DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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September 14, 2007

The Honorable James A. Rispoli
Assistant Secretary for Environmental Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0113

Dear Mr. Rispoli:

The Defense Nuclear Facilities Safety Board (Board) has been following the design and safety basis development for the Uranium-233 Downblending and Disposition Project in Building 3019 at Oak Ridge National Laboratory. The Board notes the recent approval of the Critical Decision (CD)-2/3A milestone as defined in Department of Energy (DOE) Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*. The Board agrees with the overall safety strategy as summarized in the enclosure to this letter but has concerns with the implementation of this strategy as identified below. The safety-related areas that need to be addressed as the project progresses include:

- **Preliminary Documented Safety Analysis (PDSA).** There needs to be improvement in future PDSA revisions in the following areas: linkage of safety-related controls to hazardous events, development of specific administrative controls, and evaluation of toxicological hazards.

- **Project Fire Hazards Analysis.** The Board noted significant weaknesses in the previous version of the Project Fire Hazards Analysis including a lack of integration into the PDSA. A revision to this document was issued immediately prior to CD-2/3A approval. The Board has reviewed this revision and found that it continues to have weaknesses, notably its failure to explicitly state all assumptions and requirements to be carried forward by the project through final design, construction, and administrative control development.

- **Ventilation Stack 3020.** The CD-2/3A Project Baseline provides funding sufficient for shortening the 3020 stack to prevent a fall onto Building 3019. Other options, including attempting to control the fall or accepting the risk of a fall are still under consideration. The Department of Energy continues to develop a risk basis to support the decision regarding Stack 3020 and the Board plans to follow this effort. Insufficient information is available, at the present time, to evaluate the alternatives to shortening the stack.

- **Confinement Strategy.** The project will undergo a gap analysis in accordance with the Implementation Plan for Recommendation 2004-2, *Active Confinement Systems*. The Board will review the confinement strategy once this analysis is complete to determine its adequacy.

The Board notes that completion of this project will meet the intent of the Board's Recommendation 97-1, *Safe Storage of Uranium-233*. Providing a disposition path for this large portion of the uranium-233 in the defense nuclear complex precludes the need for extensive repackaging and major upgrades to the Building 3019 storage facility. To ensure safe final disposition of this material, the Board encourages project personnel to continue their interactions with the Waste Isolation Pilot Plant so as to meet all technical and legal requirements for geologic disposal of the downblended material.

Sincerely,

A. J. Eggenberger
Chairman

c: Mr. Gerald G. Boyd
Mr. Mark B. Whitaker, Jr.

Enclosure

Enclosure
Uranium-233 Downblending and Disposition Project Summary

The Uranium-233 (U-233) Downblending and Disposition Project is designed to downblend the vast majority of the Department of Energy's (DOE) inventory of separated U-233. The material will be blended with depleted uranium to less than 1 percent equivalent U-235 enrichment (0.66 percent U-233) in an aqueous process, then denitrated to a solid uranium trioxide product. This product will be packaged in shielded containers for interim storage at Oak Ridge National Laboratory (ORNL) prior to final disposition. The majority of the downblended material is expected to be disposed of at the Waste Isolation Pilot Plant, and a small portion at the Nevada Test Site. Unpackaging, dissolution, downblending, denitration, and packaging operations will take place in Building 3019 at ORNL. Building 3019 is a Hazard Category 2 nuclear facility that would be expected to meet Performance Category 3 requirements. However, certain structures and components, notably the penthouse on top of Building 3019 and the adjacent 3020 stack, do not meet current site requirements for Performance Category 3. Calculations show that the stack could fail and potentially fall onto Building 3019 in certain seismic and wind events. Additional analyses to identify a risk mitigation strategy are in progress.

The safety strategy for the U-233 Downblending and Disposition Project relies on confinement of hazardous materials under normal and accident conditions, use of heavy shielding to attenuate high radiation fields, and safe geometry and other controls to prevent inadvertent criticality during handling of fissile material. The primary material at risk in the facility is the U-233 itself. It is a fissile alpha emitter with a strong gamma field due to daughter products of impurities. Significant hazards include fires, natural phenomena events, criticality, and insults to containers or material-handling equipment. The current Preliminary Documented Safety Analysis identifies a control set designed to prevent or mitigate these hazards. The safety classification of the controls has not been finalized because of site boundary changes and continued revisions to safety documentation. However, the following were initially recommended as safety-class controls:

- Storage tube vault structure
- Noncombustible construction of structures, surfaces, and equipment in certain process areas
- Closed Type B shipping containers
- Process Cell 3 structures and passive confinement (Note: Use of passive confinement is under evaluation as a part of a gap analysis being conducted in accordance with Recommendation 2004-2, *Active Confinement Systems*)
- Stack 3020
- Vacuum lift system filters

There are also numerous safety-significant controls, including the following:

- Fixed and movable radiation shielding

- Confinement systems such as:
  - Filters in process cell, vessel, and laboratory ventilation system
  - Containers and container transfer equipment
  - Passive building and cell confinement (Note: This is under evaluation as a part of a gap analysis being conducted in accordance with Recommendation 2004-2, *Active Confinement Systems*)
- Nuclear criticality safety controls
- Certain equipment with noncombustible construction not already designated safety-class

Administrative controls to augment facility safety have not yet been fully developed. Certain fire prevention controls and placement of movable shielding are anticipated to be safety-significant administrative controls.

Project personnel are currently updating safety documentation, finalizing design efforts, and planning the procurement of items requiring long lead times. Additionally, with CD-2/3A having been approved, dismantlement and removal of existing contaminated equipment in Building 3019 can be planned and executed.