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Supplement Analysis

For

STORAGE OF SURPLUS PLUTONIUM MATERIALS IN THE K-AREA MATERIAL STORAGE FACILITY AT THE SAVANNAH RIVER SITE

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STORAGE OF SURPLUS PLUTONIUM MATERIALS IN THE K-AREA MATERIAL STORAGE AT THE SAVANNAH RIVER SITE

INTRODUCTION AND PURPOSE

In August 1998, the U.S. Department of Energy (DOE) issued an Amended Record of Decision (ROD) for Storage and Disposition of Weapons-Usable Fissile Materials to support early closure of the Rocky Flats Environmental Technology Site (RFETS) and the early deactivation of plutonium storage facilities at the Hanford Site (DOE, 1998b). DOE decided to take steps that allow accelerated shipment of surplus plutonium materials from RFETS to Savannah River Site (SRS) in advance of completion of the Actinide Packaging and Storage Facility (APSF) scheduled for 2001, and the relocation of surplus plutonium materials from Hanford to SRS pending disposition. The movement of surplus plutonium from RFETS and Hanford was subject to a condition that SRS was selected as the plutonium immobilization disposition site. To accommodate storage of Hanford surplus plutonium, DOE would expand the APSF. In addition, DOE decided to prepare additional suitable storage space in the K-Area Materials Storage (KAMS) facility in Building 105-K to accommodate early receipt and storage of RFETS surplus plutonium, pending completion of the APSF.

In January 2001, a decision was made to cancel APSF and use existing facilities for processing and storing surplus plutonium at SRS (DOE, 2001a). The previous analysis assumed that the KAMS facility would operate for the storage of surplus plutonium for 10 years pending disposition. With the cancellation of the APSF coupled with the revised Surplus Plutonium Disposition strategy (i.e. cancellation of the immobilization facility and enhancing the aqueous polishing unit for the Mixed-Oxide (MOX) Fuel Fabrication Facility), storage of these materials in KAMS beyond 10 years may be needed. Surplus plutonium materials will be stored in the KAMS facility until they are processed and converted into MOX fuel, which is expected to occur in the 2007 – 2019 time frame. In addition, DOE previously determined that surplus RFETS plutonium/enriched uranium composite parts and plutonium-contaminated highly enriched uranium parts would also be stored in KAMS (DOE, 1997 and DOE, 2001b). These items will be stored at the SRS until they are processed in preparation for disposition; processing is expected to occur in the 2005 – 2008 time-frame.

The Council on Environmental Quality regulations for implementing the National Environmental Policy Act (NEPA), 40 CFR 1502.9 (c), direct Federal agencies to prepare a supplement to an environmental impact statement when an agency "(i) makes substantial changes in the proposed action that are relevant to environmental concerns, or (ii) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or impacts." DOE regulations for compliance with NEPA, 10 CFR 1021.314(c), direct that when it is unclear whether a supplement to an environmental impact statement is required, DOE must prepare a supplement analysis (SA) to assist in making that determination.

This SA evaluates the potential impacts associated with the storage of surplus plutonium materials from RFETS and other sites beyond 10 years at KAMS pending disposition. The evaluation also examines performance issues and surveillance needs relating to the use of KAMS and the capability of the 9975 shipping containers[1] to support a long-term storage system potentially beyond 10 years at KAMS.

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[1] The 9975 shipping container is a DOE approved Type B shipping package that meets the safety standards set forth in Subpart E, "Package Approval Standards" and Subpart F, "Package and Special Form Tests" Title 10, Code of Federal Regulations, Part 71.

BACKGROUND

Through a series of decisions supported by appropriate NEPA analyses, DOE has decided to store and disposition its surplus plutonium at existing facilities and at additional facilities to be built at the SRS. Existing facilities at SRS are to be used for storage of SRS surplus plutonium materials as well as surplus plutonium currently located at Hanford and RFETS. Further details on the decisions and related NEPA documentation with respect to surplus plutonium storage are provided in the following:

1. *Interim Management of Nuclear Material Final Environmental Impact Statement* (IMNM EIS), DOE/EIS-0220, October 20, 1995.

2. Record of Decision and Notice of Preferred Alternatives for the Interim Management of Nuclear Materials EIS, *Federal Register,* Vol. 60, p.65300, December 19, 1995.

3. *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (S&D PEIS), DOE/EIS-0229, December 1996.

4. Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement, *Federal Register,* Vol. 62, p. 3014, January 21, 1997.

5. Amended Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials *Federal Register*, Vol. 63, p. 43386, August 13, 1998 with *Supplement Analysis for Storing Plutonium in the Actinide Packaging and Storage Facility and Building 105-K at the Savannah River Site* (APSF/B105-K SA), July 1998.

6. Surplus Plutonium Disposition Final Environmental Impact Statement (SPD EIS), DOE/EIS-0283, November 1999.

7. Record of Decision for the Surplus Plutonium Disposition Final Environmental Impact Statement *Federal Register,* Vol. 65, p. 1608, January 11, 2000.

8. Amended Record of Decision on Interim Management of Nuclear Materials, *Federal Register*, Vol. 66, p. 7888, January 26, 2001.

9. Amended Record of Decision on Interim Management of Nuclear Materials, *Federal Register,* Vol. 66, p. 55166, November 1, 2001.

The IMNM EIS evaluated a suite of alternatives for ensuring the continued safe management and storage of nuclear materials at SRS until decisions on their ultimate disposition are made and implemented (DOE, 1995a). A part of the preferred alternative was the construction of the APSF, to prepare, package, and store plutonium oxide and metal in accordance with DOE's plutonium storage standard (DOE, 2000c). The APSF also was intended to provide space for consolidated storage of plutonium and special actinide materials at the SRS. DOE's Record of Decision for the IMNM EIS included the decision to construct the APSF (DOE, 1995b).

The S&D PEIS analyzed the potential impacts of various alternatives for the long-term storage (up to 50 years) of weapons-usable fissile materials (i.e., plutonium and highly enriched uranium (HEU)) pending disposition, and for the disposal of surplus weapons-usable plutonium (DOE, 1996). The S&D PEIS

addressed several alternatives including a preferred alternative for SRS that involved the shipment of RFETS non-pit plutonium to SRS and storage in an expanded APSF. DOE's Record of Decision included the decision to expand the APSF (DOE, 1997).

To support the accelerated closure of RFETS from 2010 to 2006, DOE decided to prepare additional suitable storage space in Building 105-K, later designated as KAMS (DOE, 1998b). The KAMS storage space would be used to store non-pit, surplus plutonium from RFETS, pending completion of the APSF. To support this decision, an SA was prepared to analyze storage for up to 15 metric tons of surplus plutonium materials in KAMS for a period of up to 10 years (DOE, 1998a). The SA demonstrated this action would not result in a substantial change to the environmental concerns evaluated in the S&D PEIS and the action does not present significant new circumstances or information relevant to the environmental concerns evaluated previously. DOE published the SA, along with an amended Record of Decision that announced the decision to construct and operate KAMS to facilitate early closure of the RFETS (DOE, 1998b).

The SPD EIS analyzed the potential impacts of various alternatives for the disposition of surplus plutonium (DOE, 1999). The SPD EIS addressed several alternatives including a preferred alternative of building three disposition facilities at SRS for the disposition of surplus plutonium. The SPD ROD provided for the immobilization of approximately 17 metric tons (MT) of surplus plutonium and the use of up to 33 MT of surplus plutonium as MOX fuel. In January 2000, DOE decided to locate the facilities required for disposition of surplus plutonium at the SRS (DOE, 2000a).

Because of APSF cost growth, resource limitations, and the potential for integrating its plutonium storage and disposition activities, DOE evaluated alternative stabilization and storage options (DOE, 2000b). DOE decided in the January 2001 amended ROD for the IMNM EIS to cancel the APSF project and initiate a project to install stabilization and packaging capability in Building 235-F at SRS (DOE, 2001a). DOE will continue to use existing vault space in Building 235-F and in FB-Line at SRS for interim storage pending final disposition. The previous decision to store surplus non-pit plutonium from RFETS in the new vault space in Building 105-K was reaffirmed. Subsequently, DOE decided to install plutonium stabilization and packaging capability in FB-Line at SRS and to cancel the installation of such equipment in Building 235-F (DOE, 2001c).

PROPOSED ACTION

DOE will continue with the previous decision to store surplus plutonium from RFETS in KAMS pending disposition. In addition, DOE is proposing to use the KAMS facility for interim storage of surplus plutonium from other DOE sites, as needed. The storage of surplus plutonium materials in KAMS could extend beyond the 10 years estimated in the APSF/B105-K SA (DOE, 1998a). KAMS would serve as an interim storage facility pending disposition of the materials. DOE would also maintain the SRS Surveillance Program and the K-Area Structural Assessment Program to provide the basis for continued safe storage of the surplus plutonium materials beyond 10 years in the KAMS facility.

EXISTING NEPA ANALYSIS

The environmental impacts from the storage of fissile material at SRS were presented in the IMNM EIS and the S&D PEIS (DOE, 1995a and DOE, 1996). These two EISs contain the calculated annual impacts presented over specific time periods. The environmental impacts evaluated in the APSF/B105-K SA were compared, as appropriate, to the impacts of storing the surplus fissile materials principally under the S&D PEIS and, occasionally, the IMNM EIS. The analysis approach of APSF/B105-K SA was conservative in that it assumed both APSF and Building 105-K (i.e., KAMS) would be operated at a maximum storage capacity of 15 MT which is greater than the currently anticipated amount of surplus plutonium material (8-10 MT). The results used in these documents for annual or event impacts were evaluated for use in this SA.

IMPACTS OF STORAGE BEYOND 10 YEARS AT KAMS

The only significant normal operations designated to occur related to the material in storage at KAMS are the placing of the 9975 shipping containers in appropriate storage locations, occasional removal of 9975 shipping containers, and ultimate removal of the material from KAMS for disposition. The materials in storage at KAMS were packaged in 3013 containers[2] at the originating sites and placed in 9975 shipping containers for transportation and storage. The 9975 containers would be moved from KAMS (excluding disposition) for two reasons: (1) to conduct surveillance of the 9975 and the 3013 containers required by the SRS surveillance program, or (2) if a container is contaminated or appears to be leaking. The SRS surveillance program for storage containers is discussed later in this SA. A contaminated or leaking container would be placed in a temporary containment (e.g., double plastic bag), removed to F-Canyon for decontamination and repackaging, and then returned to KAMS (WSRC, 1999). Such removal and return operations would be similar to the operations presented for stabilization operations in the APSF/B105-K SA.

The potential impacts for storage beyond 10 years at KAMS will be separated into three categories. The first category involves non-radiological impacts. These potential impacts are associated with land resources, site infrastructure, geology and soils, biology, cultural, paleontological, air quality and noise, water, socioeconomics, and environmental justice. The second category is the radiological impacts related to operations at KAMS such as waste management, normal operations, container inspection and maintenance, and accidents. The third category addresses the structural integrity of Building 105-K and the surveillance program for monitoring the condition of the storage containers.

Non-Radiological Impacts

There are no significant changes anticipated to land resources, site infrastructure, geology and soils, biology resources, and cultural and paleontological resources due to the extended storage of surplus plutonium materials in KAMS. These areas have been in continual use for industrial applications since the 1950s, making the presence of any important cultural resources highly unlikely (DOE, 1998a). The existing electrical power infrastructure is capable of handling the additional power requirements (DOE, 1996). Because there is no new construction at KAMS, geologic and soil resources will not be further impacted. There are no aquatic habitats or wetlands in these areas and no threatened or endangered

[2] The 3013 container is a DOE approved container that meets or exceeds DOE-STD-3013-2000, "Stabilization, Packaging, and Storage of Plutonium-Bearing Materials" (DOE, 2000c).

species. The affected facility has not been nominated for inclusion in the National Register of Historic Places, and there are no plans for such nominations (DOE, 1998a).

Operations associated with storage at KAMS would not generate criteria or toxic/hazardous pollutants at concentrations that would exceed even the most stringent regulations or guidelines. Based on the noise assessment in the S&D PEIS, it is anticipated that no appreciable changes in noise from current levels will occur with long-term storage activities.

KAMS is outside the 100-year floodplain and also outside the SRS areas that could be affected by the Probable Maximum Flood as derived using the NRC Guide 1.59. Storage activities would result in negligible increases of ground-water usage and wastewater that would not exceed wastewater treatment capacity of SRS.

The socioeconomic impact from the proposed action is estimated to be minimal due to a low number of jobs affected by the storage of surplus plutonium materials at SRS.

For environmental justice impacts to occur there must be high and adverse human health or environmental impacts that disproportionately affect minority populations or low-income populations. The previous information developed under the APSF/B105-K SA is still applicable for the continued storage of surplus plutonium materials, and those results show a minimal impact on affected populations.

Therefore, the potential non-radiological impacts associated with storage beyond 10 years at KAMS are not significant and are bounded by the previous NEPA analysis.

Radiological Impacts

DOE originally estimated that, as described in the preferred alternative of the S&D PEIS, the APSF would generate only minor quantities of radioactive waste for up to 50 years of operation which was well within the waste management capabilities of SRS (DOE, 1996). This estimate would not significantly change for KAMS for two reasons. First, storage at KAMS does not involve opening the 9975 shipping containers or otherwise exposing the facility areas or personnel to radioactive contamination. Secondly, the expected periodic maintenance and surveillance operations involving the 9975 shipping containers do not exceed the anticipated handling operations previously analyzed for APSF. Therefore any radioactive waste generated by such storage operations along with the maintenance and surveillance program would again be well within the waste management capabilities of SRS.

Since the 9975 shipping containers would not be opened in KAMS, there are no significant additional radiological impacts to either the general public or non-involved workers beyond 10 years from normal storage operations in KAMS. These impacts would be within the potential impacts as presented in the IMNM EIS for the Existing Storage alternative of plutonium and uranium stored in vaults at SRS (Table D-33, DOE, 1995A). The impacts to the public or non-involved workers from the removal and return of 9975 shipping containers with the 3013 storage containers would be bounded by the stabilization [and declassification] operations presented in the APSF/B105-K SA. The dose to the maximally exposed individual member of the public at the site boundary would be no greater than approximately 1 mrem per year.

As presented in the APSF/B105-K SA, the annual dose estimated to all involved workers at KAMS is slightly higher than APSF but significantly less than regulatory limits (DOE, 1998a). For the SRS workforce, storage operations at KAMS will add 0.13 Latent Cancer Fatality (LCF) for up to 50 years as

compared to the 5.3 LCFs expected from all operations at SRS over the same 50-year period (Table 4.2.6.9-2, DOE, 1996). The potential radiological impacts to the involved and non-involved workers for the removal and transportation of the containers from KAMS to F-Area, conducting inspection and maintenance operations, and returning the containers back to KAMS would be bounded by the stabilization [and declassification] impacts presented in the APSF/B105-K SA. Therefore, normal storage operations at KAMS versus APSF would not significantly affect the public, non-involved workers, or involved workers.

Potential accidents involving the storage of 9975 shipping containers at KAMS were previously evaluated and presented in Table 4 in the APSF/B105-K SA (DOE, 1998a). The accidents included events related to natural phenomena (e.g. earthquakes), nuclear criticality, and operator errors. The accident impacts associated with KAMS could be at least three orders of magnitude greater than the potential accident impacts from APSF. This is due to KAMS not having a double High Efficiency Particulate Attenuation (HEPA) filtration ventilation system as was intended for the APSF design. Thus, for a loss of confinement inside KAMS, an unfiltered release would result. However, the APSF/B105-K SA results show that potential accident impacts at KAMS are still small (less than 1 LCF) and have a low frequency of occurrence (less than 1.0E-3 event per year).

A review of these radiological impact analyses (IMNM EIS, S&D PEIS, and APSF/B105-K SA) allows DOE to conclude that potential impacts for the storage of surplus plutonium material at KAMS are similar and not significantly different than the impacts for APSF. DOE has committed to maintain the risk potential as low as practical (less than 1.0E-6 event per year) by establishing and implementing a series of surveillance programs (engineered and administrative controls) for the KAMS structure (Building 105-K) and the integrity of the 3013 containers inside the 9975 shipping containers.

Evaluation of the KAMS Structure and 3013/9975 Containers Surveillance Programs

In response to concerns raised by the Defense Nuclear Facilities Safety Board (DNFSB), DOE and Westinghouse Savannah River Company (WSRC) implemented a K-Area Structural Assessment Program (KSAP) to determine the condition of Building 105-K and assess the viability of storing surplus plutonium materials as addressed in the APSF/B105-K SA (DNFSB, 2000 and WSRC, 2000). The evaluation included engineering structural analysis, structural assessment literature survey, monitoring cracks at critical sections, and a detailed survey (including sample analysis) of the present condition of the primary structural elements for the Building 105-K.

The engineering analysis and literature search determined that the total seismic shears were less than those calculated for the K-Reactor restart criteria and were within allowable limits for storage of surplus plutonium materials (WSRC, 1992). The actuator tower walls were identified as a critical structural element for a Class PC3 tornado scenario; however, it was determined that distress in the tower walls would not cause any interaction with the KAMS area of interest. Structural analysis and settlement monitoring of the soils underlying KAMS by Site Geotechnical Services determined that the ground under and around the facility has undergone no appreciable settlement when compared to historical data from field measurements of the benchmark monuments.

The area of the Building 105-K being evaluated for extended use as KAMS primarily consists of reinforced concrete walls 4 to 5.5 ft thick and solid concrete floor slabs 2 to 5.5 ft thick. Test data of compressive strength of the concrete walls and slabs give a value of 3,000 psi based on a 95-percent confidence. While this value is not characteristic of high-strength concrete, it is within the normal range of 2,650 to 4,000 psi and is most likely caused by a high water-cement ratio or low cement content during

construction rather than concrete degradation. Degradation of reinforced concrete is normally caused by either chemical or physical attack, and neither is likely to occur in the KAMS. Because concrete deterioration is a complex issue and the non-homogeneity and massive size of the Building 105-K structure makes an accurate determination of the remaining life of the structure very difficult, the use of periodic inspections is recommended. Periodic inspections will give greater assurance of structural behavior and continued safe performance of the KAMS structure.

Wall, floor, and ceiling cracks have been observed and monitored in Building 105-K for several years. The cracks range from microcracks to cracks about 0.4 in wide. Ceiling cracks in the process room and stack area were monitored and found to be inactive since measurements taken about nine months apart showed no movement. Gages at these locations continue to be monitored as part of the existing surveillance program. The largest visible crack is in the north wall of the Exhaust Fan Building (EFB), and it runs from about elevation 0.0 to 20.0 ft in the east-west corridor of the north side of the EFB. The crack is east of the expansion joint between the process building and EFB, and it is being investigated separately. Since the north wall of the EFB is outside the area being used for KAMS, the crack will not affect the KAMS area of interest.

An inspection of the facility showed the building structure to be in good shape. From the outside the building looks clean, devoid of degradation, discoloration, or major cracks. The building columns are large in sectional dimensions and thus are more like walls than columns from construction and behavioral points of view. Almost all of the interior walls are painted. In most areas, the paint surface is still good without any blemish. In some areas, the paint has peeled most likely due to moisture or poor surface preparation. The peeling paint is local in nature and will not cause any structural damage to the walls.

Based on the background information and investigative work by WSRC, it is concluded that the condition of the Building 105-K structure, which houses KAMS, is acceptable without further evaluation or testing. DOE will perform follow-up condition surveys of the Building 105-K structures every five years to assure safe storage at KAMS beyond 10 years.

Evaluation of the 9975 shipping container resulted in recommendations for periodic surveillance of the Celotex packing material as well as the O-ring seals. The shipping container components were qualified for a minimum 10-year life under expected storage conditions. Thermal effects in storage arrays, fire protection, effects of external explosions, nuclear criticality, effects under natural phenomenon hazard conditions (e.g., tornadoes) impact resistance, and corrosion resistance were also evaluated. Periodic surveillance was recommended to validate the evaluation, and it has been incorporated into the SRS Surveillance Program to help assure the continued safe storage of surplus plutonium materials beyond 10 years (WSRC, 2001). Ten 9975 shipping containers would be removed from KAMS per quarter (40 containers per year), transported to the FB-Line, placed in an appropriate glovebox, opened for inspection and maintenance, re-sealed, and returned to KAMS. The data obtained from this surveillance program would be evaluated and tracked to assure that the integrity of the 9975 shipping and the 3013 storage containers is maintained. Adjustments to the surveillance program may be made based on results received.

The combination of the 9975 shipping container and the robust Building 105-K structure protects the 3013 stabilized and packaged surplus plutonium materials while stored in KAMS. The SRS Surveillance Program and the KSAP, combined with the requirements of DOE-STD-3013-2000 for stable and safe storage of surplus plutonium materials for up to 50 years, provides continued assurances that the 9975 shipping container and Building 105-K structure function as intended for safe storage in KAMS well beyond the ten-year baseline storage period (DOE, 2000c; WSRC, 2000; and WSRC, 2001).

CONCLUSIONS

The potential impacts from the storage of surplus plutonium materials in the KAMS facility at SRS, pending final disposition, are not significantly different than or are bounded by the impacts identified in the preferred storage alternative for SRS in the S&D PEIS. There are no significant non-radiological impacts for storage in KAMS. The radiological impacts from normal storage operations at KAMS are not significantly different than those previously analyzed for APSF. The potential radiological accident impacts from KAMS are still small and comparable to the impacts identified for the Preferred Alternative in the Storage and Disposition PEIS. For a loss of confinement inside KAMS, an unfiltered release would result. However, the APSF/B105-K SA results show that potential accident impacts at KAMS are still small (less than 1 LCF) and have a low frequency of occurrence (less than 1.0E-3 event per year).

A review of these radiological impact analyses (IMNM EIS, S&D PEIS, and APSF/B105-K SA) allows DOE to conclude that potential impacts for the storage of surplus plutonium materials at KAMS are similar and not significantly different than the impacts for APSF. To further mitigate the potential risks, DOE expects to reduce the annual frequency of the release of radioactive material to less than 1.0E-6 through the application of engineered and administrative controls. The engineered and administrative controls include the implementation of surveillance programs for the 3013 containers inside the 9975 shipping containers and for the structure of Building 105-K. These results demonstrate that safe storage of surplus plutonium in KAMS can continue beyond 10 years pending disposition. DOE plans to disposition its surplus plutonium as soon as practical and believes storage in KAMS would be necessary for less than 20 years.

DETERMINATION

The results of this SA indicate that the activities and potential environmental impacts associated with the storage of surplus plutonium materials in the KAMS facility at SRS are encompassed within those activities analyzed in the NEPA and supporting documentation described above. Storage of these materials would not constitute a substantial change in actions previously analyzed and would not constitute significant new circumstances or information relevant to environmental concerns and bearing on the previously analyzed action or its impacts. Therefore, DOE does not need to undertake additional NEPA analysis.

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