination of participants and review of information provided by DOE in advance of the meetings.
- NRC participation in meetings with DOE and DOE contractors to discuss and provide comments on the information provided by DOE, to provide guidance, and to address specific questions.
- NRC review and comment on meeting records developed by DOE and DOE contractors to summarize discussions and information previously provided by NRC.
- NRC follow-up work to address outstanding questions from meetings with DOE and DOE contractors. DOE will be responsible for documenting answers and amending the meeting records.
- NRC review of regulatory plans (including schedules and level-of-effort) developed by DOE. These plans will incorporate information obtained during meetings with NRC.
- NRC identification of legislative actions needed to implement strategies and participate in drafting such legislative additions or changes.

Products:

Annotated comments on DOE supplied licensing strategies and plans.

To minimize resources expended and to expedite communications, DOE will be responsible for documenting interactions with NRC. This documentation will be coordinated with NRC to assure that the documentation accurately reflects the communications.

ATTACHMENT C

DOE F 1332.1
(04-89)
All other editions obsolete

U.S. DEPARTMENT OF ENERGY
REPORTING REQUIREMENTS CHECKLIST

1. PROGRAM/PROJECT TITLE
Technical Support For Licensing & Regulatory Compliance Plans

2. IDENTIFICATION NUMBER
DE-AI01-97MD10203

3. PARTICIPANT NAME AND ADDRESS
U.S. Nuclear Regulatory Commission Division of Fuel Cycle Safety & Safeguards, M.S. T-I-A-33, Washington, D.C.

4. PLANNING AND REPORTING REQUIREMENTS

	Frequency
A. General Management	
[ ] Management Plan	
[ ] Status Report	
[ ] Summary Report	
B. Schedule/Labor/Cost	
[ ] Milestone Schedule/Plan	
[ ] Labor Plan	
[ ] Facilities Capital Cost of Money Factors Computation	
[ ] Contract Facilities Capital and Cost of Money	
[ ] Cost Plan	
[x] Milestone Schedule/Status	Q
[ ] Labor Management Report	
[x] Cost Management Report	Q
C. Exception Reports	
[ ] Conference Record	
[ ] Hot Line Report	
D. Performance Measurement	
[ ] Management Control System Description	
[ ] WBS Dictionary	
[ ] Index	
[ ] Element Definition	
[ ] Cost Performance Report	
[ ] Format 1 — WBS	
[ ] Format 2 — Functional	
[ ] Format 3 — Baseline	

	Frequency
E. Financial Statements	
[ ] Statement of Income and Expense	
[ ] Balance Sheet	
[ ] Cash Flow Statement	
[ ] Statement of Changes in Financial Position	
[ ] Loan Drawdown Report	
[ ] Operating Budget	
[ ] Supplementary Information	
F. Technical	
[ ] Notice of Energy RD&D Project (Required with any of the following)	
[ ] Technical Progress Report	
[ ] Draft for Review	
[ ] Final for Approval	
[ ] Topical Report	
[ ] Final Technical Report	
[ ] Draft for Review	
[ ] Final for Approval	
[ ] Software	
[ ] Other (Specify)	

5. FREQUENCY CODES

A — As Required
C — Change in Contractual Agreement
F — Final (end of effort)
M — Monthly
O — Once After Award
Q — Quarterly
S — Semi-Annually
X — With Proposal/EA/Application or with Significant Change
Y — Yearly at Upon Renewal of Contractual Agreement

6. SPECIAL INSTRUCTIONS (ATTACHMENTS)

[ ] Report Distribution List/Addresses
[ ] Reporting Elements
[ ] Due Dates
[ ] Analysis Thresholds
[ ] Work Breakdown Structure
[ ] Other

7. PREPARED BY (SIGNATURE AND DATE)
Sandra Haller [signature] 5/28/97

8. REVIEWED BY (SIGNATURE AND DATE)
Andre Cygelman [signature] 5-28-97

*U.S. GPO

Program Acquisition Strategy for Obtaining Mixed Oxide Fuel Fabrication and Reactor Irradiation Services (PAS)

Date Published: July 17, 1997

Prepared by:
The Office of Fissile Materials Disposition
United States Department of Energy

ATTACHMENT 3

TABLE OF CONTENTS

1. INTRODUCTION

The Department of Energy (DOE) issued the Record of Decision (ROD) for the Storage and Disposition of Weapons-Usable Fissile Materials, including surplus plutonium, on January 14, 1997. In that ROD, the Department decided to pursue a strategy for plutonium disposition that allows for immobilization of surplus weapons plutonium in glass or ceramic forms and irradiating the surplus plutonium as mixed oxide (MOX) fuel in existing reactors, while reserving the option to immobilize all the surplus weapons-usable plutonium. The Department also decided that the extent to which either or both of these disposition approaches would ultimately be deployed would depend in part upon future National Environmental Policy Act (NEPA) review for surplus weapons plutonium disposition, although the Department committed to immobilize at least 8 metric tonnes of currently declared surplus plutonium.

The January 14, 1997 ROD stated that the United States would pursue the use of domestic light water reactors (LWRs) for the MOX fuel approach to effect the disposition of its surplus plutonium. The ROD also stated that the United States would consider the use of Canadian Deuterium Oxide Natural Uranium (CANDU) reactors if international agreements with the Russian Federation and Canada were reached to implement disposition of U.S. and Russian plutonium as part of an international plutonium disposition campaign. Accordingly, the present document focuses on the disposition of U.S. plutonium absent any agreement with the Russian Federation to implement plutonium disposition. However, in the event that an international agreement is reached with the Russians and the Canadians to utilize CANDU reactors for the disposition of surplus plutonium, MOX fuel efforts will be modified as necessary. To prepare for this contingency, the Department is working with the Canadian Federal Government and nuclear industry to examine technical, economic, safety, nonproliferation, and environmental issues related to the use of MOX fuel in CANDU reactors. A program is underway to fabricate and test small quantities of MOX fuel at prototypic conditions in a Canadian research reactor. Adequate space will be provided in the MOX fuel fabrication facility to accommodate the fabrication of both LWR and CANDU MOX fuel.

An integral part of the MOX fuel approach is acquisition from the private sector of MOX fuel fabrication and reactor irradiation services. The purpose of this document is to describe the DOE's intended approach for acquiring these services and to request comments from prospective offerors in advance of publishing a draft Request for Proposals. A technical description of the mission is provided in Attachment A.

As indicated in its announcement in the Commerce Business Daily (March 24, 1997), DOE prefers to use a single consortium to provide all services. If this approach is adopted, the selection of a consortium to provide the services for the disposition of plutonium in reactors would be pursued in parallel with determining whether to ultimately use the MOX fuel approach, and if so, the location for a domestic MOX fuel fabrication facility. A Surplus Plutonium Disposition Environmental Impact Statement (EIS) is being prepared by the DOE to analyze, among other things, the expected environmental impacts associated with establishing a domestic MOX fuel fabrication capability. The decision whether to use the MOX fuel approach, and if so, the siting for the MOX fuel fabrication facility (at a DOE site) will be determined in the Surplus Plutonium Disposition ROD in compliance with the NEPA. The Department will not construct or operate a MOX fuel fabrication facility nor irradiate MOX fuel in commercial nuclear reactors until issuance of, and depending on decisions in, the Surplus Plutonium Disposition ROD. Contract award will not be made until the Surplus Plutonium Disposition ROD is issued.

For the purposes of this document, the following terms are defined:

- Reactor irradiation services: includes all the functions that are necessary to permit the irradiation of MOX fuel elements in commercial LWRs under license from the Nuclear Regulatory Commission (NRC). The term includes, for example, performing all the design and engineering services to modify reactors and facilities to use MOX fuel, identifying and performing necessary fuel qualification activities, obtaining NRC license modifications, preparing any necessary federal, state and local environmental permit/other documentation, performing core design and fuel design services, irradiating the fuel, safeguarding fresh fuel under applicable security measures, and storing irradiated fuel pending disposal actions.
- Fuel fabrication services: includes all the functions that are necessary to develop a domestic MOX fuel fabrication facility at a DOE site. The Department anticipates NRC licensing of the MOX fuel fabrication facility, although it is clear that legislation would be required for such external regulation of a DOE-owned facility. The scope of fuel fabrication services includes designing, building/modifying, licensing, and operating a fuel fabrication facility, supplying commercial nuclear fuel for the proposed reactors, and, ultimately, decontaminating and decommissioning the facility.
- Consortium: a team of firms that has the expertise and capabilities to perform the functions outlined in Section A.2.1.2 of Attachment A that are necessary to accomplish the mission.

All references to reactor irradiation, MOX fuel fabrication, consortium, and the like should be understood to mean "potential" reactor irradiation, fuel fabrication, consortium, and so forth, since the Department has not and will not decide whether to ultimately deploy the MOX fuel option until it issues the Surplus Plutonium Disposition ROD.

2. OVERALL DOE PROCUREMENT APPROACH

2.1 CONSORTIUM PREFERENCE

DOE is pursuing the transformation of plutonium oxide powder derived from surplus plutonium to the spent fuel standard (making the plutonium as difficult to recover and as unattractive for use in weapons as the plutonium in existing commercial spent nuclear fuel). To do so will require both fuel fabrication and reactor irradiation services. DOE prefers that the two services be coupled and integrated by a single consortium. The consortium approach would maximize private sector participation and provide for the coordination of all services within the consortium. Most importantly, it would encourage traditional business relationships among fuel designers, fuel fabricators, reactor vendors, reactor operators, and architect-engineers, including retaining the long-standing relationship between utilities and their fuel fabricators. It would also simplify negotiations and contractual relationships between DOE and the selected consortium.

2.2 CONSORTIUM SELECTION APPROACH

DOE's strategy is to acquire fuel fabrication and reactor irradiation services in a manner which: (1) promotes competition; (2) limits the time and effort expended by the offerors and DOE; and (3) simplifies the final selection process. DOE is considering awarding one contract to a consortium to perform all aspects of the Statement of Work (SOW) in the Request for Proposals (RFP). A Source Selection Official (SSO) will appoint a Source Evaluation Board (SEB) which will review the proposals and evaluate them against the stated evaluation criteria. The SSO will then select the offeror offering the best value to the government.

2.3 NEAR-TERM PROCUREMENT PLANS

This document identifies DOE's plans for acquisition of services. The document is provided as a reference for prospective offerors and to solicit comments.

The comment period will include an opportunity for prospective offerors and the public to submit their questions and comments to DOE in writing. Written comments and suggestions provided to DOE are for the intent of obtaining input to prepare a draft RFP. The submitter's name and organization and any proprietary information will be withheld from release to the public to the extent allowed by law. Prospective offerors are strongly encouraged to provide comments on the PAS in order to assist DOE in the formulation of a draft RFP that is acceptable to both the government and prospective offerors.

To obtain early comments, DOE will convene a PAS workshop for prospective offerors in which a dialogue and question and answer session will be held. DOE does not commit to answer all inquiries but will provide answers to advance the solicitation. The DOE officials involved in the procurement processes and contractors assisting DOE in the acquisition will not meet personally with individuals representing prospective offerors on any matter potentially impacting the procurement processes during the PAS public comment period, except at the PAS Workshop. All contact with DOE and its contractors in reference to this procurement can only be made through the SEB Chairman or designated representative.

The Department is proposing to issue a draft RFP that will consider comments on the PAS from prospective offerors and others. This draft RFP will be issued by DOE to obtain comments from prospective offerors on specific contractual requirements proposed by DOE.

In response to the comments and feedback from the PAS and the draft RFP, DOE intends to issue an RFP. Prospective offerors will be asked to submit written proposals which DOE will evaluate against the criteria in the RFP in accordance with DOE and Federal Acquisition Regulations (FAR).

3. SCHEDULE FOR PROCUREMENT ACTIONS

These are approximate dates for the actions identified in this plan. The dates may be changed at the sole discretion of DOE:

03/24/97	Issue Commerce Business Daily (CBD) Announcement for PAS
07/17/97	Issue PAS
08/15/97	Initial comments due on PAS
08/28/97	PAS Workshop
09/12/97	Final comments due on PAS
11/97	Issue Draft Request for Proposals
02/98	Issue Request for Proposals
05/98	Proposals Due
09/98	Award contract

4. INFORMATION INCLUDED WITH THIS DOCUMENT

Attachment A Mission Technical Overview. This attachment provides prospective offerors with DOE's planning basis for pursuing and potentially implementing the reactor option and the subsequent mission requirements and is prepared as a means to elicit comments.

Attachment B Qualification and Evaluation Criteria. This attachment specifies the qualification and evaluation criteria that DOE anticipates using to select a consortium and is prepared as a means to elicit comments.

Attachment C Proposed Contractual Arrangements between DOE and Consortium. This attachment suggests possible types of contracting vehicles between DOE and the consortium. Its purpose is to provide a basis for consideration of possible DOE/consortium business arrangements and is prepared as a means to elicit comments.

Attachment D Information Requested. This attachment lists the information that is proposed to be requested from consortia in response to the RFP and is prepared as a means to elicit comments.

5. OTHER AVAILABLE INFORMATION

In addition to this document, important technical and programmatic information is available to prospective commentors. The first four documents listed below can be found on the Office of Fissile Materials Disposition Internet WEB site. The Internet address for this WEB site is URL: http://web.fie.com/htdoc/fed/doe/fsl/pub/menu/any. The last two sets of documents can be found on the Oak Ridge National Laboratory Internet web site. The Internet address for this web site is URL: http://www.ornl.gov/etd/FMDP/fmdpproc.htm.

Surplus Fissile Material Storage and Disposition Final Programmatic Environmental Impact Statement, December 1996.

Surplus Fissile Materials Storage and Disposition Record of Decision, January 14, 1997.

Technical Summary Report for Surplus Weapons-Usable Plutonium Disposition, October 31, 1996. This document identifies programmatic cost, schedule, and technical issues relating to plutonium disposition options.

Department of Energy Surplus Plutonium Disposition Environmental Impact Statement Notice of Intent [6405-01-P], May 16, 1997.

FMDP Reactor Alternative Summary Report, Volume I Existing LWR Alternative, ORNL/TM-13275/V1, September 1996. This report provides detailed coverage of the technical, cost, and schedule issues involved in implementing plutonium disposition in LWRs.

Topical Reports in Support of the Program Acquisition Strategy.

ATTACHMENT A - MISSION TECHNICAL OVERVIEW

A.1 GENERAL INFORMATION

A.1.1 Introduction

A.1.1.1 Programmatic Objectives

The National Academy of Science (NAS) has called the world's surplus plutonium a *"clear and present danger"* in the Management and Disposition of Excess Weapons Plutonium Volume I, 1994. The disposition of surplus weapons-usable plutonium in the United States is being pursued to mitigate the plutonium proliferation danger. Actions being undertaken by the United States will be orchestrated in concert with international efforts to address surplus plutonium stocks in the Russian Federation. The rate of implementation of plutonium disposition will likely be dependent on terms and conditions in international agreements yet to be negotiated.

DOE is tasked with the disposition of plutonium that is surplus to national security requirements to a condition that meets the spent fuel standard. Existing LWRs will potentially be used to achieve the spent fuel standard by irradiating the plutonium in the form of MOX fuel in fuel cycles comparable to conventionally used low enriched uranium (LEU) fuel cycles. The spent fuel standard thus achieved renders the residual plutonium to a nonweapons-usable form and demonstrates irreversible arms reduction.

The first step in the disposition of the surplus plutonium as MOX fuel in reactors is to convert the surplus materials to plutonium oxide powder. This step will be performed by DOE and its contractors and is not part of the scope of this procurement. The SOW for this procurement will require that the plutonium oxide powder be blended with uranium oxide powder, pressed into fuel pellets, and placed in fuel rods. The MOX fuel will then be irradiated in existing commercial LWRs to meet the spent fuel standard. Spent fuel disposition is outside the scope of this procurement. Disposition of MOX spent fuel will likely be handled in the same manner as LEU spent fuel.

A.1.1.2 Purpose of this Attachment

This document describes DOE's baseline plans for potential fuel fabrication, irradiation, and associated services. The baseline satisfies the following purposes:

- It provides a description of the technical approach DOE intends to utilize to implement fuel fabrication, reactor irradiation, and associated services.
- It provides a basis for requirements to be applied during applicable phases of the mission. Some of the requirements could be used in conjunction with consortium selection processes.

A.1.1.3 Assumptions

The information outlined in this document is based on several assumptions listed below that are reasonable for planning purposes at this time. Changes will be made as needed in the future. Unless otherwise indicated in this document, MT denotes metric tonnes of plutonium.

1. International Agreements: Future international agreements will be needed to establish a framework and timetable for international plutonium disposition actions. Flexibility in fuel design approaches and operations of the fuel facility is required to link U.S. efforts to international actions. The need for flexibility is also driven by the potential for additional plutonium that may be declared surplus and by the potential for use of additional reactors.
2. NEPA Compliance: DOE's preferred alternative, including the preferred site for a MOX fuel fabrication facility, will be announced in early 1998, and the ROD will be issued later in 1998. Further NEPA analysis for existing licensed facilities may be provided in conjunction with NRC's licensing.
3. Transportation: Plutonium oxide and unirradiated MOX fuel elements will be transported by DOE via safe, secure trailers (SSTs).
4. Feed Materials: The amount of feed material for the reactor disposition mission is expected to be about 33 MT but may range from 20-40 MT. Plutonium feed materials will be made available starting in 2004 from a dry (also known as hydride) chemical process at a rate of approximately 3.5 MT/year to be added to the inventory of other oxides available at that time.
5. MOX Fuel Fabrication Facility Licensing and Ownership: In the event legislation is implemented to permit NRC to license a DOE fuel fabrication facility, the consortium (or one of its permanent members) will be a licensee.
6. International Safeguards: Pursuant to Presidential Decision Directives 13 and 41, all surplus plutonium will be made available for the application of International Atomic Energy Agency (IAEA) safeguards under the U.S./IAEA Voluntary Offer Agreement as soon as practicable.
7. Domestic Safeguards and Security: NRC safeguards and security requirements apply to the operations at the reactor site and MOX fuel fabrication facility.

A.1.2 Implementation Strategy

DOE proposes to contract with a private-sector consortium to transform the surplus plutonium to the spent fuel standard. DOE would provide plutonium to the consortium as an oxide. The consortium would provide fuel fabrication and reactor irradiation services and all other related disposition processes after receipt of the plutonium oxide from DOE, except that DOE would be responsible for transportation of the unirradiated special nuclear material (SNM) between sites. A government-owned and NRC-licensed (depending on legislation) MOX fuel fabrication facility would be designed, built/modified, and operated, by the consortium on an existing DOE site. The consortium would construct and startup this facility pursuant to the contract. The consortium would operate the facility on behalf of the Government and make a payment to DOE. Operational and decommissioning costs would be borne by the consortium.

The MOX fuel fabrication plant will be operated solely for the disposition of surplus U.S. plutonium. The government will terminate operation of the fuel fabrication facility either after completion of the plutonium disposition mission or earlier, if required by changes to U.S. policies. DOE retains the right to defer or terminate MOX fuel fabrication or irradiation services.

As the licensees of the operating reactors, the reactor owners retain their inherent responsibilities for operating their reactors safely in accordance with the NRC regulations.

The consortium would have the responsibility to ensure that all functions to implement MOX fuel disposition are performed, though some functions may be subcontracted.

DOE has selected existing LWRs as the platform for potential reactor-based plutonium disposition because of the low cost, shorter schedule, and minimal technical risks associated with the use of MOX fuel in LWRs compared to other reactor alternatives. Utilization of MOX fuel for LWRs is not a new concept since the technologies are operating on a commercial basis in Europe today. To this end, the design of facilities, cores, and fuel cycles should be predicated on using existing technology and should avoid developing any novel fuel cycles. In particular, the MOX fuel designs should avoid any approaches that will require an extensive developmental and/or experimental test program for qualification and licensing. The need for conducting fuel qualification testing should be restricted to examining and characterizing parameters that are unique to the surplus weapons-derived plutonium, such as the morphology of the hydride-derived powder and the possible presence of small amounts of gallium in the plutonium powder, unless overriding technical, cost, or schedule advantages can be shown.

The remainder of this document is predicated on the assumption that the approach described above is implemented.

A.1.3 Responsibilities

A.1.3.1 DOE's Responsibilities

The following are examples of DOE responsibilities:

1. Make available to offerors the non-classified experimental and analytical results obtained by DOE and its contractors during the last several years.
2. Select and contract with the consortium.
3. Determine whether to ultimately deploy the MOX fuel approach, and if so, select a site for and own a MOX fuel fabrication facility.
4. Establish the rate at which plutonium oxide will be provided to the consortium.
5. Provide a certified package design for the transport of fresh MOX fuel from the MOX fuel fabrication facility to the reactor sites.
6. Make available plutonium oxide and depleted uranium as feed source materials.
7. Transport plutonium oxide powder to the MOX fuel fabrication facility and transport fresh fuel assemblies between the fuel facility and the reactors.
8. Process the necessary DOE Level 3 clearances.
9. Accept SNM-derived transuranic (TRU) waste.
10. Make changes, if any, in the statement of work.
11. Provide project oversight and performance assessments.
12. Provide oversight and verification of adequate safeguards and security for special nuclear material.
13. Maintain stakeholder involvement program.

A.1.3.2 Consortium Responsibilities

The consortium will:

1. Provide management of the MOX disposition functions within the consortium, including technical direction and control, financial controls, coordinating among subcontractors, and reports and liaison to DOE.
2. Provide MOX fuel fabrication services including design, construction, startup, and operation of a MOX fuel fabrication facility and final decontamination and decommissioning of the MOX fuel fabrication facility upon completion of the plutonium disposition mission.
3. Provide transportation and conversion of government furnished depleted uranium to UO_2, if depleted uranium is selected by the consortium.
4. Provide reactor services including fuel design and core management; reactor and fuel safety analysis; completion of reactor plant modifications, if any; conduct of fuel qualification, irradiation of the MOX fuel; and storage of irradiated fuel pending disposal. (The reactor owners retain their current responsibilities for decontamination and decommissioning of their facilities.)

5. Provide safeguards and security for all operations within the MOX fuel fabrication facility site and at the reactor sites. (IAEA as well as the NRC and other specified federal safeguard standards must be maintained.)
6. Obtain and maintain the NRC licenses and site permits for the execution of this program and any federal, state, and local licenses or permits.
7. Procure and maintain fresh MOX fuel transportation packages.
8. Establish a proactive stakeholder relations program in coordination with the DOE.

A.1.4 Schedule

The following requirements, constraints, and criteria apply to the schedule.

A.1.4.1 Requirements

The consortium would be required to propose a reactor loading schedule such that the first in a series of MOX core reloads (not lead assemblies) is inserted into a reactor in or before 2007. The consortium shall also propose a reactor loading schedule such that the last MOX fuel assembly has been irradiated for at least one cycle before or in 2022.

To achieve the 2007 requirement, the consortium shall not rely on the use of MOX fuel fabricated in Europe. If a MOX fuel fabrication capability is required to make lead assemblies to satisfy the 2007 requirement, the consortium must demonstrate how the lead assemblies will be fabricated domestically. The offeror could consider using existing DOE facilities or constructing a pilot line in advance of or in parallel with a production line in the MOX fuel fabrication facility. (See A.2.3.4)

A.1.4.2 Feedstock Constraints

The availability of plutonium oxide may limit the initiation of certain activities. The following constraints apply:

1. Sufficient plutonium oxide is currently available to support whatever lead assembly demonstrations might reasonably be necessary. However, this available oxide was derived through aqueous processing and therefore is not necessarily prototypic of plutonium to be made available in significant quantity (hundreds of kilograms) from future large-scale hydride processes.
2. By the beginning of 2001, DOE anticipates that at least 0.5 MT of plutonium from weapons dismantlement via hydride processing will be available for lead assembly demonstration or production operation, and at least 1 MT will be available by the beginning of 2004.
3. The generation rate of plutonium oxide after 2004 is assumed to be approximately 3.5 MT/year. The demand for plutonium oxide by the fuel fabrication facility shall not exceed the supply available, which includes any prior accumulation.

A.2 DESCRIPTION AND REQUIREMENTS FOR SERVICES

A.2.1 Consortium Services

A.2.1.1 Consortium Organizational Structure

The consortium must be a legal entity capable of assuring financial responsibility and accountability to DOE. The consortium must provide an organizational structure such that project management authority clearly resides at a single point, regardless of the specific function being performed. This requirement includes the establishment of clear lines of authority among the participants in the consortium. The consortium must be organized such that all contractual arrangements with DOE are with the consortium. The consortium would have responsibility for all the functions necessary to satisfy the mission requirements.

The consortium shall establish one firm as the lead organization. The lead organization shall be:

- A U.S.-owned reactor licensee whose reactor operations are affected; or
- A U.S.-owned nuclear steam supply system (NSSS) vendor. (Note: in order to be the lead organization, the contract will provide that the NSSS vendor designs and warrants the fuel.)

The consortium shall assign an individual as the Chief Executive Officer (CEO). The CEO shall be a full-time employee of the lead organization and shall be required to obtain a DOE-issued Level 3 clearance.

A.2.1.2 Consortium Membership

Fabrication of fuel, fuel irradiation in reactors, and program/project management must be provided by firms that are members of the consortium. Consortium members will provide contracted services over the life of the contract.

The following functions shall be performed by consortium members or subcontractors:

Design of commercial fuel.

Nuclear steam supply system (NSSS) design and reactor modification services.

Architect/Engineering (A/E) services.

Capability to obtain NRC licensing of the MOX fuel fabrication facility (depending on legislation).

Participants performing these functions shall be specified as part of the consortium proposal.

In the event that a consortium member or subcontractor performing one of the above functions withdraws from the consortium, the consortium must propose a qualified replacement capability (if necessary to complete the mission). DOE must approve any changes in membership in the consortium and subcontractors performing any of the above functions.

A.2.1.3 Stakeholder Involvement

The consortium must establish and maintain a proactive stakeholder involvement program to include a public education and information campaign for residents in communities affected by the MOX fuel program. DOE would retain its obligation to maintain its own stakeholder program. The consortium's program would complement DOE's.

A.2.2 Fuel Fabrication Services

A.2.2.1 Overview

Depending on decisions made in the Surplus Plutonium Disposition ROD, DOE will contract for construction of the domestic fuel fabrication facility that will be located at one of the following candidate DOE sites: Savannah River Site (SRS), the Hanford Reservation, the Idaho National Engineering and Environmental Laboratory, or the PANTEX Site. DOE intends to execute a long-term agreement for the facility with the consortium, including a negotiated payment to DOE. New facilities will be considered at SRS, Idaho, and PANTEX sites. Modification of existing buildings is being considered at the Hanford site. The consortium must be capable and willing to fabricate and operate a fuel fabrication facility at any of the four sites.

A.2.2.2 Feed Materials

PuO_2 will be available as specified in A.1.4.2. In determining the rates for using the PuO_2, the designer may draw down any accumulated inventory as desired.

DOE desires to use the output from its hydride processes as the source of plutonium oxide for MOX fuel without requiring any additional chemical (i.e., reagent) processing.

Plutonium will be made available at no cost to the fuel fabricator as a ceramic-grade oxide powder. In general, the plutonium will meet all of the ASTM C757-90 requirements for plutonium oxide for MOX fuel. The plutonium will have a total fissile concentration of ~93%. The powder will be delivered via DOE SSTs and will be encased in government-owned, welded stainless steel cans and outer transport containers.

The plutonium that will become available after 2004 should be assumed to have been produced from the hydride process.

Much of the plutonium will contain small residual levels of gallium. If desired, to accelerate fuel qualification or licensing, the DOE can make available substantially gallium-free material to start up the campaign. However, the opportunity to use such material would be restricted to existing oxides (mostly non-weapons grade) and a few hundred kilograms (kgs) of plutonium oxide powder from the hydride process that may have also undergone subsequent additional processing by DOE.

Depleted uranium, either as uranium hexafluoride (UF_6) or uranium trioxide (UO_3), will be made available to the consortium at no extra cost. If the consortium chooses to use depleted uranium, the fabrication of MOX fuel must utilize existing DOE inventories of depleted uranium and the consortium must perform any necessary processing of the depleted uranium in existing, licensed U.S. facilities, unless it can demonstrate compelling advantages to using other sources of depleted uranium or other facilities. Alternatively, the consortium may choose to use other uranium enrichments at its own cost from the open market.

A.2.2.3 Design and Operation Criteria

The consortium will be responsible for providing conceptual, preliminary, and final designs for the fuel fabrication facility. The final design must be sufficiently complete and detailed to support construction of the facility under a fixed price contract. The facility design and operation shall conform to the NRC regulations promulgated in Title 10 of the *Code of Federal Regulations* (CFR) Part 70. Other applicable federal regulations and standards may be specified. State and local regulations and standards will be complied with to the extent applicable. The DOE site selected for the MOX facility will have services which are available (e.g., utilities, fire protection, and security) at a price subject to negotiation between the DOE and the consortium.

The facility design must be compatible with NRC and IAEA safeguards and with verification of domestic safeguards as specified in Section A.3.1.

The non-MOX fuel rods, fuel cladding, and all other bundle hardware including springs, grid spacers, and assembly end fittings will be acquired or manufactured by the consortium. Final bundle assembly will be completed at the fuel fabrication facility.

The fuel fabrication facility design may be required to adapt to a temporary change in MOX fuel demand. Accordingly, the design must accommodate a change in MOX fuel throughput, i.e., production rate, by ±30% relative to the nominal plant design throughput.

In addition, to accommodate the potential for more plutonium being declared surplus in the future, the MOX fuel fabrication facility design shall provide unused space to permit the addition of another production-scale MOX fuel line (nominally 30-45 MTHM/yr; minimum 25 MTHM/yr). The space shall accommodate both pellet manufacturing and fuel assembly fabrication to augment existing production or for production of another type of fuel for LWRs or CANDU reactors.

The fuel fabrication facility shall be designed with low net plutonium loss. DOE desires an all dry facility primarily for waste minimization purposes. The minimum plutonium recovery as a fraction of plutonium that is ultimately incorporated into fuel shall be 99.25% and preferably greater than 99.5%. Wet recycling of plutonium streams cannot be relied on to achieve this requirement. The SNM - derived TRU waste generated will be transferred to the DOE for disposal, with packaging of the waste the responsibility of the fuel fabricator.

The MOX fuel facility must be able to accommodate an interruption of operation due to national policy considerations. If an interruption is dictated by national policy considerations, operation of the facility will continue to satisfy the reactor demand as identified in Section A.2.3.2 or until the ongoing MOX fuel reload campaign is completed, whichever is less restrictive to reactor operations.

The facility shall provide capability to store a minimum of 7.0 MT of plutonium as plutonium oxide in stainless steel cans (nominally 4.5 kg per can) and also be able to store a minimum of one year's supply of finished fuel.

The MOX fuel shall be fabricated to meet reactor demand schedules. However, to avoid excessive inventory at the fuel fabrication and/or the reactor plant facilities, fuel shall not be fabricated more than 18 months in advance of shipment to the reactor, and the fresh fuel shall not be stored at the reactor site longer than the current and next scheduled reload.

After the domestic MOX fuel fabrication facility is available, it will be the exclusive source of the MOX fuel for the reactors.

A.2.3 Irradiation Services

A.2.3.1 General

Transportation of the MOX fuel from the fuel fabrication plant to the reactor plant site(s) will be provided by DOE. Accommodations for adequate storage and safeguards for the fresh fuel will be provided by the consortium. Qualification of the fuel to be used for reactor irradiation is described in Section A.2.3.4.

A.2.3.2 Design and Operation Criteria

All phases of reactor design and operation must conform to the NRC regulations and license conditions. The initial MOX core reload designs must be based on existing core designs supported by significant European experience. Once successful initial core performance is demonstrated and design approaches have been validated, extrapolations from the existing experience to achieve higher plutonium disposition rates will be considered. DOE will not consider any design that requires the use of neutron absorbers integral with plutonium in the same fuel pellets.

The realized schedule for disposition of surplus plutonium will depend on a number of external factors including reciprocal actions by the Russian Federation. Therefore, one of the decision criteria in selecting reactors and fuel cycles for U.S. disposition will be the flexibility to adjust to the evolving policy that will drive the plutonium disposition rate. Flexibility means the ability to modify core designs for reloading reactors at future refuelings so as to increase or decrease the plutonium core loading rate. To the extent practical, the core design approach should enable interchangability of LEU assemblies with

MOX assemblies, such that more or less MOX fuel can be charged to the reactors with the balance being supplied as traditional LEU fuel.

The consortium shall maintain an inventory of LEU fuel bundles or have the capability to acquire LEU fuel bundles in a timely manner. This requirement to replace the MOX fuel bundles that would have otherwise been loaded in the reactor is necessary to mitigate any disruption of MOX fuel supply due to national or international policy considerations.

To further mitigate fuel supply disruptions due to policy considerations, DOE will provide sufficient notification to the consortium to enable procurement of replacement LEU fuel. The advance notification will be sufficient to allow completion of the MOX fuel load for then-current irradiation cycle and the next MOX core reload for each reactor.

The reactor owner will provide facilities for storage of fresh MOX fuel assemblies at the site prior to insertion into the core. The reactor owner shall possess the capability to store an amount of fresh fuel at each reactor to accommodate at least one partial core reload. Transportation of fuel by SSTs should not be relied upon for just-in-time inventory management. (See also Section A.2.2.3 requirements related to maximum duration for fresh fuel storage times.)

A.2.3.3 Reactor Selection Criteria

1. Only operating reactors located in the United States will be considered.
2. A reactor will not be considered if its license expires before 2012.
3. A consortium must provide a minimum of three and a maximum of eight operating reactors that can complete the mission (See A.1.4.1) within their remaining licenses.
4. The selected group of reactors must be capable of disposition of 33 MT of plutonium before the end of 2022.
5. The group of reactors proposed must not require more than two fuel qualification and licensing efforts.

A.2.3.4 Fuel Qualification

The reactor owners retain their responsibility for inserting qualified MOX fuel into their reactors, pursuant to the NRC regulations and license conditions.

The consortium will be required to design, qualify, and license fuel forms in parallel with the development of the domestic MOX fuel fabrication capability.

The consortium shall prepare and execute a plan to provide fuel for any qualification and testing activities. This plan shall reflect that fuel is provided exclusively from domestic facilities. However, the consortium may also propose European sources of fuels for qualification if significant cost or schedule savings result.

If a dedicated pilot line capability is required and it is desired to utilize existing DOE facilities for this purpose, for example, for early fuel qualification or licensing, DOE will select candidate sites for the pilot line capability in conjunction with the issuance of the ROD for Surplus Plutonium Disposition for the siting of the MOX fabrication facility. Any pilot capabilities at a DOE facility would likely be under DOE Orders and regulations, instead of under NRC license.

Any procurement of MOX fuel from foreign fabricators must be coordinated with DOE to ensure that proper agreements between the governments are in place, to ensure that U.S. provided plutonium oxide powder is properly safeguarded, to verify that the U.S. supplied plutonium is not fungible with other sources of plutonium, and to ensure proper secure transport between countries.

A.2.3.5 Irradiation

Total irradiation time shall be sufficient to irradiate the MOX fuel to a minimum of 20,000 MWd/MTHM. At this level, the intrinsic radiation barrier will be comparable with spent commercial fuel already in storage at many reactor sites.

The reactor owner may change the fuel bundle or assembly irradiation duration or time between refueling for the MOX fuel cycles relative to the LEU cycles, at the owner's discretion. However, DOE will not be financially liable for any decreased net capacity factor due to the change in the irradiation cycle length. For example, if a reactor owner chooses to change the irradiation cycle from 18 to 12 months and then suffers a lower capacity factor as a result, DOE will not be responsible for lost production of electricity.

The planned burnup should reflect a balance between two competing objectives. First, the reactor owner should avoid MOX fuel cycle designs which require that the MOX fuel be depleted to significantly higher burnups than the experience base in Europe. Second, DOE prefers higher burnup over lower burnup to minimize the amount of spent fuel generated.

Reactor owners must develop plans and procedures to handle any pin (or rod) that needs to be withdrawn from a bundle (or assembly) to ensure that proper security control of the extracted pins (or rods) can be maintained. The use of DOE facilities may be considered to dispose of any pin (or rod) that may be suspected of leakage.

Spent fuel that results from this mission must meet acceptance criteria for the Nuclear Waste Policy Act Repository.

Reactor owners may configure their core loading patterns to reflect noncontinuous irradiation of a particular MOX fuel assembly because it may be desirable to irradiate fuel assemblies, withdraw them, and later reinsert them. In so doing, better fuel economy and a faster net plutonium disposition rate (to the spent fuel standard) may be obtained. However, the owner shall provide the required safeguards and security for fuel which is withdrawn and intended to be reinserted before obtaining 20,000 MWd/MTHM.

MOX assemblies, such that more or less MOX fuel can be charged to the reactors with the balance being supplied as traditional LEU fuel.

The consortium shall maintain an inventory of LEU fuel bundles or have the capability to acquire LEU fuel bundles in a timely manner. This requirement to replace the MOX fuel bundles that would have otherwise been loaded in the reactor is necessary to mitigate any disruption of MOX fuel supply due to national or international policy considerations.

To further mitigate fuel supply disruptions due to policy considerations, DOE will provide sufficient notification to the consortium to enable procurement of replacement LEU fuel. The advance notification will be sufficient to allow completion of the MOX fuel load for then-current irradiation cycle and the next MOX core reload for each reactor.

The reactor owner will provide facilities for storage of fresh MOX fuel assemblies at the site prior to insertion into the core. The reactor owner shall possess the capability to store an amount of fresh fuel at each reactor to accommodate at least one partial core reload. Transportation of fuel by SSTs should not be relied upon for just-in-time inventory management. (See also Section A.2.2.3 requirements related to maximum duration for fresh fuel storage times.)

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Any procurement of MOX fuel from foreign fabricators must be coordinated with DOE to ensure that proper agreements between the governments are in place, to ensure that U.S. provided plutonium oxide powder is properly safeguarded, to verify that the U.S. supplied plutonium is not fungible with other sources of plutonium, and to ensure proper secure transport between countries.

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A.3 PROGRAMMATIC REQUIREMENTS

A.3.1 Safeguards and Security

The fuel fabrication and irradiation service providers will have to provide safeguards and security protection appropriate for storing and handling SNM. The NRC safeguards requirements, including those specified in 10 CFR 73, must be met.

Facility designs, accommodations, procedures, and specifications must accommodate IAEA activities.

A.3.2 Access to Facilities

The IAEA, the Russian Federation, and the DOE monitors will be given access to the MOX fuel fabrication facility and the reactors involved in burning MOX. Consideration should be given to configuration of facilities, equipment, and processes to permit inspection by these officials with minimal or no access to proprietary or other sensitive information.

Individuals who will have unescorted access to SNM must be U.S. citizens and possess appropriate clearances for the access.

A.3.3 Information Security

An interface with the plutonium oxide production operations may involve access to limited classified information. Therefore, at least one senior technical manager at the fuel fabrication facility and two or more individuals responsible for fuel qualification must have a DOE-issued Level 3 clearance. Among other things, this clearance requires that the individuals be U.S. citizens.

Interfaces also exist with the DOE SST management system that may involve access to limited amounts of classified information. Accordingly, at least one senior technical manager at the fuel fabrication facility and at least one senior technical manager at each reactor site must possess a DOE-issued Level 3 clearance.

ATTACHMENT B - QUALIFICATION AND EVALUATION CRITERIA

B.1 EVALUATION METHODOLOGY AND BASIS FOR AWARD

The government will award a contract to the offeror whose offer represents the best value to the government on the basis of (1) the merits of the offer and (2) the offeror's capability, as explained below. The evaluation of qualified proposals will be performed pursuant to the evaluation criteria identified in Sect. B.3.

A SEB will be appointed by the SSO to prepare a solicitation and evaluate the proposals submitted. The offerors are required to prepare written proposals. Proposals will be evaluated by the SEB in accordance with applicable DOE and Federal procurement policies and procedures.

B.2 QUALIFICATION CRITERIA

Proposals failing to meet the following qualification criteria will be eliminated from further consideration. An offeror must certify that it meets the qualification criteria.

B.2.1 Consortium

1. A consortium would have to provide the functions listed below. Participating firms must be identified by assigning a company name to the following functions: (Note: Some firms may be able to satisfy more than one function.)
    - Program/Project management
    - Fuel irradiation in reactors
    - Design of commercial fuel
    - NSSS design and reactor modification services
    - Fuel fabrication services
    - Architect-Engineering services
    - Capability to obtain NRC licensing of the MOX fuel fabrication facility (depending on legislation).
2. The organization designated for program/project management must demonstrate experience in contract management, project management, and system integration functions for an interdisciplinary, nuclear industry, or government project for which it held a prime contract of at least $100M.
3. The consortium would have to provide an organizational structure such that project management authority clearly resides at a single point, regardless of the specific function being performed.

4. The consortium shall establish one firm as the lead organization. The lead organization shall be:

   A U.S.-owned reactor licensee whose reactor operations are affected; or

   A U.S.-owned nuclear steam supply system (NSSS) vendor. (Note: in order to be the lead organization, the contract will provide that the NSSS vendor designs and warrants the fuel.)

B.2.2 Reactor Irradiation Services

1. Only operating reactors located in the United States will be considered.
2. A reactor will not be considered if its license expires before 2012.
3. A consortium must provide a minimum of three and a maximum of eight operating reactors that can complete the mission (See A.1.4.1) within their remaining licenses.
4. The selected group of reactors must be capable of a disposition of 33 MT of Pu before or during 2022.
5. The group of reactors proposed must not require more than two fuel qualification and licensing efforts.

B.2.3 Fuel Fabrication Services

The consortium member proposed to perform the fuel fabrication function must currently be fabricating commercial nuclear reactor fuel for LWRs.

B.3 EVALUATION CRITERIA

DOE will use technical, business management, and cost criteria to evaluate the submittals of the offerors. The criteria will be applied to the information requested in Attachment D. These criteria are expected to include the following:

1. Ability of the consortium to organize and manage the work.
2. Relevant corporate experience.
3. Relevant past performance.
4. Ability to start and complete the mission in a timely manner.
5. Cost reasonableness and realism, including probable cost to the government.
6. The technical approach for fuel fabrication and irradiation services.
7. Qualifications of key personnel.

ATTACHMENT C - PROPOSED CONTRACTUAL ARRANGEMENTS BETWEEN DOE AND CONSORTIUM

C.1 CONTRACT STRATEGY

The DOE Fissile Material Disposition Program Office's intent is that the business/contracting relationship (1) be relatively simple in the sense that the government can deal with one party, (2) enhance cost efficiencies, (3) share financial risk, (4) enhance confidence in mission completion, and (5) emulate normal private-sector fuel supplier/utility relationships. Table C.1 contains DOE's proposed contracting methods and Table C.2 lists government-furnished materials and services. In summary, the performance periods and corresponding contracting types are as follows:

- The base contract will be priced, run from 3-5 years, and will contain a combination of cost reimbursement and fixed price tasks.
- Option 1 will be unpriced, run for approximately 2 years, and will contain cost reimbursement tasks.
- Option 2 will be unpriced, run for approximately a 5 year term, and will contain cost reimbursement and fixed price tasks. For construction of the MOX plant, DOE will request cost sharing by the consortium.
- Option 3 will be unpriced, run for approximately a 15 year term, and will require negotiation of payments to the government.

C.2 NUCLEAR AND NON-NUCLEAR LIABILITY

C.2.1 Nuclear Liability

Protection under the Price-Anderson Act will be provided; however, DOE is examining whether NRC or DOE Price-Anderson protection will be provided for the MOX fuel fabrication facility. Operating commercial nuclear reactors will continue to be covered by their existing NRC Price-Anderson protection.

C.2.2 Non-Nuclear Liability

Firm-fixed-price tasks - The consortium will retain all liability, including liability to third parties, except as otherwise provided under the terms of the contract.

Cost-reimbursement tasks - The contract will generally make certain liabilities to third persons, not compensated by insurance, an allowable cost under the contract.

C.3 FOREIGN OWNERSHIP OR CONTROL

Section 836 of the FY 1993 Defense Authorization Act (P.L. 102-484) prohibits the award of a DOE contract under the National Security Program to a company owned by an entity controlled by a foreign government if it is necessary for the company to be given access to a proscribed category of information in order to perform the contract. DOE's implementing regulations are contained in the DEAR, 48 CFR 904.71.

The DEAR contains important provisions and definitions, including the definition of "proscribed information" and the provision in 48 CFR 904.7102 for waiver of the prohibition by the Secretary of Energy.

The DEAR, at 48 CFR 904.70, also sets forth DOE policies and procedures regarding foreign ownership, control or influence (FOCI) over contractors. These procedures are designed to protect against an undue risk to the common defense and security which may result if classified information or special nuclear materials are made available to DOE contractors or subcontractors who are owned, controlled, or influenced by foreign governments, individuals, or organization. In order for the Contracting Officer to obtain sufficient information to make the required findings regarding FOCI, the solicitation under this program will include the representations contained in the DEAR at 48 CFR 952.204-73 and its Alternate I. The resultant contract will contain the DEAR FOCI clause found at 48 CFR 952.204.74.

Table C.1

CONTRACT STRUCTURE/TYPE		
Base Contract (3-5 years)	MOX Fuel Fabrication Facility • Conceptual and Preliminary Design Report • Preparation and Submittal of License Application Reactor Irradiation Services • Preparation and Submittal of License Modification Application • Fuel Qualification Program Management	Fixed Price Fixed Price Fixed Price Cost Reimbursement Cost Reimbursement
Option 1 (~ 2 years)	MOX Fuel Fabrication Facility • Defense of License Application • Final Design of MOX Facility Reactor Irradiation Services • Defense of License Modification Application Program Management	Cost Reimbursement Cost Reimbursement Cost Reimbursement Cost Reimbursement
Option 2 (~ 5 years)	MOX Fuel Fabrication Facility • Construction and Startup of MOX Facility Reactor Irradiation Services • Perform required reactor modifications Program Management	Fixed Price Fixed Price Cost Reimbursement
Option 3 (~ 15 years)	• Operation of MOX Fuel Fabrication Facility • Irradiation Services/Operation of reactors • Decontamination & Decommissioning of MOX Plant • Program Management	Fee Paid to DOE Paid by consortium Paid by consortium Cost Reimbursement

Table C.2

GOVERNMENT FURNISHED MATERIAL & SERVICES
• Depleted Uranium (UF_6 or UO_3), if desired • Plutonium Oxide (PuO_2) • Fuel Fabrication Facility at DOE Site • Transportation of PuO_2 to Fuel Fabrication Facility, Including Transportation Package • Transportation of Fuel to Utilities for Irradiation • Acceptance of SNM - Derived TRU Waste • Certified Package Design for Transportation of Fresh MOX Fuel

ATTACHMENT D - INFORMATION REQUESTED

Information requested to be provided by each consortium relates to the criteria established in Attachment B. Submittals for each item listed below shall be no more than ten pages or less, except for items 1 and 14, which shall be no more than twenty pages. The consortium will be required to:

1. Provide qualifications and relevant experience of organizations and key personnel.

2. Provide a program plan including a description of the organizational structure of the consortium, how systems integration functions will be performed, responsibilities of the consortium and its members, the legal status and liabilities of the consortium, how program management functions will be implemented (including cost and schedule controls), how subcontracts will be managed, a preliminary contractor work breakdown structure, and projected annual cash flow profile within the consortium.

3. Describe approach for accommodating fluctuating plutonium oxide supply requirements, including impacts on the fuel fabrication facility and reactor transition cycles. Provide evidence that the approach is technically valid.

4. Describe approach, including issues and proposed solutions, to operation of reactors with MOX fuel, including identification of plant modifications, operational changes, and startup testing required.

5. Provide a table identifying the proposed plutonium and MOX fuel loading schedule by reactor, by year and total cumulative. Provide a basis why the loading schedule is technically valid.

6. Describe approach, including issues and proposed solutions, to fuel qualification, including a description of the major steps to achieve fuel qualification, how European data can be used, need for and ability to fabricate test and demonstration fuel, previous experience in fuel qualification, security measures for any lead assembly testing, and a proposed schedule for fuel qualification activities.

7. Describe approach to implementing safeguards and security measures at the fuel fabrication facility and reactor sites.

8. Describe the operational performance of reactors and technical and economic ability of reactors to operate for the entire mission, including discussion of plant capacity factors and outage histories; historical compliance with safety and environmental regulations; plant material condition, effectiveness of reactor plant aging management programs, and potential for premature shutdown to address failures of life-critical components and systems;

historical licensing performance including NRC Systematic Assessment of Licensee Performance ratings and enforcement actions; current and projected electricity production cost with and without debt service; and projected wholesale power costs in region where reactors are located.

9. Describe financial capability of each of the consortium members to perform the mission.

10. Describe experience and proposed approach for external relations, including relations with public utility commissions, state and local authorities, interested parties, and local community residents.

11. Describe the licensing approach, including identification of strategy for obtaining license modifications for reactors and, depending on the enactment of appropriate legislation, the license for the MOX fuel fabrication facility, anticipated licensing issues and proposed solutions, anticipated licensing schedules and any linkage to fuel qualification activities.

12. Describe the experience/past performance and capability to fabricate commercial nuclear fuel.

13. Describe the approach, including issues and proposed solutions, and schedule for designing, building/modifying, and starting up, and operating the MOX fuel fabrication facility including the technical justification for the approach.

14. Describe the estimated capital and operational costs and schedule for each element of the project necessary to complete the mission and the methodology and key assumptions used in the estimate. This should include a discussion of areas of potential cost or schedule savings to the government due to unique features of the proposed approach (including cost sharing), areas of significant cost or schedule uncertainties and the information or actions needed to reduce those uncertainties. Anticipated cash flow to the government during operation of MOX fuel fabrication facility and irradiation of fuel should also be identified.

15. Describe the procurement strategy for equipment and other purchases maximizing competition or other methods to reduce the overall cost to the government.

16. Describe the overall schedule for performing all aspects of the MOX fuel disposition program, including major milestones.

Vanice
May 23, 97

Department of Energy

Washington, DC 20585

May 19, 1997

Mr. Ted Sherr
Nuclear Regulatory Commission
TWFN, MS 8-A-33
Washington, DC 20555

Dear Mr. Sherr:

The Department of Energy (DOE) is planning to prepare an Environmental Impact Statement (EIS) for Surplus Plutonium Disposition as a tiered analysis from the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement*. This EIS will examine reasonable alternatives for the siting, construction and operation of three facilities. The first is a facility to disassemble and convert surplus pits from nuclear weapons into plutonium oxide for subsequent immobilization or use in fabricating mixed oxide fuel. The second is a facility to immobilize the surplus plutonium into a form suitable for final disposal in a high level waste repository. This second facility will contain collocated facilities to convert non-pit materials into a form suitable for immobilization. The third facility will fabricate plutonium oxide into mixed oxide fuel for use in existing domestic commercial reactors with subsequent disposal of the spent fuel in a high level waste repository.

A Notice of Intent (NOI) to prepare the EIS will be published in the *Federal Register* in the near future. A Draft of that NOI is enclosed for your information. The NOI will invite all interested parties to comment on the scope and content of the EIS, as well as on significant environmental issues and alternatives to be included in the analysis.

We would appreciate your views, as a potential cooperating agency, on the following:

- The issues that DOE identified for analysis in the NOI.
- Additional issues and data related to the proposal that you believe to be important.
- Jurisdiction by law that your agency may have regarding some aspect of the actions, including the potential external regulation of DOE facilities at some time in the future.

ATTACHMENT 4

- Special expertise that your agency may have that would aid DOE in addressing an environmental issue related to the EIS.

- Information, including other environmental impact statements, environmental assessments, reports, studies, surveys, etc., prepared by or for you that may be helpful in the preparation of the EIS.

We would appreciate your response to this request within the next 30 days especially regarding the extent to which your agency wishes to participate in the EIS process as a Cooperating Agency. If you have any questions, please contact me at (202) 586-4513, or Mr. Bert Stevenson at (202) 586-5368.

Sincerely,

J. David Nulton
Director, NEPA Compliance & Outreach
Office of Fissile Materials Disposition

Enclosure

[6450-01-P]

DEPARTMENT OF ENERGY

SURPLUS PLUTONIUM DISPOSITION

ENVIRONMENTAL IMPACT STATEMENT

AGENCY: Department of Energy

ACTION: Notice of Intent

SUMMARY: The Department of Energy (DOE) announces its intent to prepare an Environmental Impact Statement (EIS) pursuant to the National Environmental Policy Act (NEPA) on the disposition of United States' weapons-usable surplus plutonium. This EIS is tiered from the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement (Storage and Disposition PEIS) (DOE/EIS-0229), issued in December 1996, and the associated Record of Decision (62 FR 3014), issued on January 14, 1997.

The EIS will examine reasonable alternatives and potential environmental impacts for the proposed siting, construction, and operation of three types of facilities for plutonium disposition. The first is a facility to disassemble and convert pits (a nuclear weapons component) into plutonium oxide suitable for disposition. As explained in the January 1997 Record of Decision, this pit disassembly and conversion facility will be located at either DOE's Hanford Site, Idaho National Engineering and Environmental Laboratory (INEEL), Pantex Plant, or Savannah River Site (SRS). The second is a facility to immobilize surplus plutonium in a glass or ceramic form for disposition in a geologic

repository pursuant to the Nuclear Waste Policy Act. This second facility will be located at either Hanford or SRS, and include a collocated capability to convert non-pit plutonium materials into a form suitable for immobilization. The EIS will discuss various technologies for immobilization. The third type of facility would fabricate plutonium oxide into mixed oxide (MOX) fuel. The MOX fuel fabrication facility would be located at either Hanford, INEEL, Pantex or SRS. MOX fuel would be used in existing commercial light water reactors in the United States, with subsequent disposal of the spent fuel in accordance with the Nuclear Waste Policy Act. Some MOX fuel could also be used in Canadian deuterium uranium (CANDU) reactors depending upon negotiation of a future international agreement between Canada, Russia, and the United States. The EIS will also discuss decommissioning and decontamination (D&D) of the three facilities.

This Notice of Intent describes the Department's proposed action, solicits public input, and announces the schedule for the public scoping meetings.

DATES: Comments on the proposed scope of the Surplus Plutonium Disposition EIS (SPD EIS) are invited from the public. To ensure consideration in the draft EIS, written comments should be postmarked by July 18, 1997. Comments received after that date will be considered to the extent practicable. DOE will hold interactive scoping meetings near sites that may be affected by the proposed action to discuss issues and receive oral and written comments on the scope of the EIS. The locations, dates and times for these public meetings are included in the Supplementary Information section of this notice and will be announced by additional appropriate means.

ADDRESSES: Comments and questions concerning the plutonium disposition program can be submitted by calling (answering machine) or faxing them to the toll free number 1-800-820-5156, or by mailing them to:

Bert Stevenson
NEPA Compliance Officer
Office of Fissile Materials Disposition
U.S. Department of Energy
Post Office Box 23786
Washington, DC 20026-3786

Comments may also be submitted electronically by using the Office of Fissile Materials Disposition's web site. The address is http://web.fie.com/fedix/fisl.html.

FOR FURTHER INFORMATION CONTACT: For general information on the DOE NEPA process, please contact:

Carol Borgstrom
Director, Office of NEPA Policy and Assistance
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585
202-586-4600 or 1-800-472-2756

SUPPLEMENTARY INFORMATION:

Background:

The Storage and Disposition Programmatic Environmental Impact Statement (PEIS) analyzed the potential environmental consequences of alternatives for the long-term storage (up to 50 years) of weapons-usable fissile materials and the disposition of surplus plutonium. Surplus plutonium for disposition refers to that weapons-usable plutonium that the President has declared surplus to national security needs, as well as such plutonium that may be declared surplus in the future. As stated in the Record of Decision for the Storage and Disposition PEIS, the Department decided to pursue a hybrid approach that allows immobilization of surplus plutonium in glass or ceramic form and burning of some of the surplus plutonium as MOX fuel in existing, commercial light water reactors in the United States (and potentially in Canadian Deuterium Uranium (CANDU) reactors in Canada depending on future international agreement). The Department decided that the extent to which either or both of these disposition approaches would ultimately be deployed would depend in part upon future NEPA review, although the Department committed to immobilize at least 8 metric tons (tonnes) of currently declared surplus plutonium and reserved the option of immobilizing all surplus weapons plutonium. In the Record of Decision for the Storage and Disposition PEIS, the Department further decided to: 1) locate the immobilization facility (collocated with a plutonium conversion facility) at either Hanford or SRS; 2) locate a potential MOX fuel fabrication facility at either Hanford, INEEL, Pantex, or SRS; 3) locate a pit disassembly and conversion facility at either Hanford, INEEL, Pantex, or SRS; and 4) determine the specific technology for immobilization based in part on this follow-on disposition EIS.

The processes, materials and technologies involved in surplus plutonium disposition are depicted in Figure 1.

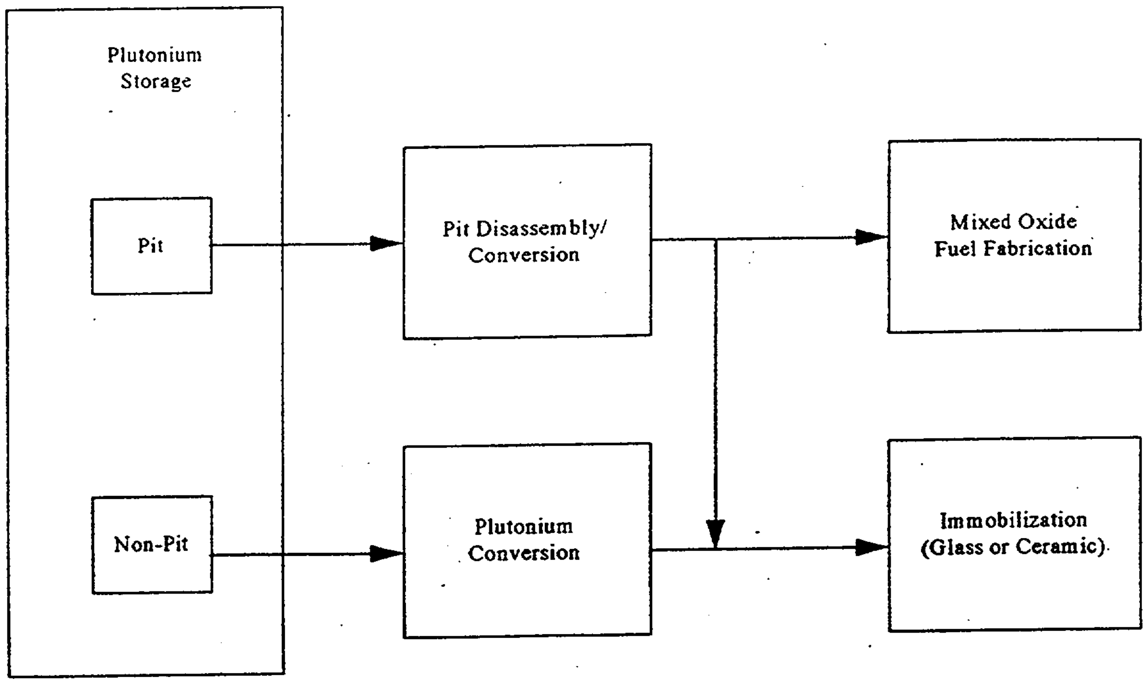

Figure 1. Plutonium Disposition Processes in DOE's Proposed Action

<u>Proposed Action</u>:

The Department proposes to determine whether to continue with both the immobilization and MOX approaches for surplus plutonium disposition and if so, to site, construct, and operate and ultimately D&D three types of facilities for plutonium disposition at one or more of four DOE sites, as follows:

- A collocated non-pit plutonium conversion and immobilization facility at either Hanford, near Richland, Washington, or SRS, near Aiken, South

Carolina, with sub-alternatives for the technology and facilities used to form the immobilized plutonium.

- A pit disassembly/conversion facility at either Hanford; SRS; INEEL, near Idaho Falls, Idaho; or the Pantex Plant, near Amarillo, Texas.
- A MOX fuel fabrication facility at either Hanford, INEEL, Pantex, or SRS, with sub-alternatives for fabrication of Lead Test Assemblies for use in fuel qualification demonstrations.

Construction of these facilities would be on previously disturbed land and could include the modification of existing facilities where practicable, to reduce local environmental impacts, reduce costs, and shorten schedules. In the pit disassembly and conversion facility, the Department proposes to disassemble surplus pits and convert the plutonium in them to an unclassified oxide form suitable for disposition. The Department also proposes to convert most non-pit plutonium materials to plutonium oxide at the plutonium conversion facility, which will be collocated with the immobilization facility.

Plutonium Disposition Decisions:

The Department expects to make the following decisions based upon the results of this EIS and other information and considerations:

- Whether to construct and operate collocated plutonium conversion and immobilization facilities, and if so, where (including selection of the specific immobilization technology).
- Whether to construct and operate a pit disassembly/conversion facility, and if so, where.

- Whether to construct and operate a MOX fuel fabrication facility, and if so, where (including selection of the site for fabrication of Lead Test Assemblies).

The exact extent to which the MOX approach would ultimately be deployed will depend on a number of factors, in addition to environmental impacts. These are likely to include cost, contract negotiations, and international agreements.

Alternatives:

No Action: A No Action alternative will be analyzed (Alternative 1) in the SPD EIS. Implementation of the No Action alternative would mean that disposition would not occur, and surplus weapons-usable plutonium, including pits, metals and oxides, would remain in storage in accordance with the Storage and Disposition PEIS Record of Decision.

Plutonium Disposition Alternatives: The SPD EIS will analyze alternatives for the siting, construction and operation of the three facilities at various candidate sites as described in the Proposed Action. These facilities would be designed so that they could collectively disposition surplus plutonium (existing and future) over their operating lives. Although the exact quantity of plutonium that may be declared surplus over time is not known, for purposes of analysis a nominal 50 tonnes of surplus plutonium will be used for assessing the environmental impacts of plutonium disposition activities at the various candidate sites. Under alternatives involving the "hybrid" (immobilization and MOX) approach selected in the Storage and Disposition Record of Decision, the SPD EIS will analyze the same distribution of surplus plutonium that was analyzed in the Storage and

Disposition PEIS, which is fabrication of pits and pure plutonium metal or oxide (approximately 33 tonnes) into MOX fuel, and immobilization of the remaining non-pit plutonium (approximately 17 tonnes). The Record of Decision on the Storage and Disposition PEIS states, "DOE will immobilize at least eight tonnes of currently declared surplus plutonium materials that DOE has already determined are not suitable for use in MOX fuel." Since the issuance of that decision, the Department has further determined that a total of about 17 tonnes of surplus plutonium is not suitable for use in MOX fuel without extensive processing. Thus, an alternative for fabricating all surplus plutonium into MOX fuel will not be analyzed. However, converting the full 50 tonnes of surplus plutonium into an immobilized form will be analyzed as a reasonable alternative.

Under each disposition approach, DOE could in principle locate one, two, or all three facilities at a candidate site. However, locating one facility at each of three sites would mean conducting disposition activities at three widely separated locations around the country. This would substantially increase transportation cost, unnecessarily increase exposure of workers and the public, and increase transportation risks, without any apparent compensating benefit. Therefore, the Department is proposing to consider only alternatives that locate two or more facilities at one site, with the possibility of one facility at a separate site. Further, certain combinations of facilities and sites are not being considered as reasonable alternatives, because they would also substantially increase transportation cost, unnecessarily increase exposure to workers and the public, and increase transportation risks, without any apparent compensating benefit.

Based on the above considerations and the candidate site selections in the Storage and Disposition Record of Decision, the following alternatives have been developed in addition to the No Action alternative. Table 1 summarizes the alternatives by site. Alternatives 2 through 10 (see Table 1) would involve immobilization of approximately 17 tonnes of low purity (non-pit) plutonium, and fabrication of approximately 33 tonnes of high purity plutonium (pits and plutonium metal) into MOX fuel. The differences among alternatives 2 through 10 are the locations of the proposed facilities. Alternatives 11 and 12 would involve immobilization of all 50 tonnes of plutonium at either Hanford or SRS.

The Department has identified existing facilities that can be modified for use in plutonium disposition at various candidate sites. A summary of the existing and new facilities (shown in the parentheses in Table 1) to be used in the SPD EIS analyses is given in Table 1, where FMEF is the Fuel and Materials Examination Facility, FPF is the Fuel Processing Facility, and DWPF is the Defense Waste Processing Facility.

Lead Test Assemblies: With respect to the MOX alternatives, the Department would qualify MOX fuel forms for use in existing commercial reactors. DOE will analyze two sub-alternatives for the fabrication of the lead test assemblies needed to qualify the fuel. In one sub-alternative, the lead test assemblies would be fabricated in the United States. Fabrication in the United States would involve constructing a pilot capability in conjunction with the fuel fabrication facility. Therefore, the potential sites include the candidate sites for the fuel fabrication facility (i.e., Hanford, INEEL, Pantex, and SRS). The pilot capability could also be located in an existing small facility at the Los Alamos National Laboratory (LANL). The second alternative would be for fabrication in existing

European facilities; three potential fabrication sites exist (Belgium, France, and the United Kingdom) that would allow fabrication of the Lead Test Assemblies sooner than with any facility under the United States alternative.

TABLE 1

DISPOSITION ALTERNATIVES

ALTERNATIVE / SITE / DISPOSITION FACILITY				
ALT. NO.	**PIT DISASSEMBLY**	**MOX PLANT**	**PLUTONIUM CONVERSION and IMMOBILIZATION**	**AMOUNTS OF PLUTONIUM**
1	No Action			
2	Hanford (FMEF)	Hanford (FMEF)	Hanford (FMEF)	17t Immobilization / 33t MOX
3	SRS (New)	SRS (New)	SRS (New, or Bldg 221F, and DWPF)	17t Immobilization / 33t MOX
4	Pantex (New)	Hanford (FMEF)	Hanford (FMEF)	17t Immobilization / 33t MOX
5	Pantex (New)	SRS (New)	SRS (New, or Bldg 221F, and DWPF)	17t Immobilization / 33t MOX
6	Hanford (FMEF)	Hanford (FMEF)	SRS (New, or Bldg 221F, and DWPF)	17t Immobilization / 33t MOX
7	INEEL (FPF)	INEEL (New)	SRS (New, or Bldg 221F, and DWPF)	17t Immobilization / 33t MOX
8	INEEL (FPF)	INEEL (New)	Hanford (FMEF)	17t Immobilization / 33t MOX
9	Pantex (New)	Pantex (New)	SRS (New, or Bldg 221F, and DWPF)	17t Immobilization / 33t MOX
10	Pantex (New)	Pantex (New)	Hanford (FMEF)	17t Immobilization / 33t MOX
11	Hanford (FMEF)	N/A	Hanford (FMEF)	50t Immobilization / 0t MOX
12	SRS (New)	N/A	SRS (New, or Bldg 221F, and DWPF)	50t Immobilization / 0t MOX

Immobilization Technology: The Record of Decision on the Storage and Disposition PEIS stated, "Because there are a number of technology variations that could be used for immobilization, DOE will also determine the specific immobilization technology based upon the follow-on EIS..." (i.e., the SPD EIS). The technologies to be considered are those identified as variants in the Storage and Disposition PEIS.

Preferred Alternative:

For immobilization, the Department prefers to use the "can-in-canister" technology at the DWPF at SRS. Under the can-in-canister approach, cans containing plutonium in glass or ceramic form would be placed in DWPF canisters, which would be filled with borosilicate glass containing high-level waste.

Classified Information:

The Department plans to prepare the SPD EIS as an unclassified document with a classified appendix. The classified information in the SPD EIS will not be available for public review. However, the classified information will be considered by DOE in reaching a decision on the disposition of surplus plutonium. DOE will provide as much information as possible in unclassified form to assist public understanding and comment.

Research and Development Activities:

The Department recently announced its intent to prepare two environmental assessments (EAs) for proposed research and development activities that DOE would conduct prior to completion of the SPD EIS and ROD. One EA will analyze the potential environmental impacts of a proposed pit disassembly and conversion integrated systems test at LANL. In addition, to further the purposes of NEPA, this EA will describe other research and development activities currently on-going at various sites, including work related to immobilization and to MOX fuel fabrication. The other EA will be prepared for the proposed shipment of special MOX fuel to Canada for an experiment involving the use of United States and Russian fuel in a Canadian test reactor, for development of fuel for the CANDU reactors. This EA will analyze the prior and future fabrication and proposed shipment of the fuel pellets needed for the experiment.

Relationships with Other DOE NEPA Activities:

In addition to the SPD EIS and the EAs discussed above, the Department is currently conducting NEPA reviews of other activities that have a potential relationship with the SPD EIS. They include:

1. Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage and Disposal of Radioactive and Hazardous Waste (DOE/EIS-0200D) (Draft issued: September 22, 1995; 60 FR 49264).

2. Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site EIS (Notice of Intent to Prepare an Environmental Impact Statement: November 19, 1996; 61 FR 58866).

Invitation to Comment:

DOE invites comments on the scope of this EIS from all interested parties, including potentially affected Federal, State, and local agencies, and Indian tribes. Comments can be provided by any of the means listed in the Address Section of this notice and by providing oral and written comments at the scoping meetings.

The Department is requesting, by separate correspondence, that Federal agencies[1] desiring to be designated as cooperating agencies on the SPD EIS inform DOE by July 18, 1997.

Scoping Meetings: Public scoping meetings will be held near each site that may be affected by the proposed action. The interactive scoping meetings will provide the public with the opportunity to present comments, ask questions, and discuss concerns regarding plutonium disposition activities with DOE officials, and for the Department to receive oral and written comments on the scope of the EIS. Written and oral comments will be given equal weight in the scoping process. Input from the scoping meetings along with comments received by other means (phone, mail, fax, web-site) will be used by the Department in refining the scope of the EIS. The locations and dates for these public meetings are as shown below. All meetings will consist of two sessions (1:00 pm to 4:00 pm and 6:00 pm to 9:00 pm).

Hanford Site:

July 1, 1997
Shilo Inn
50 Comstock
Richland, WA 99352
509-946-4661

Idaho National Engineering and Environmental Laboratory

June 10, 1997
Shilo Inn
780 Lindsay Boulevard
Idaho Fall, ID 83402
208-523-0088

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[1] Arms Control and Disarmament Agency; Department of Defense; Department of State; Environmental Protection Agency; and Nuclear Regulatory Commission

Pantex Plant:

June 12, 1997
Radisson Inn Airport
7909 I-40 East at Lakeside
Amarillo, TX 79104
806-373-3303

Savannah River Site

June 19, 1997
North Augusta Community Center
495 Brookside Avenue
North Augusta, SC 29841
803-441-4290

Advanced registration for the public meetings is requested but not required. Please call 1-800-820-5134 and leave your name and the location of the meeting(s) you plan to attend. This information will be used to determine the size and number of rooms needed for the meeting.

Scoping Meeting Format:

The Department intends to hold a plenary session at the beginning of each scoping meeting in which DOE officials will more fully explain the framework for the plutonium disposition program, the proposed action, preliminary alternatives for accomplishing the proposed action and public participation in the NEPA process. Following the plenary session, the Department intends to discuss relevant issues in more detail, answer questions, and receive comments. Each scoping meeting for the Surplus Plutonium Disposition EIS will have two sessions, with each session lasting approximately three to four hours.

Issued in Washington, DC this 16 day of May, 1997, for the United States Department of Energy.

Peter N. Brush
Principal Deputy Assistant Secretary
Environment, Safety and Health

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 11, 1997

Mr. J. David Nulton, Director
NEPA Compliance and Outreach
Office of Fissile Materials Disposition
U.S. Department of Energy
Washington, DC 20585

Dear Mr. Nulton:

This is in response to your May 19, 1997, letter regarding the preparation of an Environmental Impact Statement for Surplus Plutonium Disposition (SPDEIS).

In your letter you requested the U.S. Nuclear Regulatory Commission (NRC) to comment on several issues. The issues included the Notice of Intent (NOI) published in the Federal Register of May 22, 1997; additional issues to the NOI; NRC's jurisdiction by law on future actions, such as the potential external regulation of DOE facilities; and NRC's role in the SPDEIS process.

With respect to the issues identified in the NOI and any additional issues, the NRC staff has reviewed the NOI and does not have any comments at this time. The staff believes that, to the extent that DOE anticipates that the surplus plutonium disposition activities will be subject to NRC regulatory authority, the regulatory requirements that would apply to an NRC licensed facility should be considered in the EIS process.

Addressing the issue related to the regulatory authority of NRC it is our understanding that in the absence of legislative changes, NRC may not have authority to regulate the facilities under consideration in the NOI. With regard to the MOX facility, we understand that DOE plans to seek legislative changes to authorize NRC regulatory authority for the licensing of such a facility.

In addition, your letter requested information concerning the extent to which NRC would participate in the EIS process as a Cooperating Agency. The NRC staff will be seeking a Commission decision on this matter and will advise you on the outcome of this review.

In the interim, pending Commission review, it is anticipated that any NRC resources expended in relation to the SPDEIS process will be covered by the Reimbursable Agreement entitled, "Technical Support for the Preparation and Review of Licensing and Regulatory Compliance Documents." To facilitate our ability to respond to DOE requests,

ATTACHMENT 5

we suggest that task statements concerning NRC requested support be provided at the earliest possible time. It would be useful to schedule a meeting, in the near future, to discuss anticipated DOE requests. We will be happy to make arrangements for the meeting at your earliest convenience at NRC facilities.

Sincerely,

Theodore S. Sherr
Regulatory and International Safeguards Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards