

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

January 23, 1995

MEMORANDUM

FOR:

G. W. Cunningham, Technical Director

FROM:

Dan Burnfield

COPIES:

Board Members

SUBJECT:

Savannah River Site Spent Fuel Storage Trip Report, January 3-6, 1995

1. **Purpose:** This report documents a review by Defense Nuclear Facilities Safety Board (DNFSB) staff members concerning actions by the Savannah River Site (SRS) to resolve vulnerabilities associated with the storage of spent nuclear fuel (SNF) and to plan for the final disposition of the fuel currently in storage at the site or scheduled to be received. Staff reviewers were Dan Burnfield and Ron Barton.
2. **Summary:** The planned corrective action program for the SRS spent fuel disassembly basins is still moving forward. Although the Department of Energy (DOE) has attempted to use a systems-engineering approach to address the management of spent nuclear fuel, such an approach was not evident at SRS. There appear to be few links between the actual work being conducted at SRS and the DOE SNF integrated plan.

The organizational chain of command was not clear. Because of the lack of definition while transitioning the site between Defense Programs and Environmental Restoration and Waste Management, at least four program offices were involved in making key decisions. This lack of definition has appeared to slow the process of resolving the vulnerabilities. In addition, the DOE personnel were not aware of the *Manual of Functions, Assignments and Responsibilities for Nuclear Safety*.

Two areas of concern have recently been highlighted at the Receiving Basin for Offsite Fuel (RBOF). First, some fuel in RBOF is stored vertically in racks, allowing the fuel to lean from top to bottom slightly, resulting in a violation of criticality safety requirements for geometry. Secondly, the amount of water shielding was misidentified in the safety documentation. These two errors combined could result in an increased risk to the workers and the public.

3. **Background:** During reviews performed by the DNFSB staff and DOE's Office of Environment, Safety and Health during 1993, several observations were made regarding the wet storage of spent nuclear fuel at the SRS SNF Basin Facilities. DOE classified these observations according to the degree of vulnerability each posed to the safety of the public, the worker, or the environment. Based on this classification, discussions centered on Westinghouse Savannah River Company (WSRC) activities at the K, L, and P reactor disassembly basins noted as having the most serious vulnerabilities (e.g., corrosion of fuel and target material and the potential release of radionuclides from these materials to the environment). Discussions of activities at the RBOF were also included to decide what corrective actions are being considered at

these facilities. In addition, DOE is in the process of evaluating the alternatives for the storage of foreign research reactor fuel. Each of these alternatives requires the storage of up to 24,000 aluminum clad fuel elements in the RBOF and L reactor disassembly basin. The material would be shipped into SRS over the next 10 years, and the use of the L basin would be required through the year 2004.

4. **Discussion:** The site has still not used a systems-engineering approach to review the options for correcting the vulnerabilities of the basins. Although DOE headquarters has agreed to approach the problems using a systems approach, they have been slow in implementing such an approach and there is little evidence of SRS applying the approach to the spent fuel management project. Because of the slowness in the development of this approach, there are few links between the actual work and the system definition being developed by DOE headquarters.

In addition, the organizational chain of command is not clear. Because the transition to decommissioning process lacks definition, at least four program offices (DP-33, EM-60, EM-37, and EM-32) were involved in making key decisions. This lack of definition has appeared to slow the process. In addition, the DOE EM and site personnel were not aware of the *Manual of Functions, Assignments and Responsibilities for Nuclear Safety*.

- a. **K, L and P Reactor Disassembly Basins:** As previously reported, the processing facilities at SRS have not operated for several years, the fuel stored in these basins from the final operations of the production reactors has remained in the basins much longer than was originally planned. There is no accurate leak detection mechanism or confinement system. The fuel and targets have corroded far more than was originally expected and the water treatment systems were not designed to handle the amount of radioactive material presently contained in the basin water. Therefore, the radioactive concentration of the water is approaching, and at times has exceeded, the administrative limits imposed on the basins. In addition, the basins were not designed to meet modern seismic design criteria. WSRC identified these problems in late 1992 and began to take corrective actions. These corrective actions are outlined in the *Plan of Action to Resolve Spent Nuclear Fuel Vulnerabilities Phase III, October 1994*. The major actions which have yet to be completed include:
 1. An evaluation of methods to correct basin water chemistry resulted in plans to procure the services of a vendor to provide a single deionization treatment. This treatment will reduce the conductivity in the water to approximately 10 $\mu\text{mho/cm}$, from approximately 150 $\mu\text{mho/cm}$. WSRC believes that after this shock treatment the loading on the deionizers will be reduced, water chemistry can be better controlled, and less frequent regeneration of the resins will be required. In addition as a more permanent correction, WSRC plans on obtaining permanent deionizer systems for the makeup water and also a continuous system for the basin water.
 2. WSRC will vacuum the reactor disassembly basins to remove the sludge

as a part of the implementation plan for the Board's Recommendation 94-1. The immediate plan is to move the sludge to an isolated portion of the basins. WSRC did not schedule an in-process test to ensure fissile materials would not build up in the isolated portion of the basin. During our site visit WSRC management corrected this potential problem. This project has fallen severely behind the schedule which was provided last year.

3. WSRC will replace the sand filter at the K area. This project is underway.
4. The performance of the hazards assessment for the disassembly basins and the preparation of a Basis for Interim Operation for these basins was completed on schedule by WSRC and awaits DOE approval.

The staff is concerned that aggressive action is not being taken to improve the water chemistry of the basins.

- b. ***RBOF***: The vulnerabilities identified at RBOF were considered by DOE to be less serious. However, because this basin will store foreign and domestic research reactor fuel for many years, WSRC has taken action to correct these vulnerabilities quickly. Two areas of concern have recently been highlighted at the RFOF. First, some fuel in RBOF is stored vertically in rack locations which allow the fuel to lean from top to bottom slightly, thus allowing the fuel to violate the criticality requirements for geometry. This problem was caused by a lack of attention to detail by the former basin managers who failed to provide the surveillance necessary to assure the spacing was maintained. Secondly, the amount of water shielding was misidentified in the design documentation. Since the radiation exposures from a criticality incident with this reduced shielding could be higher, these two errors combined could result in an increased risk to the workers and former basin management. WSRC has initiated an aggressive program to ensure that the risks associated with these two errors are accurately quantified and are acceptable. However, the efforts for the two areas are not tied together and therefore may result in a lack of successfully linking the two hazards.

5. **Future Staff Actions:** WSRC progress in resolving SRS SNF safety issues will be followed to determine the adequacy of resources applied to meet or improve the schedules that now exist. In addition, the staff will follow-through on areas of concern at RBOF to insure SRS adequately accounts for the hazards. The staff will perform a similar review at the Idaho National Engineering Laboratory.