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# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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April 10, 1995

Mr. Mark Whitaker, EH-9  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, D.C. 20585

Dear Mr. Whitaker:

Enclosed for your information and distribution are eight Defense Nuclear Facilities Safety Board staff reports. The reports have been placed in our Public Reading Room.

Sincerely,

A handwritten signature in black ink, appearing to read "George W. Cunningham".

George W. Cunningham  
Technical Director

Enclosures (8)

**DEFENSE NUCLEAR FACILITIES SAFETY BOARD**

May 3, 1994

**MEMORANDUM FOR:** G.W. Cunningham, Technical Director**COPIES:** Board Members**FROM:** H.W. Massie, Jr.**SUBJECT:** Savannah River Site (SRS) - Review of Preparations for the Decontamination and Decommissioning (D&D) of the Separations Equipment Development (SED) Facility

- 1. Purpose:** This trip report documents a second review of the readiness of the SRS SED D&D project by the Defense Nuclear Facilities Safety Board (DNFSB) technical staff (H.W. Massie) on February 24, 1994.
- 2. Summary:** The development of the authorization basis for the SED D&D project, including DOE approval, is less than adequate. There is little evidence that DOE-SR conducted an adequate technical review of the SED D&D safety analysis, including an assessment of technical assumptions, such as Pu release fractions.
- 3. Background:** The SED facility consists of laboratory facilities that were once used to process isotopes of plutonium and uranium, and test plant-scale prototype units. The SED facility is located within Building 773-A of the Savannah River Technology Center (SRTC). The SRTC facility is a moderate risk facility; it is situated about 1,000 meters from the site boundary and is even closer to the parking area, which is accessible to the public. Six of the prototype units remain in place. Construction of the SED facilities was completed in 1971. All prototype units were shut down by 1978. These units have remained essentially unchanged since that time. The units are suspected to contain significant quantities of <sup>239</sup>Pu. The initial phase of the D&D project will include removal of portions of the prototype units in order to use far-field gamma ray measurement techniques to more accurately assay the quantity and location of the plutonium, and subsequently store these units safely until the material is disposed of.

Since the staff's last review of the SED facility, the Manager of the DOE Savannah River Operations Office (DOE-SR) had placed a hold on the project until the authorization basis is properly defined, documented, and approved by DOE-SR. Subsequently, at the direction of DOE-SR, Westinghouse Savannah River Corporation (WSRC) issued a

positive unreviewed safety question (USQ) for the SED D&D project. The DOE-SR took this action because the Pu limits of one of the SED rooms would be above that specified in the safety analysis report (SAR) when prototype units are moved for Pu characterization. This problem was addressed by WSRC in the basis for interim operation (BIO) on November 30, 1993. In addition, DOE determined that a readiness self-assessment by WSRC with a final validation review by DOE will be performed.

DOE's near-term goal for the SED D&D project is to reduce the risk to the off-site public by removing the Pu<sup>239</sup> contained within the SED facility and relocating it to the Savannah River transuranic (TRU) waste pad (i.e., away from the site boundary towards the center of the site).

4. **Discussion:** The staff reviewed the status of the authorization basis, the calculated risks of SED versus the total SRTC facility, the schedule for the trap removal and characterization, the ALARA plan, the airborne and nuclear incident monitoring (NIM) placement and the worker training plans. The staff also reviewed the status of the WSRC readiness self-assessment and the DOE validation process, and the technical capability of the DOE personnel who are conducting reviews of the safety documentation. The staff's observations are as follows:
  - a. **Authorization Basis:** The approval process for the authorization basis was unduly complex for a relatively small D&D job. The authorization basis entails the SRTC SAR (since SED is a sub-facility of SRTC), the SED unreviewed safety question (USQ), the SRTC basis for interim operation (BIO) which includes evaluation of the USQ for the SED project, and Operational Safety Requirements (OSRs). The BIO was submitted to DOE for approval on November 30, 1993; it includes additional controls for the SED prototype unit removal and characterization. The SAR does not meet DOE Order 5480.23, *Nuclear Safety Analysis Reports*, and was based on the previous DOE Order 5481.1B, *Safety Analysis and Review System*. The SRTC SAR was approved on an interim basis by the DOE-SR manager.

The staff has observed the development of the authorization basis for the SED D&D project since June 1993. At that time, no authorization existed but WSRC was ready to initiate removal of the prototype units for Pu characterization. Since June 1993, DOE-SR had to approve the SRTC SAR (which contains SED) on an interim basis in a letter issued by the manager of DOE-SR, direct WSRC to declare a positive USQ, issue a stop-work order, and finally, direct WSRC to prepare a BIO for SRTC/SED. During the last nine months, the staff has observed that the approval process for SED has been confusing and unduly complex, particularly as compared to that used for commercial nuclear facilities. One significant problem is that SRTC (which includes the SED facility) did not have an approved SAR and authorization basis. A second

problem was that the DOE Orders (5480.23 and 5480.31, *Startup and Restart of Nuclear Facilities*) do not adequately address a D&D-type facility such as SED (i.e., a sub-facility contained within a larger facility such as SRTC). Based on these observations, the staff believes that the DOE approval process of the authorization basis for D&D projects could be improved and clarified. At this point in time, the SED authorization basis is not yet fully approved until the BIO is approved by DOE-SR.

- b. SED Safety Risks: The limiting accident in the SRTC safety analysis report for both SRTC and SED is an earthquake followed by a fire. The calculated relative risk of the SED facility (due to a Pu dispersion caused by earthquake and fire) as compared to that of the SRTC facility overall, has now been reduced from 11% to 1%. The total calculated dose to the maximum offsite individual located at SRTC from an earthquake plus fire ( $=6.6 \times 10^{-5}$  per year probability) located at SRTC is about 4 rem. The 4 rem dose is very close to the WSRC 9Q risk envelope curve. The WSRC 9Q risk envelope is bounded by the new DOE risk curve presented in proposed DOE standard DOE-STD-3005-93, *Evaluation Guidelines for Accident Analysis and Safety Structures, Systems, and Components*. In any event, the calculated risk to the offsite public for SRTC is one of the highest at the Savannah River Site; this is due more to the proximity of the site boundary than the magnitude of source term itself.

More recent analyses, in which the plutonium release factor assumptions were changed, indicate that the calculated dose to the maximum offsite individual is less than four rem. The recent analyses are based on current upper bound inventories of plutonium and other radionuclides in SRTC and SED, and utilized more realistic Pu release factors based on the DOE-STD-0013, *Recommended Values and Technical Bases for Airborne Release Fractions (ARFs), Airborne Release Rates (ARRs), and Respirable Fractions (RFs) for Materials from Accidents in DOE Fuel Cycle, Ex-Reactor Facilities*, Rev. 2 Handbook for determining release fractions. However, WSRC assumes the SRTC and SED facilities will collapse during a seismic event and Pu would be released by brittle fracturing of the material contained in the prototype unit. In addition, WSRC assumes that the Pu is contained in a ceramic matrix within the prototype unit and that the matrix is brittle. In its review of the airborne release fractions (ARF)/respirable factors (RF) utilized from the DOE standard assuming brittle fracture, the staff believes that WSRC is utilizing the correlations outside the range of the data presented on Figure 4-13 of the standard. Hence, the calculations of SED risks may be non-conservative (i.e., > 1% of SRTC risk).

Nevertheless, because of the remaining risk (99%) at SRTC, WSRC has identified several areas (other than SED) for elimination of risks to the public. These are:

removal of TRU waste storage in Building 778-1A (9%), removal of Pu<sup>239/241</sup> in B&C labs (9%), high activity waste (HAW) tanks near SRTC (7%), and small quantities of Pu<sup>238</sup> in B lab (2%). The staff notes that at this time no work is being done to address these other risks.

- c. Status of SED D&D Plans and Schedule: The staff reviewed the SED prototype unit removal procedures including mockup training plans, radiological controls and ALARA. The ALARA planning seemed improved since the staff's last visit. WSRC intends to utilize mockup training for the workers, including use of a glovebag to enclose the prototype units prior to removal, reducing the potential for contamination. Also, WSRC has set an ALARA goal of less than 2.5 man rem for the total prototype unit removal and assay effort based on task breakdown estimates.
  - d. SED D&D Project Readiness: DOE has determined that based on its interpretation of DOE Order 5480.31, *Startup and Restart of Nuclear Facilities*, that an Operational Readiness Review (ORR) is not required. DOE has determined that a WSRC readiness self-assessment (RSA) and subsequent DOE validation will be conducted. DOE-SR stated that the RSA will assess each of the 20 areas required by the Order, but based on a graded approach. The plans for the WSRC readiness self-assessment and DOE validation review had not been prepared at the time of the staff visit.
  - e. DOE Review of Safety Documentation: The safety documentation for the SED D&D project is reviewed and approved by the DOE-SR Safety Division. The DOE EH-10 organization (i.e., EH Site Representatives) located at the site, primarily reviewed the work procedures and provided useful comments for improving the procedures. However, EH-10 does not appear to perform technical reviews of safety analysis-type information such as Pu release fraction assumptions.
5. **Future Staff Action**: The DNFSB staff plans the following actions:
- a. Review the WSRC readiness self-assessment plans, DOE validation plans, and the basis for level of effort.
  - b. Review the technical adequacy of the DOE safety evaluation for approval of the SED D&D project.
  - c. Conduct an oversight audit of the conduct of operations of the earlier prototype unit removal(s).

- d. Review DOE/WSRC evaluation or justification of the plutonium airborne release factors in the safety analysis.