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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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May 23, 2000

The Honorable Carolyn L. Huntoon
Assistant Secretary for
Environmental Management
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0113

Dear Dr. Huntoon:

The Defense Nuclear Facilities Safety Board (Board) has been reviewing activities concerning the September 1999 event at the FB-Line at the Department of Energy's (DOE) Savannah River Site (SRS), whereby workers were exposed to airborne plutonium released from a storage can with a defective seal. The enclosed issue report prepared by the Board's staff is provided for your information and use as appropriate.

During the week of April 17, 2000, the Board discussed FB-Line recovery actions with site personnel. The FB-Line manager informed the Board that additional actions will be taken to address concerns raised by the Board's staff. These additional actions include plans to (1) qualify facility operators as Level 2 weld inspectors, (2) conduct visual inspection of the closure weld on Bagless Transfer System (BTS) cans using at least 7x magnification, and (3) review BTS welder parameters for each can before it is moved from the BTS room. The Board is encouraged by the responsive leadership demonstrated at the FB-Line facility to better ensure integrity of the storage cans.

This event highlights the importance of packaging plutonium metal and oxide material to meet the long-term plutonium storage standard, DOE-STD-3013-99, *Stabilization, Packaging, and Storage of Plutonium-Bearing Materials*. The original DOE Implementation Plan for Recommendation 94-1, *Improved Schedule for Remediation*, committed to meeting this standard by 2002. However, recent DOE decisions have dramatically extended the schedule for meeting this commitment at SRS.

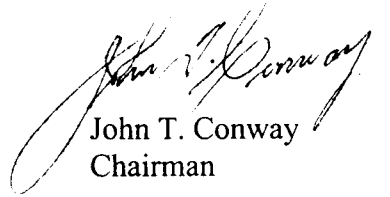
It is essential that the plutonium-bearing materials at SRS be stored safely during the interim period until final packaging is complete. DOE's investigation of the plutonium intakes noted that the SRS storage system does not meet the interim safe storage criteria promulgated by DOE Headquarters in 1996, nor has the site developed a technical basis for the system in use. In response to this finding, the DOE Savannah River Operations Office has directed the contractor to develop a technical basis for interim storage by September 30, 2000. The Board remains concerned that plutonium bearing-materials in single-barrier containers may continue to pose a

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threat to facility workers and finds that DOE actions planned to date to address interim storage requirements lack the appropriate level of urgency. The Board is hopeful that this matter will be addressed by DOE in the revision of the implementation plan for Recommendation 94-1 that DOE is currently developing.

Sincerely,



John T. Conway
Chairman

c: Mr. Greg Rudy
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

April 12, 2000

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: D. Ogg

SUBJECT: FB-Line Recovery at Savannah River Site

This report documents an issue being reviewed by the staff of the Defense Nuclear Facilities Safety Board (Board) concerning recovery actions and restart planning at the FB-Line facility at the Department of Energy's (DOE) Savannah River Site (SRS). This review was conducted March 28–30, 2000, by staff members D. Ogg, R. Kasdorf, D. Burnfield, W. Linzau, and C. Keilers and outside expert R. West.

Background. The FB-Line converts F-Canyon product solutions into plutonium metal, which is then packaged in bagless transfer system (BTS) cans and stored in FB-Line vaults. The BTS was added to the facility in 1997 to provide a capability to package plutonium metal in welded cans that would meet the requirements for an inner storage can specified by DOE-STD-3013-96, *Criteria for Preparing and Packaging Plutonium Metals and Oxides for Long-Term Storage*.

On September 1, 1999, several Westinghouse Savannah River Company (WSRC) workers were exposed to airborne plutonium contamination released from the failed closure weld of a BTS can. DOE completed a Type B accident investigation on February 8, 2000, and concluded that the BTS can had not been subjected to an adequate quality assurance program during production. Additional findings included deficiencies in the following:

- The control and accomplishment of radiological work
- Response to a radiological occurrence
- Conduct of the facility drill program
- The feedback and improvement program
- The implementation of Integrated Safety Management

The investigation team also found that the DOE Savannah River Operations Office (DOE-SR) had not developed a site-specific technical basis for interim storage of plutonium-bearing materials. Concurrent with the investigation, WSRC conducted a failure analysis on the BTS can, but could not identify a definitive root cause for the occurrence. WSRC identified overpressurization of the can during welding (possibly due to lack of venting) as the most likely cause of the weld failure.

Corrective Actions. On March 17, 2000, WSRC issued a corrective action plan to address the findings of the DOE Type B investigation. Most of the short-term actions in the plan had been completed at the time of the staff's visit, and WSRC plans to finish all short-term actions by May 1, 2000, the scheduled date for restart of the BTS.

Radiological Protection and Alarm Response—A significant portion of the WSRC corrective action plan addresses deficiencies in alarm and casualty response, compliance with radiological work permits, conduct of radiological operations, and training. The corrective actions appear to be appropriate for the deficiencies noted.

Bagless Transfer System—Planned improvements to the weld process include modifications to the monitoring of helium pressure (helium is used as a fill gas) and improved definition and recording of weld parameters. The latter action includes a chart recorder to measure the rotational speed of the can welder, arc gap voltage, and weld current. WSRC is conducting a study to determine the acceptable ranges for weld parameters, and has found that unacceptable welds could be made without exceeding the alarm setpoints in the weld machine. FB-Line management and operators had relied on the alarms to provide indication of a bad weld. On the basis of staff comments, WSRC now plans to review the chart recorder data before accepting BTS welds.

WSRC is also making several improvements to the leak tester that conducts volume displacement, gross helium, and fine helium leak checks of BTS cans. The staff believes the proposed modifications will serve to improve the reliability of the leak check.

The WSRC corrective action plan places significant reliance on improving the visual inspection process for completed BTS welds. Previously, there was no requirement to conduct a thorough inspection of the weld. The revised procedure will include separate visual inspections by the BTS operator and another operator outside the BTS room. WSRC has completed visual inspection training for some of the BTS operators. The Board's staff reviewed the training materials and noted that they did not contain acceptance criteria for the welds to be inspected or a practical or written test of operator capabilities. Additionally, facility management had not determined whether a visual acuity examination would be required, nor had they considered the use of magnification in conducting the inspections. The staff believes these shortcomings could be addressed by qualifying the operators as Level 2 inspectors in accordance with the requirements of the American Society for Nondestructive Testing.

Plutonium Interim Safe Storage Criteria—One finding of the Type B investigation was that DOE-SR had not developed a site-specific technical basis for relying on BTS cans as the single barrier protecting workers. The interim storage criteria promulgated by DOE-Headquarters in 1996 call for double containers or a technical justification for using a less robust package. At the time of the staff's visit, DOE-SR had not completed its portion of the corrective action plan and did not present information regarding this technical justification. It was originally intended that SRS would rely on the BTS cans for a relatively short interim storage period until the Actinide Packaging and Storage Facility (APSF) was ready. With the probable cancellation of the APSF, the use of a single barrier requires further review and justification.

Plutonium Packaging and Storage. Plans for stabilizing and packaging plutonium metal and oxide at SRS have been dramatically delayed by DOE's apparent decision not to proceed with APSF construction. The site now intends to modify the 235-F facility to provide the capability to meet the long-term plutonium storage standard, DOE-STD-3013. Plutonium oxide stabilization furnaces that meet the 950°C temperature requirement and an outer packaging capability will not be available until about 2007, with final stabilization and packaging completed in 2008. The original DOE Implementation Plan for Recommendation 94-1 committed to completing this activity in 2002.

This delayed stabilization and packaging implies that the current inventory of plutonium metal in BTS cans will remain in a single boundary container for the next 8 years. This configuration does not meet DOE-STD-3013 or the interim safe storage criteria. This single boundary configuration is vulnerable to future contamination events similar to the 1999 event in the FB-Line vault. Because the closure weld is not a full penetration weld and the welder alarms do not alert operators to all anomalies that would result in an inadequate weld, the staff has low confidence in the integrity of the weld. Additionally, the process of cutting the weld using roller cutters tends to smear the weld surface and may mask defects in the weld that could escape detection by visual inspection and leak testing. In order to prevent another potential release event, the staff believes it would be prudent to place the BTS cans into another contamination boundary as soon as practical. This additional boundary preferably would be the DOE-STD-3013 outer container, but a simple overpack can could be used until the more robust container is available.

Authorization Basis. WSRC is currently developing a new authorization basis for operations in FB-Line. The upgrades to the authorization basis will include a rewrite of the Basis for Interim Operation (BIO), including a new hazard and accident analysis, a new double-contingency analysis, and new Technical Safety Requirements (TSRs). The double-contingency analysis will be submitted in May 2000, but not implemented until October 2001. The focus is on reducing the number of credible criticality scenarios and making the facility easier and more economical to operate. The final BIO and new TSRs would not be implemented until March 2004.

WSRC plans to complete most FB-Line operations in fiscal year 2004, with a few activities continuing through 2006. The facility's mission after this time would be limited to storage. Given this relatively short remaining operational service life and the protracted schedule for authorization basis improvements, complete upgrades to the BIO, TSRs, and procedures may not be worthwhile and may even be a distraction to accomplishing safety-related missions.