DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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January 16, 1998

The Honorable Federico Peña
Secretary of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-1000

Dear Secretary Peña:

In a letter dated December 23, 1997, Mr. Roy Schepens, the Acting Assistant Manager for High-Level Waste at the Department of Energy's Savannah River Operations Office (DOE-SR), informed the Defense Nuclear Facilities Safety Board (Board) that DOE-SR is reevaluating the strategy described in the Recommendation 96-1 Implementation Plan for resolving safety issues associated with the Savannah River Site's In-Tank Precipitation (ITP) Facility. The DOE-SR letter states that the current level of understanding of ITP process chemistry does not support completion of the Implementation Plan's commitments to provide final reports on process chemistry and controls in November and December 1997, and commits to provide in March 1998 an updated action plan for closure of Recommendation 96-1.

The effort that has been put forth thus far to characterize the ITP process and resolve the safety issues identified in Recommendation 96-1 is commendable. Much has been learned about the ITP process chemistry as a result of this program. Important catalysts for benzene generation have been identified, as well as the fact that precipitated tetraphenylborate solids can be significant sources of benzene. Several benzene retention mechanisms have also been characterized, and the very large benzene retention capacity of the ITP slurry has been demonstrated. However, as recognized by DOE-SR, the laboratory results show that excessively high benzene generation and release rates are possible, and operation of the ITP Facility in its current configuration cannot be supported unless positive controls can be developed.

It is important that the DOE-SR action plan show a clear path forward for resolving the technical questions that remain. Some key issues that would be appropriate to address in the action plan are summarized below:

- What are the bounding and expected benzene generation and release rates for potential conditions in the ITP Facility, including credible upset conditions? Can the conditions that may lead to a rapid benzene release similar to that observed in Tank 48 on March 5, 1996, be avoided in the future?

- What benzene inventory can be allowed to accumulate in the ITP tank slurries without presenting a hazard if released, and what worst-case benzene release rates (e.g., instantaneous release, free benzene evaporation rate, etc.) should be used in defining this limit?

- If decomposition of tetraphenylborate precipitates cannot be avoided, to what degree does this problem affect ITP's viability from both a safety perspective (large source term for benzene generation) and a process effectiveness perspective (redissolution of precipitated cesium)?

- How will the transition from laboratory-scale testing to operations in the extremely large ITP tanks be made? Scale-up issues will be particularly important in determining the validity of the current strategy of relying on periodic mixer pump operation to manage benzene accumulation and release.

- Are facility or process modifications required to accommodate the predicted behavior safely, and can the proposed controls be relied upon to maintain the facility within the defined safe operating envelope? For example, are the existing mixer pumps sufficiently reliable and effective to provide the required degree of control over benzene accumulation and release? Are the tank ventilation systems adequate to prevent flammable conditions from developing? Is improved process monitoring (e.g., temperature, slurry composition, vapor composition, etc.) required? Are residual uncertainties sufficient to warrant additional defense-in-depth features to protect facility workers?

It is also important to consider what will be done if these issues cannot be resolved satisfactorily. The function to be provided by the ITP Facility needs to be available within a few years to support high-level waste vitrification activities at the Savannah River Site. If the ITP process cannot be implemented, or if the required controls would excessively restrict the throughput of the current ITP Facility, DOE will need to develop an alternative process in a timely manner. The principal options appear to be pursuit of an equivalent tetraphenylborate precipitation process in a smaller facility with enhanced engineered controls, or development of an alternative cesium removal process such as ion exchange.

The Board remains keenly interested in DOE's efforts to characterize the ITP process and assess the adequacy of the ITP Facility, and will review the action plan as soon as it is available. While the results to date have not been encouraging, we will continue to provide safety oversight for these activities as long as DOE considers pursuit of ITP to be warranted.

If you need additional information, please do not hesitate to contact me.

Sincerely,

John T. Conway
Chairman

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