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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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95-0005856

December 8, 1995

Mr. Mark Whitaker
Department of Energy
1000 Independence Avenue
Washington, DC 20585-0119

Dear Mr. Whitaker:

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

Sincerely,

George W. Cunningham
Technical Director

Enclosures (6)

95-0005862

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

June 7, 1995

MEMORANDUM FOR: G.W. Cunningham, Technical Director

COPIES: Board Members

FROM: Donald J. Wille

SUBJECT: Savannah River Site - Review of the Safety Basis for the Defense Waste Processing Facility (DWPF) - Trip Report (May 3-4, 1995)

1. **Purpose:** This report documents a review of the status of the Upgraded Safety Basis for the Defense Waste Processing Facility (DWPF) at the Savannah River Site (SRS) by Defense Nuclear Facilities Safety Board (DNFSB) technical staff, Donald J. Wille and Outside Expert John D. Stevenson on May 3-4, 1995.

2. **Summary:** The Upgraded Safety Basis for the DWPF uses a deterministic approach to define the design basis accidents (DBA) and provide a defense in depth with safety class systems to prevent or mitigate the accidents. The definition of the DBAs and the safety classification of the structures, systems, and components (SSC) resulted in selected ventilation, purge and support systems being upgraded to safety class, in addition to the vitrification building. This effort will be documented in a Safety Analysis Report (SAR) to be issued in July 1995. Review of the DBAs and safety classifications by the Board staff will be required to confirm the adequacy of the approach.

   Where new safety class systems are being added to DWPF, the design will meet the requirements of the DOE Order 6430.1A, *General Design Criteria,* except for selected instances, such as single passive failures, i.e. ducts and piping. The SAR will demonstrate compliance of new and existing safety class systems with the requirements of 6430.1A, as implemented by DOE Standard 3009 (draft), with clearly identified and justified exemptions for DOE approval.

   Where existing DWPF systems and components have been upgraded to safety class, a Blume shaped spectra normalized to 0.2g zero period ground acceleration has been used for evaluation of their seismic capability. An integrated program of system walkdowns, analyses and testing has been used to qualify these upgraded systems and components. The selection of the performance categories and the design basis earthquake, and the execution of this program, will need to be evaluated further by the Board staff as part of the review of the SAR.

Following a postulated earthquake, the Distributed Control System is presumed not available, and the monitoring and control of safety class systems will be performed by a local operator in the vitrification building. There is a concern by the Board staff that personnel may not be able to perform the necessary functions given the conditions that may exist after an earthquake. Resolution of this item will require adequate demonstration that the necessary operator evolutions following DBAs can be performed at the appropriate locations.

3. **Background:** The DOE assessment of the DWPF in 1993-94 (Technical Report, SRS-DWPF-93-01, November 1994), and continuing Board and staff onsite facility evaluations and analyses, motivated the Westinghouse Savannah River Company (WSRC) to perform an Upgraded Safety Basis review of DWPF. Prior to this review, there were no safety class items at DWPF, other than portions of the structure. This upgrade resulted in classification of selected ventilation, purge and supporting systems as safety class, and some systems associated with hazardous chemicals as safety significant. DWPF is currently in startup testing with readiness for radioactive operations expected by the end of 1995.

4. **Discussion:**

   a. Upgraded Safety Basis Program: This program developed deterministic accidents to estimate unmitigated offsite doses and to determine those system functional requirements necessary to prevent or mitigate the effects of the accidents. As a result, portions of the Zone 1 ventilation system, vessel purge systems, effluent monitoring system, and electrical power were classified as safety class. Consideration of worker safety has resulted in some cold chemical tanks and inventories being classified as safety significant. The accident scenarios need further review by the Board staff, as the project has defined the DWPF as hazard category 2, the safety class SSC as performance category 3, and the safety significant SSC as performance category 2. The preliminary WSRC analysis indicates that the worst unmitigated DBA results in an approximate 40 Rem offsite dose with one exception.

   The one exception is a postulated inter-area transfer line accident with a total projected unmitigated dose of about 600 Rem, resulting mostly from scenarios involving ground water and surface stream contamination and possible offsite exposure. A mitigation for this DBA might be a plan and identification of resources needed to intercept ground water and surface flow should this event actually occur. This situation is similar to the analysis of possible failure of tanks at the In-Tank Precipitation facility and other transfer lines at the SRS. A common site-wide approach to addressing these potential accidents at SRS is appropriate and necessary. The Upgraded Safety Basis Program will be documented in a SAR prepared by WSRC to the requirements of DOE Order 5480.23, *Nuclear Safety Analysis Reports.* The Board staff will review the SAR when issued for acceptability of the defined DBAs and related accident analyses.

b .Design Basis: The functional requirements for safety class and safety significant class systems have been identified, as well as the design bases for the components of those systems. For completeness, the summary of design basis prepared by the project should include the performance class and quality class for each component. The DWPF project has stated that the requirements of DOE Order 6430.1A, *General Design Criteria*, apply to the new safety class systems being added to DWPF. The Board staff has previously indicated that the SAR should clearly identify how the requirements of 6430.1A are being met by the new and upgraded safety class systems. The DWPF project has stated that application of 6430.1A and other requirements will be described in Chapter 4 of the SAR. The Board staff will review the system classifications and design bases established for the facility SSCs.

The DWPF safety class SSCs have been evaluated for an earthquake and input based on a Blume shaped spectra normalized to 0.2g zero period ground acceleration. The DWPF facility was originally designed for a tornado loading (280 mph wind) similar to that applied to commercial nuclear power plants. Historically, tornado evaluation requirements for nuclear facilities have been set (typically in the 240-360 mph range) such that tornado loads can act as a surrogate for external explosions and a small airplane crash. A tornado loading of 137 mph and associated missiles, as now defined for the DWPF based on performance category 3 of DOE Standard 1020, no longer serves that function. In addition, such events as a malevolent vehicle explosion and small airplane crash can no longer be defined strictly on the basis of accident statistics. These issues, and the selection of the design basis earthquake, will be considered during the review of the SAR by the Board staff.

The DWPF project is using a detailed procedure for dedication of commercial grade items when they are procured as a safety class component. A sample of these evaluations will be reviewed by the Board staff to assure that the components are properly qualified and that the procedure is adequate.

c. Seismic Qualification: For existing systems and components that have been upgraded to safety class, the DWPF project has evaluated their seismic capability by using system walkdowns, analysis, and qualification testing. Review and discussion of this approach has identified the following items that require further evaluation by the Board staff:

(1) The DWPF project has used the following procedures to seismically qualify SSCs that may not have received necessary or sufficient independent validation in the form of a peer review or endorsement of a consensus standards group.

- Procedure to Screen Safety Class Piping
- Procedure to Qualify Tanks by Experience Data
- Procedure to Screen Safety Class Ducts
- Procedure to Perform 2 over 1 Evaluations

(2) Process vessels in the high radiation area canyons are not positively anchored, but have locating pins so that they can be removed remotely for maintenance or replacement. A static analysis has shown that the vessels will not slide or tip over during a seismic event. The evaluations used to seismically qualify these components should be reviewed to ensure the capability to remotely maintain these vessels is retained.

(3) It is not clear how criteria for evaluation of systems and components classified as safety significant were established. Neither the Uniform Building Code nor DOE standard 1020 provide much guidance in the seismic qualification of systems and components in performance category 2. Apparently, the evaluation approach defaulted to the more stringent category 3, which would be more conservative.

d. Local Monitoring Post-Accident: The normal process control is located in a building which cannot be upgraded to safety class and the Distributed Control System is presumed to be unavailable following a seismic event. The DWPF project has stated that all necessary instrumentation can be read at local stations in the vitrification building by an operator stationed there. It may not be possible for one person to perform the necessary monitoring functions in the event of a large earthquake, where there may be several abnormal operating conditions occurring simultaneously and outside communications may be lost. The ability of the operators to maintain control of the plant using only the local instrumentation available on the third floor gallery level of the building needs to be demonstrated. This is particularly true since the local instrumentation will be in a Radiological Control Area.