

June 12, 2003

The Honorable Spencer Abraham  
Secretary of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-1000

Dear Secretary Abraham:

The Defense Nuclear Facilities Safety Board (Board) and its staff have been evaluating the adequacy of the safety bases for the K-Area Material Storage (KAMS) facility, Building 235-F, and FB-Line at the Savannah River Site. This review is part of an overall safety assessment undertaken in response to the Public Law 107-314, Section 3183, *Study of Facilities for Storage of Plutonium and Plutonium Materials at Savannah River Site*.

In the enclosed report, the Board's staff has identified several issues that require clarification or action by the Department of Energy (DOE) to ensure that these facilities will be adequate for their storage mission. The Board is continuing to pursue the overall safety assessment mandated by Public Law 107-314, Section 3183, but believes these issues merit near-term DOE attention. The presently defined mission and the associated safety bases for some of these facilities do not appear to be consistent with the long-term storage activities planned by DOE. In particular, Building 235-F was anticipated to be shut down in the near future, but now is planned to be used for long-term storage and related operations. Future activities will require significant new analysis and physical modifications to ensure safe operation, as required by DOE directives. Additionally, the enclosed staff report notes:

- ! Planned new conditions in KAMS will require the ventilation system to operate during certain fire scenarios in order to protect the public from exposures exceeding the evaluation guideline established by DOE. The draft documented safety analysis, however, does not identify the ventilation system and associated systems as safety class consistent with DOE requirements.
- ! The majority of the fire detection and alarm systems in all three facilities have been deactivated, based in part on their expected short-term mission. Fire detection and alarm systems would normally be expected for defense-in-depth purposes consistent with DOE directives.
- ! The risk from several hazards have been accepted rather than eliminated (e.g., combustible inactive cables in KAMS and plutonium-238 contamination in Building 235-F).

The enclosed staff report discusses these issues in more detail. Pursuant to 42 U.S.C. § 2286b(d), the Board requests a report within 60 days of receipt of this letter that informs the Board of actions or further evaluations that DOE may undertake on the above issues.

Sincerely,

John T. Conway  
Chairman

c: The Honorable Jessie Hill Roberson  
Mr. Mark B. Whitaker, Jr.

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

May 7, 2003

**MEMORANDUM FOR:** J. K. Fortenberry, Technical Director

**COPIES:** Board Members

**FROM:** R. Kasdorf

**SUBJECT:** Safety Bases Review of Plutonium Storage and Support Facilities at Savannah River Site

In Public Law 107-314, Section 3183, *Study of Facilities for Storage of Plutonium and Plutonium Materials at Savannah River Site*, Congress tasked the Defense Nuclear Facilities Safety Board (Board) to conduct a study of the adequacy of the K-Area Material Storage (KAMS) facility and related support facilities, such as Building 235-F at the Savannah River Site (SRS) for the storage of defense plutonium and defense plutonium materials in connection with the Department of Energy (DOE) fissile materials disposition program. This report documents a portion of the ongoing review being conducted by the Board's staff to evaluate the adequacy of the safety bases for this planned plutonium storage mission for KAMS, Building 235-F, and FB-Line.

The DOE contractor at SRS either has submitted or is in the process of submitting documented safety analyses (DSAs) to the DOE Savannah River Operations Office (DOE-SR) for these facilities to comply with Title 10, Part 830 of the Code of Federal Regulations (10 CFR Part 830), *Nuclear Safety Management*. These safety bases do not account for some of the future activities that will be needed to support the planned long-term storage mission. Building 235-F is being studied for increased capacity for storing plutonium packaged in accordance with DOE-STD-3013, *Stabilization, Packaging, and Storage of Plutonium-Bearing Materials*; addition of a plutonium stabilization and repackaging capability; and limited sampling activities. None of these activities are addressed in the approved Safety Analysis Report for Building 235-F. The safety basis for FB-Line does not reflect the plutonium oxide stabilization process being added, although the staff expects that the existing safety basis controls will be sufficient. Additionally, the duration of the planned storage mission for KAMS significantly exceeds the 10 years originally expected. DOE-SR recognizes that the safety basis for these facilities must be changed to support the planned long-term plutonium storage mission.

**K-Area Material Storage Facility.** The draft DSA for this facility has been submitted to DOE-SR for approval. The Board's staff reviewed this draft document since it was pertinent to the mission of the facility for long-term storage of plutonium materials. The facility is currently operating using a Basis for Interim Operation (BIO) as its safety basis. The BIO does not authorize storage of the quantity of plutonium that would be required should DOE decide to consolidate all the excess

plutonium from the DOE complex at SRS. The draft DSA is based on a presumption that any material release in the facility has unacceptable consequences. Accordingly, the draft DSA requires plutonium to be stored in DOE-STD-3013 containers enclosed in Type B shipping containers meeting 10 CFR Part 71, *Packaging and Transportation of Radioactive Materials*, such as 9975 shipping containers. The safety basis of this facility does not allow opening containers in the facility, nor does it provide for any inspection of the contents other than for Material Control and Accountability, which does not require container seals to be broken.

The event with the greatest offsite consequences is postulated to be a major fire that jeopardizes the integrity of the shipping containers, potentially releasing plutonium to the environment. The majority of the controls identified in the draft DSA relate to protection against such fires. The fire thermal analysis performed in support of the draft DSA postulates two bounding fire scenarios that determine the safety controls.

- ! The first scenario is a fire on the +48 foot elevation which propagates to the Actuator Tower and into the Material Storage Area. This fire scenario is credible due to the significant amount of combustible materials at this elevation (primarily old abandoned cables). Because the KAMS plutonium storage mission was expected to be of short duration, DOE decided not to remove the combustibles and so eliminate the source of fire; instead a 40 square foot hole (vent) was cut into the Actuator Tower roof to vent the fire. The vent keeps the maximum temperature of the shipping containers below their qualified test temperatures. Given current plans for a longer term storage mission, the staff believes it would be more appropriate to prevent the fire by removing the combustibles.
  
- ! The second scenario is a fire in the Material Storage Area. This fire scenario does not apply for the activities presently authorized for KAMS. The draft DSA allows new conditions which are not authorized in the current BIO (e.g., different forklifts, which are not as robust nor explosion proof; storage of an increased quantity of plutonium; and alternate shipping containers [SAFKEG] which are insulated differently than the Type B 9975 shipping containers). These new conditions result in the need to credit the ventilation system (903 fan) to be operating during this event. The fan draws air through the Material Storage Area to prevent the Type B shipping containers from exceeding their qualified temperatures during the fire. The draft DSA, however, identifies only an air flow monitor as safety-class equipment to be maintained by Technical Safety Requirement (TSR)-level controls. Furthermore, the draft DSA does not provide adequate TSR-level control for some identified safety-significant equipment (i.e., the 903 fan suction pressure gauge). WSRC stated that a safety-class ventilation system was not needed because the likelihood of a combined occurrence of a fire in conjunction with a loss of ventilation is incredible. However, the staff believes that the ventilation system (903 fan and its associated flow path) should be identified as safety class to ensure adequate protection of the public, consistent with DOE directives and WSRC requirements.

**Building 235-F.** The safety basis for Building 235-F was prepared in 1989 using then-applicable DOE requirements. This document has been revised several times and was supplemented by a hazard analysis performed in December 2002. The combined set was approved by DOE-SR in January 2003 as a rule-compliant DSA.

The original 1989 safety basis used Management Oversight Risk Tree methodology for identification and analysis of the hazards. This approach is not consistent with the methodologies recommended by the safe harbor of 10 CFR Part 830 (i.e., DOE-STD-3009-94, *Preparation Guide for Nonreactor Nuclear Facility Safety Analysis Reports*), nor is it consistent with current SRS standards. Although this document was supplemented by a hazard analysis, the combined safety basis is still based on a methodology that is inconsistent with the safe harbor because it does not analyze operational occurrence using a deterministic approach. Instead, a frequency-based cutoff is used to screen out accident scenarios. Additionally, the unmitigated accident analysis used for identification and classification of safety controls calculates consequences using “average” or “best estimate” values of the parameters crucial to the dose estimates. Finally, the consequences to the public are calculated in terms of person-rem as opposed to the maximum dose to a member of the public at the site boundary for unmitigated releases. Presenting consequences in this manner was consistent with the DOE guidance in 1989 but is not consistent with current requirements provided in the safe harbor of 10 CFR Part 830.

The fire suppression system in the facility has been deactivated and removed. Only a small portion of the facility is covered by a fire detection and alarm system (mainly the storage vaults). During a walkdown in the facility, the staff observed a significant amount of combustibles (contaminated high-efficiency particulate air filters, plastic boxes, and cables) adjacent to a material storage vault. Reducing or eliminating extraneous combustible materials in the facility would reduce the likelihood and consequences of a fire.

The staff was informed that a significant amount of plutonium-238 (more than 700 grams) is deposited in ducts or cells in the Plutonium Fuel Form facility and could be subject to release during a fire or seismic event. The contractor considered the plutonium-238 holdup the most significant hazard in the facility. Consideration should be given to decontaminating the areas with plutonium-238 holdup to reduce the risks associated with its potential release.

The ventilation system exhaust is designated as safety significant to confine airborne contaminants and direct them away from the facility workers. As noted above, there are many areas of the facility that are not covered by a fire detection and alarm system. Workers would be notified of a fire in the facility by the alarm annunciation system. However, the facility’s Fire Hazards Analysis identifies areas that are not covered by an audible alarm annunciation system (i.e., the public address system). The Nuclear Incident Monitors (also known as the Criticality Alarm System), which will likely be required for future plutonium operations, have been removed.

**FB-Line Facility.** The safety basis for FB-Line activities is documented in a Safety Analysis Report that the contractor considers to meet the requirements of 10 CFR Part 830 and its safe harbor

provisions. This document, however, has weaknesses similar to those discussed earlier for the Building 235-F safety basis (e.g., it lacks identification of safety controls for operational events that have a very low probability of occurrence). There is a difference from Building 235-F, however, in that FB-Line has a short mission and is planned to be deactivated and de-inventoried in 2005.

The entire fire detection and alarm system for FB-Line was deactivated and removed due to the extensive modifications that would be needed to meet applicable standards. Because of the relatively short operational life expectancy of the facility, the contractor decided not to pursue such upgrades, and has instead taken other compensatory measures in an effort to avoid fires. A senior fire inspector monitors shiftly to identify conditions (e.g., excessive transient combustibles, fire initiating activities) which need to be corrected or controlled to prevent fires from becoming a significant hazard to the public and the workers.