DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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August 13, 1998

The Honorable Ernest J. Moniz
Under Secretary
Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Under Secretary Moniz:

A Defense Nuclear Facilities Safety Board (Board) staff review team visited the Savannah River Site on July 6–8, 1998, to review high-level waste storage and processing and to evaluate closure of safety issues at H-Canyon. This review was a follow-up to previous site visits and the Board's letter of March 11, 1998, which dealt with issues identified during our staff's review of preparations to resume solvent extraction operations at H-Canyon.

The Board is concerned by the continuing delays in implementing an upgraded authorization basis for the high-level waste tank farms and evaporators at Savannah River. Once finalized and implemented, the new Basis for Interim Operations and Technical Safety Requirements will improve the authorization basis for these operational facilities significantly, but an assortment of problems is delaying these efforts. The enclosed issue report by the Board's staff identifies several concerns with the current path forward, but the basic problem is that resource limitations and inadequate project management have placed the Westinghouse Savannah River Company (WSRC) in the position of having to choose among several unattractive options. WSRC's proposal, accepted by the Department of Energy Savannah River Operations Office (DOE-SR) in a letter of July 30, 1998, includes basing the interim authorization basis partially on engineering judgment, not calculations, and does not indicate when the interim controls will be implemented in the F-Tank Farm. The Board strongly agrees with the statement in DOE-SR's letter that achieving full implementation of a final authorization basis warrants high priority. This situation requires continued close attention by DOE-SR.

The Board commends the efforts that have been made at H-Canyon to resolve the questions raised by our letter of March 11, 1998. The testing of the process vessel ventilation system is producing meaningful results, and stands as proof that verification of performance is essential for safety-related systems, particularly in aging facilities. The discussions and evaluations currently under way regarding how criticality controls should be implemented in the authorization basis should also prove to be valuable. The Board wishes to reemphasize, however, that the fundamental question is whether the time available for operator response to prevent a criticality accident ought to be used as the basis for functional classification of equipment.

The enclosed report provides a synopsis of the observations made during the staff review and is forwarded for your consideration. If you need additional information, please do not hesitate to contact me.

Sincerely,

John T. Conway
Chairman

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

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

DNFSB Staff Issue Report

July 24, 1998

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: R. Tontodonato

SUBJECT: Reviews of Savannah River Site High-Level Waste Tank Farms and H-Canyon, July 6–8, 1998

This report documents issues reviewed by members of the staff of the Defense Nuclear Facilities Safety Board (Board) J. Covino, D. Moyle, J. Roarty, and R. Tontodonato during a visit to the Savannah River Site (SRS) on July 6–8, 1998. This site visit focused on the high-level waste tank farms, H-Canyon, and the review of In-Tank Precipitation (ITP) Facility alternatives. This report addresses the tank farms and H-Canyon. A separate report will be prepared to document the review of the ITP Facility.

Tank Farms Authorization Basis. Implementation of an upgraded authorization basis for the high-level waste tank farms and evaporators continues to experience major delays. In a letter of May 28, 1998, Westinghouse Savannah River Company (WSRC) informed the Department of Energy Savannah River Operations Office (DOE-SR) that the original commitment to implement Technical Safety Requirements (TSRs) in the H-Tank Farm in March 1998 could not be met. Delays were attributed to unforeseen difficulties in implementing some of the TSRs; the need to address new TSRs generated by continuing work on the safety analysis; and resource conflicts arising from the need to support near-term resolution of several safety issues, as well as preparations to start up the Replacement High-Level Waste Evaporator, and development of an interim safety basis for ITP. WSRC proposed to implement the TSRs for the H-Tank Farm by June 1999, but provided no estimate on when TSRs would be in place for the F-Tank Farm.

DOE-SR's response of June 19, 1998, stated that a more timely implementation was needed, and proposed dividing the authorization basis upgrade into two phases so that some improvements could be achieved sooner. The first phase would correct errors in the proposed Basis for Interim Operations (BIO) and address problems in implementing specific TSRs. Unresolved safety issues (e.g., tanks containing dry sludge, wastes with retained hydrogen, flammability of organics in the waste) would be resolved in the second phase. A Safety Analysis Report and TSRs that fully comply with DOE Orders 5480.22 and 5480.23 would also be completed in the second phase.

WSRC is still attempting to develop a path forward that meets DOE-SR's expectations. WSRC intends to define the scope of the "Phase I" authorization basis by August 3, 1998. Their current plan is to submit an "Interim Safety Analysis Report" to DOE-SR in mid-October 1998 and implement upgraded controls for the H-Tank Farm by March 1999. However, the controls would be a mixture of TSRs and interim procedural-level controls, and the F-Tank Farm is outside the scope of Phase I.

The Board's staff will assess the adequacy of the upgraded safety analysis and controls once they are available. However, several aspects of the WSRC plan are troubling. The path forward focuses on the H-Tank Farm, but it is equally important that improved controls be implemented in the F-Tank Farm. Furthermore, if each tank farm is operated under its own unique set of controls for more than a short time, the differences in such areas as surveillance frequencies, operability and monitoring requirements, and administrative programs could lead to errors that would impact safety. Lastly, the uncertain scope of the Phase I authorization basis leaves open the possibility that important requirements that have been difficult to finalize (e.g., tank ventilation requirements, tank overheating controls, controls that address organic materials in the tanks) may be put off until Phase II. This endeavor will require continued close monitoring by both the Board's staff and DOE-SR.

Replacement High-Level Waste Evaporator. WSRC is continuing preparations to start operating the Replacement High-Level Waste Evaporator in June 1999. The new evaporator is a large stand-alone facility with considerably larger capacity than either of the two high-level waste evaporators currently operating at SRS. Construction is essentially complete, and integrated testing is scheduled to be done by the end of 1998. WSRC recommended that DOE-SR allow the new evaporator to be treated as a modification to the tank farms, which would enable performance of a Readiness Assessment instead of an Operational Readiness Review (ORR) to confirm the evaporator's readiness to start operations. DOE-SR has not yet responded to the WSRC recommendation. The Board's staff believes the evaporator is clearly a new nuclear facility, and that an ORR is required by DOE Order 425.1.

H-Canyon. The Board's staff reviewed the status of two safety issues identified in the staff reports forwarded by the Board's letter of March 11, 1998, to the Under Secretary of Energy.

Process Vessel Ventilation System—The first issue discussed was whether the H-Canyon BIO is correct in assuming that the process vessel ventilation system provides enough air flow to each process vessel to prevent the accumulation of unsafe quantities of hydrogen gas. To resolve the question, WSRC estimated the ventilation flow rate for four process vessels using measurements of the pressure differential between the canyon cell and each vessel. Three of the vessels were shown to have more than enough air flow to prevent hydrogen gas accumulation. However, the pressure differential for the fourth vessel (Tank 9.6) was very small (0.0024 inches of water column), less than the measurement error of the instrument. Tightening of connections and measurement with different instruments had little effect. Finally, WSRC replaced the gaskets

on the jumper connecting Tank 9.6 to the process vessel ventilation system header. This resulted in an enormous increase in pressure differential (0.22 inches of water column) and a discernable increase in evaporation from the tank.

The precise problem with the gaskets on Tank 9.6 is unknown. WSRC believes the gaskets were installed many years ago, so long-term degradation is a possibility. WSRC plans to survey four more tanks in H-Canyon and eight tanks in F-Canyon by the end of 1998 to further assess the process vessel ventilation systems. WSRC also plans to perform a calculation to determine the amount of air flow that would result if a half-inch gap existed between the ventilation jumper and the process vessel, as a bounding case for gasket degradation. The Savannah River Technology Center has been tasked to study the feasibility of using improved measurement techniques to measure air flow or hydrogen concentration in the process vessels. WSRC will evaluate the need for periodic surveillance of the process ventilation systems in the canyons based on the results of these efforts.

It is too early to determine whether this is an isolated problem with one tank, or the canyon process vessel ventilation systems are significantly degraded. In either case, this problem highlights the need to verify the performance of safety-related systems in a rigorous manner, particularly for aging facilities.

Criticality Controls—The second issue discussed was the functional classification of criticality controls. The H-Canyon BIO states that instruments and equipment needed to implement administrative controls for criticality need to be safety significant only if a particular accident scenario requires taking preventive action within one shift (e.g., a scenario involving evaporation over a period of weeks would not require safety-significant instruments to monitor tank level or concentration). This approach conflicts with the accepted methodology of basing functional classification on the likelihood and consequence of bounding accident scenarios. WSRC and DOE-SR have convened a steering committee to study the cost and benefit of upgrading all equipment related to criticality controls to safety significant, as well as the general issues of how criticality controls ought to be incorporated into the authorization basis and how criticality accidents should be binned in hazard analyses. The committee estimated that upgrading the equipment in the canyons and FB- and HB-Lines would be a very large effort, largely because of the need for numerous walkdowns of existing systems (because accurate drawings are not available for many non-safety-significant systems). The committee plans to complete its work by August 21, 1998, obtain management approval in September 1998, and make changes to site procedures in October 1998.