DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Washington, DC 20004-2901

June 26, 2017

The Honorable Frank G. Klotz
Administrator
National Nuclear Security Administration
U.S. Department of Energy
100 Independence Avenue, SW
Washington, DC 20585-0701

Dear Administrator Klotz:

The Defense Nuclear Facilities Safety Board (Board) has been reviewing the design of the Uranium Processing Facility (UPF), and in particular, the safety strategies being employed. Members of the Board's staff conducted a review of the Preliminary Safety Design Report as the project prepares to enter final design. This letter constitutes our project letter at this phase of design.

The enclosure describes opportunities for improvement related to the UPF safety strategy for fire protection. We will continue to follow the National Nuclear Security Administration's efforts to integrate safety into the design as the UPF project proceeds through design and construction.

Sincerely,

Sean Sullivan
Chairman

Enclosure

c: Mr. Joe Olencz

Enclosure

The Uranium Processing Facility (UPF) Preliminary Safety Design Report and Preliminary Fire Hazards Analysis contain the latest project safety strategy. Review by members of the Board's staff found weaknesses in the revised fire safety strategy resulting from the elimination of thermal barriers and deficiencies in compliance with industry codes and standards. The staff review team identified the following three opportunities for improvement:

Fire Suppression System (FSS) Safety Classification—The UPF FSS is not classified as a safety system, but the UPF design relies on it to prevent accidents with the highest unmitigated consequences. These accidents include a large facility fire and a nuclear criticality accident that follows a design basis seismic event. The project's original strategy included thermal barriers to prevent a criticality accident by protecting fissile material from a post-seismic fire. The project has since eliminated most thermal barriers from the UPF design, thereby increasing the importance of the FSS in preventing a criticality accident. The Board's staff team believes that, given the FSS's increased contribution to the safety posture of the facility, it would be prudent to designate the FSS as safety-significant. Upgrading the FSS to a safety-significant designation would require the FSS to be designed, procured, and maintained in accordance with American Society of Mechanical Engineers NQA-1, *Quality Assurance Requirements for Nuclear Facility Applications*, and would require surveillance of this system to be conducted under Technical Safety Requirements. This increased rigor will increase confidence that the FSS can perform its required safety functions during and following design basis accidents.

FSS Diesel Pumps Limit State Designation—The UPF FSS pumps are credited as seismic design category (SDC)-2, limit state B. According to American Nuclear Society Standard 2.26-2004, *Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design*, a limit state B designation will not guarantee functionality of deformation-sensitive equipment, such as a fire pump, after the design basis seismic event (SDC-2). Thus, functionality of the FSS after the design basis seismic event cannot be guaranteed. During the review by the Board's staff team, project personnel stated that although the FSS pumps are designated limit state B, the project would test them to the more stringent limit state D requirements. However, the Board's staff team reviewed the UPF project pump testing specification, which invokes commercial testing requirements, and found that the pumps would only be tested to SDC-2, limit state B, loading levels. Testing these pumps to limit state D as suggested by UPF project personnel would improve confidence in their ability to perform their safety function.

Combustible Glovebox Windows—Gloveboxes that will contain material-at-risk (MAR) serve as the primary confinement boundary for UPF and are designed in accordance with DOE Order 420.1C, *Facility Safety*. The DOE Order requires applying industry consensus standards to the design and fabrication of gloveboxes. National Fire Protection Association 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, and American Glovebox Society G010, *Standard of Practice for Glovebox Fire Protection*, require the use of

non-combustible glovebox windows. However, the UPF project plans to use a combustible material without demonstrating fire performance equivalent to non-combustible materials. In addition, the currently specified material for glovebox windows could melt when exposed to fire, resulting in a breached primary confinement. Either using a non-combustible window material or demonstrating that the material selected by the UPF project provides equivalent performance would improve the reliability of the facility's primary confinement for MAR.