

Peter S. Winokur, Chairman  
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**DEFENSE NUCLEAR FACILITIES  
SAFETY BOARD**

Washington, DC 20004-2901



August 7, 2014

The Honorable Frank G. Klotz  
Administrator  
National Nuclear Security Administration  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-1000

Dear Administrator Klotz:

The staff of the Defense Nuclear Facilities Safety Board (Board) reviewed the Preliminary Documented Safety Analysis for the Transuranic Waste Facility project at Los Alamos National Laboratory and the actions taken by the National Nuclear Security Administration (NNSA) to resolve five safety issues identified in the Board's June 11, 2012, project letter. The review identified two new issues and revealed that additional action is required to resolve three of the prior issues. The new issues include inadequate analyses of (1) potentially high consequence accidents affecting facility workers and (2) safety controls to address a postulated wildland fire. The prior issues deal with analysis of radiological consequences to workers and the public, as well as strategies for ensuring operability of the fire protection system during cold weather. Collectively, these issues could impact the identification, design, and functional classification of safety-related controls. The enclosure to this letter describes these issues, as well as the Board's understanding of the current design and safety strategy for the project.

The Board understands that NNSA plans on beginning construction before the end of fiscal year 2014. Therefore, pursuant to 42 U.S.C. § 2286b(d), the Board requests a briefing within 60 days of receipt of this letter identifying actions taken or planned by NNSA to resolve these safety issues.

Sincerely,

Peter S. Winokur, Ph.D.  
Chairman

Enclosure

c: Dr. Donald L. Cook  
Ms. Kimberly Davis Lebak  
Mr. Joe Olencz

## ENCLOSURE

### Summary of the Transuranic Waste Facility (TWF) Project and Related Board Safety Issues

**Open Safety Issues.** The following safety issues previously identified by the Board in its June 11, 2012, project letter remain open. While the National Nuclear Security Administration (NNSA) has made progress in addressing each issue, additional action is required to achieve closure. The issues from the project letter related to providing adequate analyses and controls for aircraft and vehicle crash accidents have been sufficiently addressed by the NNSA.

- The project team has not adequately characterized the types of sealed sources to be used at TWF. As a result, key parameters in the accident analysis for events involving sealed sources may not be conservative or consistent with the bounding values recommended in Department of Energy (DOE) Handbook 3010, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. Specifically, the analysis in the Preliminary Documented Safety Analysis (PDSA) does not identify and analyze sealed sources containing powder-like materials, nor does it adequately discuss potential over-pressurization events. Both of these factors can greatly increase the appropriate release fraction to be used in modeling sealed source accident scenarios. For example, during a fire involving sealed sources containing a dispersible powder, the bounding release fraction could be 2E-3 or higher depending on the degree of over-pressurization. In applying a release fraction of 6E-5, the TWF PDSA does not consider the potential for a fire-induced pressurized release. The postulated radiological consequences from insults to the sealed sources are potentially underestimated. Additional safety-related controls may therefore be required to protect sealed sources and/or control their material form and quantity.
- In response to the June 11, 2012, project letter, the project team applied the guidance from the May 2011 safety bulletin published by the DOE Office of Health, Safety and Security. Relying on a site-wide analysis of deposition velocity performed by Pacific Northwest National Laboratory (PNNL), Los Alamos National Laboratory personnel calculated a new site-specific deposition velocity (0.4 cm/s) to be used instead of the previously proposed value (1 cm/s). The PNNL analysis, however, states that based on the persistence of low wind speed conditions, deposition velocities as low as 0.2 cm/s are appropriate for distances less than two miles. TWF's minimum site boundary distance is 0.91 mile. NNSA has not provided adequate justification to support the proposed 0.4 cm/s value in light of this statement. Therefore, the calculated dose consequences to the public from postulated accidents at TWF may not be conservative, and consideration of additional safety-class controls may be required for certain TWF accidents.
- The approach to protecting the safety-significant fire protection system from potential inoperability due to freezing continues to rely on non-safety-related components to perform a credited alarm and notification function. Specifically, safety-significant local temperature monitors and alarms designed to identify conditions that could lead to freeze-related inoperability are routed via non-safety-related communication channels to non-

TWF personnel for response. Without upgrading these communication channels to safety significant, specification of appropriate local surveillances in the Technical Safety Requirements would be required to comply with DOE's guidance for freeze protection in the *Interim Guidance for Design and Operation of Wet Pipe Sprinkler Systems and Supporting Water Supplies*. The Board recognizes that the TWF project team will develop the Documented Safety Analysis and applicable Technical Safety Requirements concurrent with construction activities, which is consistent with DOE's requirements. Until the project team completes this work, this issue remains unresolved.

**New Safety Issues.** In addition to the open issues discussed above, the Board staff's assessment of the PDSA identified two additional significant concerns.

- In some scenarios the PDSA underestimates the consequences to facility workers, resulting in a set of safety-related controls that may not be sufficient to protect facility workers. The scenarios include: (1) a forklift tine puncture spilling the contents of a pipe overpack container containing 1800 <sup>239</sup>Pu-equivalent curies of dispersible powder, and (2) a deflagration in the headspace of a drum containing transuranic (TRU) waste discovered to be damaged or otherwise not compliant with the waste acceptance criteria for the Waste Isolation Pilot Plant. The radiological or physical impacts from these events could be significant and may require identification of additional safety-related controls. Without a thorough and clearly documented basis for facility worker hazards and controls, TWF may be missing required safety-related controls for facility worker safety.
- The roof of each waste storage building is credited as safety significant to prevent ignition of a waste storage building by falling embers or burning debris from a wildland fire. The PDSA underestimates the consequences of the failure of the non-combustible roof during a wildland fire by assuming that only a single building could be impacted. However, falling embers and burning debris could start fires in all of the buildings, effectively defeating the safety-class building/trailer separation distance control. The radiological consequences of this accident could exceed DOE's evaluation guideline and would necessitate the need for safety-class controls. The PDSA needs to identify effective safety-class controls to prevent or mitigate the accident.

**Project Summary.** TWF is designed to be Los Alamos National Laboratory's new facility for storage and characterization of newly generated TRU waste in preparation for shipment to the Waste Isolation Pilot Plant. TRU waste containers will continue to be loaded into TRU package transporters at the existing Radioactive Assay and Nondestructive Testing facility. TWF will be located at Technical Area 63, between Puye Road and Pajarito Road. Storage of TRU waste at TWF will be limited to one year by the facility's Resource Conservation and Recovery Act (RCRA) permit.

TWF will be a hazard category 2 nuclear facility. The inventory limit for each waste storage building will be 3200 <sup>239</sup>Pu-equivalent curies. In this enclosure, the term "waste storage building" includes both the characterization/waste storage building and the five waste storage buildings. These six waste storage buildings will be capable of storing and staging 825 drums or drum equivalents of

TRU waste. Contingency storage will allow up to 1240 drums or drum equivalents. TWF will also house up to 1000 <sup>239</sup>Pu-equivalent curies of sealed sources in the calibration source storage building. The material limit for the entire facility will be 20,200 <sup>239</sup>Pu-equivalent curies in the waste storage buildings and calibration source storage building, 1,240 <sup>239</sup>Pu-equivalent curies in the outdoor staging area, and up to 1,200 <sup>239</sup>Pu-equivalent curies in each characterization trailer, depending on waste container type. TRU waste contained in pipe overpack containers does not contribute to any of these limits. While TWF personnel will be authorized to perform filter replacement, no waste containers will be opened.

Characterization activities required for waste certification will be performed in the characterization and waste storage building and in mobile trailers located on pads adjacent to the storage buildings. Characterization activities performed in the trailers include non-destructive assay (neutron and gamma counting) and radiography. Headspace and flammable gas sampling and analysis will be performed in the characterization and waste storage building.

Included below is a breakdown of TWF's credited control set, per the PDSA, 102355-PDSA-001-R3.1.

TWF's safety-class controls include:

- The separation distance between buildings and trailers reduces the likelihood of fires involving multiple buildings or trailers.
- The slope of the buildings and the RCRA site (the area on TWF permitted for TRU waste operations) limit the duration of fuel pool fires from spilled combustible liquids.
- The use of electric forklifts prevents fuel fires and explosions due to propane powered forklifts.
- The offsite vehicle barrier prevents impact and fire accident scenarios due to a vehicle crash into the facility.
- The standoff distance to nearby natural gas pipelines prevents explosions and fires impacting TWF due to a ruptured natural gas pipeline.
- The dimensions and layout of the buildings are protected as a design feature to reduce the likelihood of an aircraft crash into a building.
- The standoff distance between the buildings and surrounding wildland prevents facility fires ignited by wildland fires.
- The on-site vehicle barrier prevents on-site vehicles from impacting TRU waste containers.
- Pipe overpack containers prevent the dispersal of TRU waste from all possible accident stressors, with the exception of forklift punctures.

- TRU waste containers provide primary confinement of TRU waste.
- The seismic power cutoff system prevents post-seismic fires resulting from electrical distribution faults. Its enclosure protects it during seismic events and from wind-borne missiles.

TWF's safety-significant controls include:

- The fire suppression system limits the size, temperature, and duration of fires, which limits the amount of TRU waste involved in fires.
- Shielding for the radiography system protects workers from over-exposure to radiation.
- An interlock for the radiography system protects workers from over-exposure to radiation.
- The roof of each waste storage building is made from non-combustible materials to prevent fires from falling embers or burning debris generated during wildland fires.

TWF's specific administrative controls include:

- The material-at-risk inventory control ensures the amount of radioactive material in the facility is bounded by the amount assumed in the hazard and accident analyses.
- The combustible loading and flammable material control reduces the consequences of fires.
- The hot work and ignition source control reduces the likelihood of fires.
- The fueled vehicle location prohibition reduces the likelihood of fuel pool fires impacting TRU waste containers.
- The prohibition on the use of fossil fuel powered forklifts reduces the likelihood of fuel pool fires impacting TRU waste containers.