**DEFENSE NUCLEAR FACILITIES SAFETY BOARD**

**Staff Issue Report**

January 12, 2009

**MEMORANDUM FOR:** T. J. Dwyer, Technical Director

**COPIES:** Board Members

**FROM:** J. Pasko

**SUBJECT:** Transuranic Waste Facility Project, Los Alamos National Laboratory

This report provides observations on the Transuranic (TRU) Waste Facility Project based on a review conducted by the staff of the Defense Nuclear Facilities Safety Board (Board) during the week of November 17, 2008, in preparation for Critical Decision (CD)-1. This review was conducted by staff members J. Pasko, J. Anderson, B. Broderick, T. Davis, and J. Plaue. Issues identified during this review were discussed with Los Alamos National Laboratory (LANL) and the National Nuclear Security Administration's (NNSA) Los Alamos Site Office (LASO) on November 24, 2008, and with NNSA Headquarters personnel on November 25, 2008. On December 10, 2008, NNSA canceled an Energy Systems Acquisition Advisory Board (ESAAB) review for CD-1, scheduled for December 19, 2008, pending additional study of mission need and alternative courses of action.

**Background.** The TRU Waste Facility is planned to process TRU waste generated by ongoing programmatic activities at LANL. This project will replace aging legacy facilities—including those that will be eliminated by the closure of Area G pursuant to an agreement between the Department of Energy (DOE) and the State of New Mexico –with a 30-year capability to store, characterize, repackage, size reduce, and ship solid TRU waste. The facility will be designated as Hazard Category 2 based on the quantity of radioactive material to be stored and processed.

The proposed facility is divided into five functional areas, with a unique set of safety system requirements identified for each area. The functional requirements developed during the conceptual stage of this project include staging and storage, characterization and certification, packaging and repackaging (including decontamination and size reduction), utilities and support, and shipping operations.

The primary means of confining radioactive material in the facility are waste storage drums (designated as safety class). The preliminary hazard analysis (PHA) identified three additional engineered safety-class systems: (1) the facility structure (to maintain structural

integrity following a performance category [PC]-3 natural phenomena event), (2) the fire suppression system, and (3) a passive confinement feature (reliance on high-efficiency particulate air filters and associated duct work without motive force) in the repackaging area only. The following engineered controls are identified as safety significant in the PHA:

- Airborne radiation monitors
- Facility ventilation (differential pressure)
- Fire detection/alarm system
- Lightning protection system
- Fire barriers

**Safety-in-Design Issues.** The conceptual design lacks sufficient development of credited controls (i.e., clearly defined and scoped safety systems supported by preliminary one-line diagrams). Additionally, a number of inconsistencies exist between the PHA and the conceptual design that result in uncertainty regarding the overall safety strategy:

- The safety-significant active confinement ventilation system for the repackaging function is identified in the PHA as providing functionality during all design basis accidents; however, the conceptual design report does not require functionality following a PC-3 seismic event. The conceptual design report identifies safety-class emergency electrical power and safety-significant standby electrical power as support for other safety systems, but these are not identified as credited controls in the PHA.

- The conceptual design of the characterization function relies on the use of existing trailers parked on an outdoor pad. The project was unable to provide evidence that the design of these trailers can perform the safety functions identified in the PHA (e.g., safety-class structure, safety-class fire suppression).

- The facility structure is identified as PC-3, with a functional requirement to maintain structural integrity following natural phenomena events for all functions except utilities and support. It is unclear why the utilities and support portion of the facility, which includes equipment that performs post-seismic safety functions (e.g., support for safety-class fire suppression), is not identified in the PHA as requiring PC-3 construction to preclude two-over-one interactions.

The conceptual design relies on personal protective equipment rather than engineered controls to protect workers from exposed radioactive material during repackaging and size reduction operations. This approach is contrary to safety-in-design principles and the requirements of DOE Order 420.1B, *Facility Safety*, and is a regression from the current safety posture at LANL for TRU waste repackaging, which utilizes a credited glovebox. In this case, the project has not conservatively identified appropriate safety systems early in the design process.

**Additional Issues.** The following issues are considered to have contributed to the significant safety-in-design issues discussed above:

- Oversight by the federal Integrated Project Team needs improvement. For example, LASO currently does not have an individual assigned exclusively to this project.

- The Technical Independent Project Review (TIPR) did not adequately review the project to determine whether the safety documentation was sufficiently conservative and bounding to be relied upon for the next stage of design. This is a specific requirement of DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*. The nuclear safety scope of the TIPR was limited based on a recommendation by the acquisition executive. As a result, the only explicit review of the project's safety strategy was LASO's review of the PHA.

- Findings from the TIPR (July 2007) and a follow-up Limited TIPR (August 2008) were not sufficiently addressed, and the corrective action plans were never formally approved.

- The project is required to implement DOE Standard 1189, *Integration of Safety into the Design Process*, after the CD-1 milestone, but a gap analysis and implementation strategy have not yet been developed as part of the conceptual design. In particular, the project intends to depart from the typical design phasing associated with critical decisions (e.g., completing final design at CD-2). The staff believes the project ought to evaluate when safety-in-design actions should be performed consistent with their intended design phase (e.g., development of a Preliminary Safety Design Report upon completion of the preliminary design).

- The project has not implemented lessons learned from other LANL projects (e.g., the Replacement Radioactive Liquid Waste Treatment Facility). For example, although a need to develop databases to track assumptions and requirements has been identified for other projects, the TRU Waste Facility Project did not incorporate these databases into the conceptual design. The project needs to adopt an approach whereby issues and lessons learned from other construction projects are captured and implemented. This has been a consistent problem with LANL projects.