



Department of Energy

Washington, DC 20585

January 6, 1998

The Honorable John M. Spratt, Jr.
U.S. House of Representatives
Washington, D.C. 20515

Dear Congressman Spratt:

This is in response to your letter dated November 14, 1997, requesting information concerning the Department's future plans at the Savannah River Site. In reviewing the enclosed responses to your specific requests for information, you will note that some of the Department's plans are in the preliminary stages of formulation. I look forward to working with you as we define the future missions for the site.

If you have further questions, please contact me or have a member of your staff contact Ms. Melanie Kenderdine, Deputy Assistant Secretary for House Liaison, Office of Congressional and Intergovernmental Affairs, at (202) 586-5468.

Sincerely,

A handwritten signature in black ink, appearing to read "Alvin L. Alm".

Alvin L. Alm
Assistant Secretary for
Environmental Management

Enclosure



Responses to Requests for Information in
Congressman John Spratt, Jr.'s November 14, 1997, Letter

1. "Please identify the total amount of surplus U.S. plutonium by form (e.g., pits, metals, residues, etc.), how much of it (by form) is suitable for processing into mixed oxide fuel (Mox), and how much of it (by form) is likely to be immobilized (vitrified). Please indicate how much of this surplus plutonium is addressed by the ROD discussed above, how much is addressed by the draft EIS mentioned in the next question, and how much will be addressed by other EIS's and identify those EIS's."

Response: The total amount of plutonium that has been declared surplus to date is 52.5 metric tons. This amount is comprised of 28.9 metric tons (including 1.1 metric tons of fuel - grade plutonium) in pits and other metal; 4.4 metric tons in oxide; 4.6 metric tons in unirradiated reactor fuel; 7.5 metric tons in irradiated reactor fuel; and 7.1 metric tons in other forms, including residues.

Of 52.5 metric tons of surplus plutonium, 7.5 metric tons in spent fuel is sufficiently unattractive for weapons use and will not be subject to disposition actions. Furthermore, approximately 2.0 metric tons of material in residues is of low concentration and is expected to be processed and repackaged for disposal as transuranic waste. As a result, the net amount of surplus plutonium that is considered weapons-usable and is therefore subject to disposition actions, is approximately 43.0 metric tons. The Record of Decision (ROD) for the Storage and Disposition of Weapons-Usable Fissile Materials issued in January 1997, addressed 50 metric tons of surplus weapons-usable plutonium because an allowance of 70 metric tons was included to provide for additional plutonium that may be declared surplus in the future. The Surplus Plutonium Disposition Environmental Impact Statement (EIS), scheduled for completion at the end of next year, will continue to address the 50 metric tons of material.

The Department intends to minimize the amount of processing associated with the removal of impurities from plutonium feed materials in order to reduce the environmental impacts associated with processing and to reduce costs. Of the 50 metric tons currently being analyzed for planning purposes, approximately 31.8 metric tons of plutonium in pits and clean metal would likely meet purity specifications for use in the fabrication of MOX fuel.

Other EIS's that address surplus plutonium include the Programmatic Spent Nuclear Fuel Management EIS (which addresses the management of Department of Energy (DOE)-owned spent nuclear fuel including the 7.5 metric tons of surplus plutonium in spent fuel) and the Draft EIS on Management of Certain Plutonium Residues and Scrub Alloys Stored at the Rocky Flats Environmental Technology Site (which addresses the stabilization and repackaging of 2.8 metric tons of surplus plutonium in residues).

2. "Please discuss what priority SRS currently has to forward waste on site to either WIPP or Yucca Mountain (or a temporary repository if Congress enacts legislation over the Administration's objections). Please discuss specifically what priority SRS materials receive as compared with other DOE sites (Hanford, Oak Ridge, Rocky Flats, INEEL, etc.)."

Response: The Waste Isolation Pilot Plant (WIPP) is scheduled to be open to receive defense transuranic waste (TRUW) in May of 1998. The first transportation corridor will provide for shipments to WIPP from the Idaho National Engineering and Environmental Laboratory (INEEL) in Idaho, the Rocky Flats Environmental Technology Site (RFETS) in Colorado, and the Los Alamos National Laboratory (LANL) in New Mexico. The Savannah River Site (SRS) will have a transportation corridor established and has priority (and the site is planning) for early shipment of TRUW beginning in fiscal year (FY) 1999.

Regarding waste shipments to Yucca Mountain, the Office of Environmental Management (EM) and the Office of Civilian Radioactive Waste Management (RW) have prepared a Memorandum of Agreement (MOA) for Acceptance of DOE Spent Nuclear Fuel (SNF) and High-Level Radioactive Waste. This agreement is similar to the Standard Contract for Disposal of Spent Nuclear Fuel (SNF) for commercial facilities that is specified in 10 CFR 961. Approval of this MOA is expected in the near future. This MOA includes an Acceptance Schedule section that notes that EM will submit to RW, in conjunction with Naval Reactors, an integrated acceptance schedule for DOE-owned SNF, high-level waste (HLW), and Naval Reactors program SNF. The responsibility for prioritizing transfer of all these streams, therefore, resides with EM. At this time, no attempt has been made to establish such an acceptance schedule.

It is expected that factors to be considered in establishing such priorities will include the following:

- Health and safety risk to the public, DOE site workers, and the environment from continued storage of such materials.
- Reduced life-cycle storage costs by avoiding construction of additional storage facilities because of off-site transfers.
- Regulatory or legal commitments between DOE sites and State or Federal regulators for shipment of these materials off-site, and
- Nonbinding agreements or commitments between DOE sites and stakeholders for shipment of these materials off-site.

It is anticipated that the DOE-owned SNF, HLW and Naval Reactors program

SNF will all be subject to these factors in order to establish priorities for acceptance at either Yucca Mountain or an interim storage facility.

3. "Please provide the timetable for transporting plutonium metals and oxides from Rocky Flats to the Savannah River Site per the Record of Decision (ROD) completed this year in January. If possible, please include the approximate amounts shipped to Savannah River Site per year or other appropriate measure."

Response: If SRS is chosen as the plutonium immobilization site in the Surplus Plutonium Disposition ROD sometime in late 1998, approximately 7.3 metric tons of surplus non-pit weapons-usable plutonium metal and oxides now stored at the RFETS, would be transported to the Actinide Packaging and Storage Facility (APSF) at SRS once the facility is completed near the end of 2001. The plutonium metals and oxides will be shipped directly to the APSF over a period from about 2002 to 2004. The exact timing would depend on activities taking place at RFETS and at the APSF.

4. "Please provide any alternatives the Department may be considering to accelerate the shipments of plutonium metals and oxides per the same ROD, or modifications to the ROD, and discuss:

(I) what the Department would have to do at SRS to accommodate the acceleration and the costs involved with these changes (broken out by fiscal year);

(II) what cost savings the Department could expect at Rocky Flats by each acceleration alternative (broken out by fiscal year). If the cost savings at Rocky Flats is dependent on other variables, such as residues, please discuss these variables; and

(III) If modifications to the ROD are required, what are the nature of the changes."

Response: The current baseline plan for removing plutonium metals and oxides from Rocky Flats is to ship the material to the new vault at Savannah River in 2002-2004 which supports closure of Rocky Flats by 2010. The Department is considering accelerating the shipment of plutonium metals and oxides from RFETS to SRS for storage. The Department is evaluating the shipment of this plutonium for storage at an SRS reactor facility (modified for safe, secure plutonium storage). Modifying an SRS reactor for receipt of the RFETS plutonium is seriously being considered since this is the most viable alternative at Savannah River to support RFETS closure in 2006 instead of 2010.

At Hanford, the current baseline plan is to continue to store plutonium in the Plutonium Finishing Plant vault until a plutonium immobilization facility becomes operational at Savannah River or Hanford. The material would then be shipped as needed through the next decade. The Department is also considering the early shipment of Hanford plutonium metal and oxide to the Savannah River Site permitting cost savings from closure of the storage facilities and potential

early deactivation of the Plutonium Finishing Plant. The Hanford material would be stored in the APSF. The plutonium will be stabilized to meet the safe storage standard for this material.

(I) Under the option of modifying an SRS reactor for the RFETS plutonium, National Environmental Policy Act requirements would need to be met before construction of modifications to an SRS reactor could begin. The following estimated additional funds are required: (\$2 million in FY 1998, \$23 million in FY 1999, and \$25 million in FY 2000). After FY 2000, the additional costs are \$7 million per year at SRS for surveillance and maintenance of this material. Additional funding requirements for accelerating plutonium shipments from Hanford are estimated to be: \$4 million in FY 2002; \$4 million in FY 2003; and \$4 million in FY 2004.

(II) Cost savings achieved at RFETS would not be evident until the plutonium metals and oxides would be shipped offsite. Cost savings at RFETS are estimated at \$100 million in FY 2004 and \$1.2 billion for FY 2005 and beyond over the baseline plan described above. These cost savings are dependent on the plutonium residues leaving RFETS in a timely manner, since this is also required to accelerate RFETS closure to 2006. The savings at Hanford from early plutonium shipment are estimated at \$600 million beginning in 2005.

(III) The nature of the addenda to the ROD would be (1) to permit shipments of the RFETS plutonium metals and oxides to SRS prior to completion of the APSF, and (2) to permit shipments of Hanford plutonium metals and oxides to SRS for storage prior to completion of an immobilization facility at SRS.

5. "Please provide a summary of the draft EIS for the Rocky Flats residues, including a time line that shows when and how much of this material will be transferred to SRS, what will need to occur at SRS to safely store and treat this material (including cost estimates broken out by fiscal year), the timeline at SRS for storage and treatment of this material, and the expected savings at Rocky Flats accrued by removal of this material."

Response: The Draft EIS on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site was issued November 12, 1997. Under the Preferred Alternative a maximum of about 3,300 kilograms of plutonium residues (sand, slag, and crucible and fluorides) and 700 kilograms of scrub alloy could be shipped to the SRS for processing during the period 1998-2000. This amounts to less than ten percent of the materials covered by this EIS and amounts to a maximum of 39 truck shipments over the 1998-2000 time frame. Under the Preferred Alternative, SRS would process certain ash residues (sand, slag, and crucible), plutonium fluoride residues, and scrub alloy using the PUREX/plutonium metal recovery process in the F-Canyon. Processing of the materials covered by this EIS is consistent with the existing mission of the F-Canyon (to process certain "at-risk" materials).

The residual waste products that would be separated from the plutonium would meet safeguards termination limits for disposal. Transuranic waste would be shipped to WIPP, when that facility is available; low-level waste would be disposed of along with other SRS low-level waste; and any high-level waste would be dispositioned in the same manner as other SRS high-level waste (stored pending disposal in a geologic repository).

The separated plutonium would initially be placed into safe and secure storage in the 235F Building followed by storage in the APSF when it becomes available. Ultimately, it will be disposed of in accordance with decisions to be reached following completion of DOE's Surplus Plutonium Disposition EIS.

Detailed cost estimates by fiscal year have not been developed prior to completion of the EIS. The cost of processing this material at Savannah River is difficult to identify separately since stabilization activities for Savannah River material will be conducted in the same facilities in parallel with processing the Rocky Flats material. However, processing this material will involve extending the operation of the PUREX process part of F-Canyon for the equivalent of a little more than one year. Nevertheless, at this time we are estimating that the Department would save more than \$100 million if the preferred alternative (including processing at SRS) were chosen rather than an alternative that relies only on processing at the RFETS.

6. "Please discuss how much material at Hanford, Los Alamos, and other sites under DOE control may be transferred to SRS, and identify an existing or draft EIS's (or other evaluations) that discuss any such options. To the maximum extent practicable, include details about the nature of the material, the amounts, possible time lines for shipping the material to SRS, the alternative treatment and/or storage options at SRS (including estimated costs broken out by fiscal year), and potential cost savings at Hanford, Los Alamos, and other relevant sites."

Response: If SRS is chosen as the host site for a plutonium immobilization facility, inventories of non-pit weapons-usable plutonium would be transferred to SRS in increments to be dispositioned, excluding the 7.3 metric tons of surplus non-pit plutonium from RFETS that would be transported to SRS between 2002 and 2004. This inventory consists of 4 metric tons of metal and oxides from the Hanford site, 4 metric tons of unirradiated reactor fuel from INEEL, and 1.5 metric tons of metals and oxides from LANL. This option is included in the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement.

These shipments could commence as early as FY 2005, at the time that an immobilization facility is projected to be operational at SRS. The timing and duration of these shipments would depend on immobilization plutonium feed strategies that are still to be finalized. The Preferred Alternative would be to immobilize the plutonium material using the can-in-canister approach.

Removal of plutonium from Hanford, INEEL, and RFETS would reduce operating costs associated with maintaining plutonium at these sites. These reductions in operating costs are expected to be significant because they would include, in addition to the costs for direct handling and surveillance of the plutonium, infrastructure operating costs, such as safeguards and security and the requirements to use "cleared" contractors for site cleanup and remediation efforts. The extent of the reductions in cost would depend on how quickly the plutonium materials could be transferred to SRS, which, in turn, would depend on finalizing the immobilization plutonium feed strategy as well as other activities ongoing at APSF. Removal of the surplus plutonium from LANL is not expected to result in significant cost reductions because infrastructure costs associated with the storage and handling of amounts of plutonium for programmatic needs at LANL would only be marginally affected by the removal of the surplus plutonium.

If the SRS were chosen as the site for the Pit Disassembly and Conversion Facility that will convert pits and pure metal to a suitable feed form for fuel fabrication or immobilization, pits would be transferred to the SRS from the Pantex Plant. At the Pit Disassembly and Conversion Facility, pits consisting of plutonium metal weapons components, would be taken apart and converted to an oxide form and transferred to the MOX fuel fabrication facility either at SRS or at some other DOE site. Plans are to operate this facility starting in FY 2005 and continue for eight to ten years. Up to approximately 32 metric tons of plutonium (pits and clean metal) could be converted to a plutonium oxide feed.

Removal of surplus plutonium pits from Pantex would result in a reduction to site operating costs associated with the direct handling and surveillance of the surplus plutonium. Infrastructure costs associated with plutonium would be marginally affected so long as Pantex maintained a National defense mission involving pit disassembly and storage of strategic reserve pits.

If the SRS is chosen as the preferred treatment site for RFETS residues and scrub alloy, some of this material would be transferred to SRS. This inventory includes 0.2 metric tons of plutonium in "scrub alloy" (magnesium, aluminum, americium, plutonium mixture from an interim step in plutonium recovery - plutonium content too high for disposal in WIPP), 0.14 metric tons of plutonium in fluoride residues, 0.13 metric tons of plutonium in sand, slag, and crucible ash residues. This will increase the quantity of plutonium at the Savannah River Site by less than 25 percent.

Pending the outcome of the EIS on Management of Certain Plutonium Residues and Scrub Alloys Stored at Rocky Flats Environmental Technology Site (Draft issued on November 97), shipment of this material may start in mid-1998 and continue through early 2000. Removal and stabilization of material from storage at RFETS will allow for cessation of material management operations, safeguards, and security (at significant savings to the RFETS) as well as for the decommissioning of facilities (mortgage reduction). Removal and stabilization of

this material will address health and safety concerns of continued storage in their current form.

A study called the Nuclear Materials Processing Needs Assessment is ongoing to identify if any additional nuclear materials, beyond materials already noted above, may require the SRS canyon facilities for stabilization or disposition prior to canyon decommissioning. The assessment results will provide initial technical input for further consideration and may ultimately be incorporated into the strategy for utilization of the SRS canyons. The current canyon utilization strategy is described in the "Savannah River Site Chemical Separation Facilities Multi-Year Plan," September 1997. The expected completion date for the Processing Needs Assessment is January 1998.

7. "Please explain the ARIES process, its relationship to producing Mox, and alternatives to ARIES should it encounter developmental difficulties."

Response: The Advanced Recovery and Integrated Extraction System (ARIES) is a pit disassembly and conversion process that converts nuclear weapons components (pits) and pure metals to a safe and stable packaged plutonium oxide. The plutonium oxide form is suitable for international inspection as well as for feed stock for MOX fuel fabrication or for immobilization. The core of the system is a pyrochemical process that first hydrides the plutonium and then converts the plutonium hydride to a plutonium oxide powder. A pit enters the system and is bisected and separated into two plutonium hemishells. These shells are placed in a vessel and exposed to hydrogen. The hydrogen combines with the plutonium at high temperature to form plutonium hydride flakes that drop into a heated crucible. Nitrogen gas is introduced into the heated crucible to convert the plutonium hydride to a plutonium nitride, and oxygen is introduced into the vessel to convert the plutonium nitride to plutonium oxide. By controlling the temperature, plutonium oxide is produced with characteristics suitable for MOX fuel fabrication. The ARIES provides accountability and control of the incoming and outgoing plutonium product and packaging capability. The packaged plutonium oxide would be shipped to the MOX fuel fabrication facility. The ARIES constitutes the process part of the Pit disassembly and conversion facility.

One of the technical challenges being addressed as part of the ARIES is the reduction of gallium in the plutonium oxide form produced from some of the pits. In the event that the ARIES should encounter developmental difficulties in reducing gallium to acceptable levels, an alternative process for the removal of the gallium would be to dissolve and purify the plutonium oxide using a glove-box-sized aqueous process. The process has been used successfully in the past; however, this process would produce larger quantities of radioactive liquid wastes.

8. "To the best extent practicable, please provide the cost and time schedules for developing a Mox production capability (including all associated subprocesses) and new

vitrification capabilities needed to treat U.S. surplus plutonium. Also discuss the department's estimate of how long a Mox plant would operate, including an estimate of the [sic] how the amount of plutonium converted into Mox could affect the duration of the Mox plant's operation."

Response: The cost and schedule provided are based on conceptual designs developed for a new MOX fabrication facility and a new pit disassembly and conversion facility as well as on technology development plans. The cost for developing a MOX fuel fabrication capability is estimated at approximately \$580 million. The cost for a Pit Disassembly and Conversion Facility that would provide the plutonium oxide to the MOX fuel fabrication facility (or immobilization facility) is estimated at approximately \$600 million. Operating costs for the MOX fuel fabrication facility are expected to be offset by the value of the fuel produced, resulting in no cost liability to the Government. The MOX fuel fabrication facility is planned to be operational in approximately 2006. The Pit Disassembly and Conversion Facility is planned to be operational in approximately 2004. The amount of plutonium to be fabricated into MOX fuel is assumed to be 32 metric tons and the MOX fuel fabrication facility is assumed to operate for approximately ten years after which it would be shut down and decommissioned. If more surplus weapons plutonium were to become available for MOX fuel fabrication, the facility operation could be extended. The duration of the extension would depend on the amount of and the timing at which the additional plutonium were made available.

For immobilization, the Department's preference is to use the "can-in-canister" technology at the Defense Waste Processing Facility (DWPF) at SRS. Under the can-in-canister approach, cans containing plutonium incorporated in a ceramic matrix form would be placed in DWPF canisters, surrounded by borosilicate glass containing high-level waste. The cost and schedule provided are based on preconceptual design and technology development plans. The cost for developing this immobilization capability is estimated to be \$560 million. DOE plans to have a new immobilization facility to disposition surplus plutonium operational about the year 2005. The operating campaign for immobilization would be about ten years based on approximately 18 metric tons of plutonium.

9. "Please explain the waste streams, both nuclear and nonnuclear, that would result from producing MOX at SRS, and discuss treatment and storage options for these waste streams."

Response: The waste streams, both nuclear and nonnuclear, as well as discussions on treatment and storage options for these waste streams, are described in the Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS, Section 4.3.5.1.10, Waste Management and Section E.3.23, Generic Mixed Oxide Fuel Fabrication Facility. An update of this information will be provided in the Disposition of Surplus Plutonium EIS to be issued sometime in early 1998. A summary of the subject based on the information in the PEIS is provided below.

The nuclear waste streams that are expected to result from producing MOX fuel include transuranic (TRU) and mixed TRU solid wastes and low level and mixed low-level liquid and solid wastes. TRU and mixed TRU wastes would be generated from plutonium oxide fuel fabrication and materials recycle operations. Mixed TRU wastes consisting of filters, resins, job control wastes, process equipment, and sweepings would require treatment (volume reduction) and packaging to meet current planning-basis WIPP Waste Acceptance Criteria. This waste would be treated and packaged in an expanded central facility at SRS. This waste would also require storage facilities where it could be staged until it would be shipped to WIPP or an alternate facility for disposal.

The low-level waste (LLW) generated in uranium and plutonium oxide processing and preparation, and rod pressing and processing, would consist of contaminated job control waste, filters, and process equipment. LLW would be treated by sorting, separation, concentration, and size reduction processes. The ultimate disposal of LLW will be in accordance with the ROD from the Waste Management PEIS. Mixed LLW would consist of radioactively-contaminated solvents, lead, protective clothing, radiological survey waste, and scintillation vials. Mixed LLW would be managed in accordance with the respective site treatment plans that were developed to comply with the applicable Federal Facility Compliance Act.

Liquid and solid hazardous waste would be generated in the MOX fuel fabrication facility from the use of chemical and organic lubricants, coolants, solvents, and paints. Additional Resource Conservation and Recovery Act (RCRA)-permitted staging facilities would be required at SRS, if MOX fuel were to be manufactured at SRS, where hazardous wastes would be stored pending onsite treatment at a RCRA-permitted facility.

Liquid nonhazardous sanitary, industrial, and other wastewater would require treatment in accordance with site practice and discharge permits. At SRS the plant wastewater facility has the capacity to accommodate this increased flow. The solid sanitary and industrial nonhazardous waste and other nonhazardous waste generated by the MOX fuel fabrication facility would be recycled or shipped to onsite or offsite disposal facilities in accordance with site-specific practice.

In summary, facilities that would support the MOX fuel fabrication facility would treat and package all generated waste into forms that would enable storage and/or disposal in accordance with the requirements of RCRA and other applicable statutes. Depending in part on the decisions in waste-type-specific RODs for the Waste Management PEIS, wastes at SRS could be treated, and depending on the type of waste, disposed of on site or at a regionalized or centralized DOE sites.

10. "Is there funding programmed in DOE's budget for APT, Mox production, immobilization, and acceleration of waste from Rocky Flats to SRS?"

Response: Current FY 1998 DOE budgets fully support most of these programs. However, DOE has not made a decision on the accelerated movement of Rocky Flats plutonium metals and oxides and therefore did not build this into the budget request.

11. "Discuss the department's assumptions of the U.S. nuclear fuel market when it tries to sell or provide Mox fuel to utilities, and specifically discuss the effect that the blended down Russian HEU will have on this market."

Response: The amount of weapons plutonium that is expected to be used in MOX fuel is approximately 32 metric tons. A typical Pressurized Water Reactor or Boiling Water Reactor is expected to burn approximately one metric ton of MOX per year. The Department's program allows a period of up to 15 years for reactor burning, therefore, only the refueling of three to eight domestic reactors would be affected. Impacts that could potentially result from introducing MOX fuel into the nuclear fuel market are expected to be relatively small.

Since the signing of the historic U.S./Russia HEU Purchase Agreement in 1994, the U.S. will have received by year-end low-enriched uranium derived from 36 metric tons of HEU removed from dismantled Soviet nuclear weapons. The low-enriched uranium has two components: uranium enrichment services, which is measured in separative work units and the natural uranium that is measured in pounds.

The United States Enrichment Corporation (USEC), Executive Agent for the U.S. under the Agreement, will have received about 6.6 million SWU by the end of 1997. USEC may use the additional supply to seek new sales or by meeting existing customer orders. There have been no impacts on the uranium enrichment market resulting from the Agreement material and employment at the gaseous diffusion plants has not been affected to date. USEC has also publicly stated their intention to keep the existing plants operational through at least 2004.

The amount of the natural uranium component of the low-enriched uranium to be delivered by the end of 1997 is about 28.4 million pounds. The uranium is subject to Congressionally mandated restrictions and Commerce Department requirements for importation of Russian-origin uranium. Specifically, the USEC Privatization Act stipulates a schedule of natural uranium that may enter the U.S. from the Agreement and the Department of Commerce's Uranium-Antidumping Suspension Agreement is in place to ensure that all Russian-origin uranium enters the U.S. under provisions designed to maintain stability in the market.