National Nuclear Security Administration

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

MAY 0 2 2012

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Dear Mr. Chairman:

I am responding to your April 2, 2012, letter to National Nuclear Security Administration (NNSA) Administrator D'Agostino concerning the Uranium Processing Facility (UPF) preliminary design and integration of safety into the design. Your letter requested a report and briefing that describes NNSA's approach for demonstration of the adequate integration of safety in the preliminary design and addresses (1) resolution of issues identified by the Board and NNSA with respect to the safety documentation for UPF, (2) resubmitting and approving the Preliminary Safety Design Report (PSDR), and (3) completing a technical independent project review (TIPR) of the integration of safety into the design for UPF as required under DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets.*

NNSA and the UPF project team continue to work with your staff to address the issues identified by the Board, including discussions held at your offices on April 16-17, 2012. This visit resulted in a greater understanding by all parties of the issues and planned resolutions for the issues. The project remains committed to ensuring protection of the public, workers and environment through integration of safety into design. Safety was integrated into the design of the UPF project even before issuance of DOE-STD-1189 and NNSA remains committed to these principles. PSDR development and approval and future safety basis document development is being brought into greater alignment with the expectations of DOE-STD-1189.

The enclosed initial report addresses the Board's specific concerns where we feel that agreement has been achieved on the approach. A comprehensive report that addresses and closes outstanding issues will be provided within 60 days. In addition to the report, NNSA is providing the following schedule for delivery of activities and submissions: 1) The UPF Project will revise and resubmit the PSDR in August 2012. 2) The TIPR which specifically evaluates the integration of safety in the design process is scheduled for June 2012. 3) An updated staffing analysis and plan for UPF Federal oversight is being developed and will be available June 2012.

We look forward to continuing our dialogue with you and to resolving issues and providing the technical bases to support them. If you have any questions, please contact the UPF Federal Project Director, Mr. John Eschenberg, at (865) 574-5620.

Sincerely,

DONALD L. COOK
Deputy Administrator
for Defense Programs

Enclosure

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Report to the Defense Nuclear Facilities Safety Board in response to Defense Nuclear Facilities Safety Board Letter concerning the Safety Control Set and Preliminary Safety Design Report for the Uranium Processing Facility at the Y-12 National Security Complex (Y-12)

1. Introduction

As a result of an evaluation of the Uranium Processing Facility (UPF) Safety Design Strategy (SDS) and Preliminary Safety Design Report (PSDR), the Defense Nuclear Facility Safety Board's (DNFSB) April 2, 2012 letter identified concerns with the basis and documentation of UPF's safety control set and requested a report and brief within 30 days. This report provides an interim response to information requested in the letter.

Prior to the receipt of the Board's letter, National Nuclear Security Administration (NNSA) and the UPF Project staff have been working collaboratively with the Board staff to resolve several of these concerns and to ensure the UPF Project has a robust documented safety control set that meets Department of Energy (DOE) requirements. The UPF project has evaluated these concerns to ensure that the extent of condition is understood. As part of the continuing maturity of the analysis and design, the following major changes have been initiated and documented in the UPF SDS to improve the safety posture of the facility:

- Changes to the Hazard Evaluation Studies (HES) to address concerns with the treatment of initial conditions, worker self-protective actions, alignment with DOE-STD-1189, and adequacy of the overall control set;
- A strategy to qualify existing confinement systems to provide a post-seismic confinement capability, including availability of power and interfaces with non-seismic confinement systems, and for defense-in-depth to many accident scenarios;
- A position to address seismic requirements for nuclear criticality related equipment and systems; and
- Inclusion of safety significant fire barriers that, in conjunction with safety significant fire suppression systems, provide robust limitations on potential fire scenarios and their hazardous material releases and consequences

2. Approach to Integration of Safety in the UPF Design

From the early drafts of DOE-STD-1189, UPF has embraced the tenets and process of the standard. As the Board letter states, the Project did initially cancel the development of the PSDR. However, once the Project made the decision to proceed with a PSDR, the Project developed the PSDR and is going through the process of review and comment resolution. While the PSDR was not completed following preliminary design, the project has had a SDS and a maturing safety control set that has been integrated into the design (see Table 1 for the maturation of the safety control set). The project has maintained configuration control of the safety control set as the design has matured and is using the "road map" in the SDS to integrate safety into design. The Integrated Preliminary Design Review, a review commissioned by the project, confirmed that the control set had been integrated into design while acknowledging that the PSDR had not been developed in a time frame consistent with DOE-STD-1189. The NNSA Technical Independent Project Review (TIPR) planned for mid-June will allow NNSA to confirm that the safety control set is complete and integrated into the design or that the right

actions are planned to remedy any gaps. With (1) confirmation of integration of safety into design through the Technical Independent Project Review, (2) a revised PSDR submittal and Preliminary Safety Validation Report (PSVR), and (3) alignment of Preliminary Documented Safety Analysis (PDSA) development with project design consistent with DOE-STD-1189 and DOE Order 413.3B, the project will be poised to eliminate the misalignment between design maturity and safety basis development. As an example of the continuing, iterative nature of the evolution of the design and how it communicates with the safety basis, Table 1 identifies how the identification of the safety-related control sets have matured as the design has matured.

Table 1. Changes to the safety related controls for UPF.

Safety-Related System	Conceptual Design	Preliminary Design	Current Safety Design Strategy
Facility Structure	SS/SDC-3	SS/SDC-3	SS/SDC-3
Fire Barriers	SS/SDC-3	Not credited	SS/SDC-3
Fire Suppression System, Water supply, Fire Alarms	SS/SDC-3	SS/SDC-3	SS/SDC-3
Process Confinement	SS/SDC-3	SDC-2	SDC-2
Confinement Ventilation System	SS/SDC-2	Not credited/SDC-1	SDC-2*
Emergency Power	SS/SDC-2	No system currently credited	SDC-2*
Criticality Prevention	Not analyzed/SDC-3	SS based on analyses/SDC-2	SS based on analysis /SDC-2 or SDC-3**
Explosion Prevention	Not analyzed	SS/SDC-2	SS/SDC-2
Process Shutdown	Not analyzed	SS/SDC-2	SS/SDC-2
Seismic Detection and Response System	Not Analyzed	SS/SDC-3	SS/SDC-3
Criticality Accident Alarm System	SS/SDC-3	SS/SDC-1	SS/SDC-1

*Portion of confinement ventilation system and associated support systems designed to SDC-2 limit state D to provide an active, post seismic defense in depth function of minimizing potential release of radioactive material.

**SSCs whose NPH-initiated failure can by themselves lead to a criticality accident shall be designed to SDC-3

3. Resolution of DNFSB Issues

The Board's April 2, 2012 letter identified specific concerns including those dealing with (1) UPF's confinement strategy following a design basis seismic accident, (2) systems, structures, and components required to avoid an inadvertent criticality during or following a seismic event, (3) the need for thorough evaluation of unmitigated hazard and accident scenarios, (4) the need to identify controls to protect the public against small fires that have the potential for significant offsite toxicological consequences, and (5) the need to use reasonably conservative values to calculate dose consequences for several accident analyses that may require safety class controls. As noted above, the majority of the DNFSB issues are addressed in the recently approved SDS. The following paragraphs summarize the approach to resolution for the above five areas:

(1) UPF's confinement strategy following a design basis seismic accident

The UPF confinement strategy involves a series of physical barriers to prevent or mitigate the unintended release of radioactive materials to the environment. These barriers include:

- Process systems including tanks of aqueous uranium systems designed to Seismic Design Criteria (SDC)-2, Limit State (LS)-D
- Storage racks containing fissile material designed to SDC-3, LS-D
- All building structural walls designed to SDC-3, LS-D
- Zone 1B of the confinement ventilation system with HEPA filtration designed to SDC-2, LS-D (new upgrade per the SDS)

The UPF Project is committed to have a robust, DOE Order 420.1B compliant confinement ventilation system for UPF that minimizes the potential release of radioactive materials during normal operation and during and following accidents. To accomplish this objective, the UPF Project is designing a portion of the Confinement Ventilation System (Zone 1B) to SDC-2 that covers areas where material at risk is located. The Zone 1B confinement ventilation system provides a defense-in-depth function of confinement during and following a design basis seismic event. The seismic design requirements applied to this system (including interfaces with other systems such as confinement dampers, piping isolation valves, and required support systems including power) are SDC-2, Limit State D. The Zone 1B confinement ventilation system, in combination with the facility structure, is designed to provide active exhaust ventilation, which generates sufficient in-leakage of air across any openings (e.g., doorways, penetration seals) that are not seismically qualified during post-seismic conditions. The UPF main facility structure below the utility floor and within exterior walls serves as the physical confinement boundary, and the Zone 1B confinement ventilation system will direct potential releases of radiological material through HEPA-filtered exhaust flow paths.

(2) Systems, structures, and components required to avoid an inadvertent criticality during or following a seismic event

The UPF Project is committed to ensure fissile material operations remain subcritical during and following a seismic event. For structures, systems, and components (SSCs) whose natural phenomena hazards initiated failure can by themselves lead to a criticality accident, those SSCs will be designed to SDC-3, as stated in the project's SDS. For example, fissile storage racks maintain spacing between fissile material and, should the storage rack collapse during a seismic event, the resultant configuration may not remain subcritical. Accordingly, these racks will be designed to SDC-3. On the other hand, some solution systems contain low-equity, low-fissile concentration solutions (i.e., below the subcritical concentration limits) and under seismic conditions the resulting configuration would remain subcritical regardless of seismic design. These systems would remain at SDC-2.

The UPF Project has also established an evacuation strategy designed to meet the purpose of ANSI/ANS-8.23 in lieu of seismically qualifying the criticality accident alarm system detection components. NNSA will review the building evacuation strategy for all events, such as fire or

criticality as part of the TIPR. If necessary, optimized strategies for managing evacuations will be developed after this review is completed.

(3) The need for thorough evaluation of unmitigated hazard and accident scenarios

The UPF Project is committed to have a robust safety analysis that supports the design. DNFSB Staff and YSO reviews of the UPF PSDR had already identified a general weakness in the hazard evaluation studies. The identified weaknesses included the use of initial conditions (such as taking credit for a safety program or worker self-protection) in the hazards evaluation process, where the presumed initial condition may have precluded a hazard or control from being considered. Accordingly, all hazard evaluation studies are being reviewed in detail to ensure that the application of initial conditions did not result in unanalyzed hazards or inappropriate control selection. The UPF Project is also revising its procedures to preclude recurrence.

Hazard evaluation studies are also being reviewed to ensure that all design basis events are identified and addressed properly. The PSDR will be revised to incorporate the above actions and address YSO comments.

(4) The need to identify controls to protect the public against small fires that have the potential for significant offsite toxicological consequences

All fire scenarios are being evaluated to ensure that the consequences are understood and proper controls are defined. These evaluations will be documented in a new hazard evaluation study along with revised consequence calculations and incorporated into the PSDR. Additionally, the UPF project will document projected fire scenario controls that prevent or mitigate toxic material releases in a forthcoming revision to the SDS.

(5) The need to use reasonably conservative values to calculate dose consequences for several accident analyses that may require safety class controls

The UPF Project has carefully reviewed its determination of off-site dose from the seismic facility fire (DOE-STD-3009). However, the Project understands that what is “reasonably conservative” involves subjective judgment. Accordingly, the Project has asked the Central Technical Authority for its position on the selection of appropriate parameters/values.