DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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September 25, 2008

To the Congress of the United States:

On September 29, 2006, House Conference Report 109-702 on the National Defense Authorization Act for Fiscal Year 2007 (H.R. 5122) was released and approved by both houses of Congress. The Conference Report, Section 3201, directed the Defense Nuclear Facilities Safety Board (Board) to provide quarterly reports on the status of significant unresolved technical differences between the Board and the Department of Energy (DOE) on issues concerning the design and construction of DOE's defense nuclear facilities.

This is the sixth such quarterly report, reflecting the status of issues through the end of June 2008. It builds on earlier reports to summarize the status of issues previously raised and identifies any new issues associated with the relevant projects. The status of many issues has not changed significantly during the reporting period; however, the fact that an issue has not been resolved does not necessarily imply a lack of progress.

For each relevant facility, the following information is provided in the Board's first quarterly report: (1) a short description of the facility project, (2) the status of the facility, and (3) the status of significant issues identified by the Board. As used here, the term "unresolved issues" does not necessarily imply that the Board has a disagreement with DOE or believes DOE's path forward is inappropriate. Some of the issues noted in these quarterly reports simply await final resolution through further development of the facility design. All of the significant unresolved issues discussed here have been communicated to DOE. Minor issues that the Board believes can be resolved easily and for which an agreed-upon path forward exists are not included; the Board will follow such issues as part of its normal design review process. It is important to note that the Board may identify additional issues in the course of its continuing design reviews. New issues identified since the previous quarterly report are noted below, as well as those issues the Board believes have been resolved. For this reporting period, three new issues were identified, and four issues were resolved. Prior to the discussion of these issues, the status of DOE Standard 1189 (DOE-STD-1189), *Integration of Safety into the Design Process*, is provided.

DEVELOPMENT OF DOE STANDARD 1189

On March 31, 2008, DOE issued DOE-STD-1189, *Integration of Safety into the Design Process.* DOE is now in the initial stages of its implementation. DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, currently requires implementation of the standard within 6 months of its issuance. DOE is revising DOE Order 413.3A to make changes necessary to facilitate the standard's implementation. These changes include a requirement that the standard be implemented for all Hazard Category 1, 2, and 3 nuclear facilities. The Board views this as a positive step. However, DOE's efforts to incorporate requirements from the standard into ongoing projects, particularly those that are still early in their design phase, do not appear to be aggressively aimed at achieving full compliance before September 30, 2008. The Board is continuing to track the standard's implementation and will better understand what DOE has accomplished in this regard at the end of the 6-month implementation period.

The Board supported the timely issuance followed by rapid implementation of DOE-STD-1189, but in a letter dated February 22, 2008, raised two issues. First, the Board believed that DOE needed to make a concerted effort to identify directives impacted by the new standard and to revise such directives in a timely fashion. Otherwise, implementation of DOE-STD-1189 could be unnecessarily complicated or even prevented by the existence of competing or contradictory directives. DOE responded to this issue on May 8, 2008, providing a schedule for the revision of directives impacted by DOE-STD-1189, and established interim guidance addressing its integration with other DOE directives related to safety and design for natural phenomena hazards. The schedule for revising the related directives lacks the urgency desired by the Board, but the interim guidance should, if implemented properly, satisfy the majority of the Board's concerns with regard to the standard's implementation.

The second issue noted in the Board's February 2008 letter was that Appendix B, "*Chemical Hazard Evaluation*," and Appendix C, "*Facility Worker Hazard Evaluation*," are advisory as opposed to mandatory; thus, individual projects are not required to implement them. These appendices are used to classify safety-related controls, so it was not clear to the Board why they would not be mandatory, particularly since the approach used for protection of the public and collocated and facility workers is normally based on the severity rather than the type of hazard (i.e., chemical or radiological). Additionally, the Board questioned why the safety design criteria derived by applying the evaluation guidelines in these appendices did not provide the requisite system and component reliability (e.g., separation and redundancy) for safety controls needed for protection of the public. To ensure that the criteria governing the design of safety-related controls are adequate to protect the public, independent of hazard type, the Board believes DOE should consider carefully the need to implement Appendices B and C. In further discussions with the Board, DOE acknowledged the need to reconsider full implementation of these appendices.

DOE is currently developing a mechanism to ensure that the requisite system and component reliability is included in the design of safety-related systems that help protect the public.

PROJECTS WITH THE MOST SIGNIFICANT UNRESOLVED ISSUES

The Chemistry and Metallurgy Research Replacement Project at Los Alamos National Laboratory (LANL), highlighted in the last quarterly report, remains of concern to the Board. As noted below, the project is addressing unresolved safety issues. DOE and the Board have reached general agreement on the specific safety strategies for the issues of concern. The Board believes that satisfactory implementation of the specific safety strategies needs to be confirmed during its review of the preliminary design and Preliminary Documented Safety Analysis. This review should occur in the first quarter of next year.

Los Alamos National Laboratory, Chemistry and Metallurgy Research Replacement Project. In its first quarterly report, the Board noted its concern regarding the project's overall approach for selecting safety-related systems and the establishment of conservative design criteria for those systems. In the last quarterly report, the Board noted that the specified safety strategy, which relied on passive confinement for some accidents to protect the public, was of particular concern. Since that time, progress has been made toward addressing this issue, and the Board believes that the safety strategy for the Chemistry and Metallurgy Research Replacement facility is now robust.

On May 30, 2008, the Board transmitted a letter to the National Nuclear Security Administration (NNSA) addressing its ongoing review of project design documentation and several specific design issues that require increased attention. The Board supports NNSA's plans to complete a Technical Independent Project Review before proceeding to the final design stage. This review should provide additional confidence in the nuclear safety strategy employed and the design adequacy of safety-related systems. The current schedule calls for publication of a revised Preliminary Documented Safety Analysis in October 2008. The Board notes that ongoing reviews of the draft Preliminary Documented Safety Analysis by the Los Alamos Site Office have identified numerous issues that need to be addressed before proceeding to the final design. As reported in the last quarterly report, the Board will undertake its own detailed independent review of the design of safety-related systems and will, once it is completed, evaluate the adequacy of NNSA's Technical Independent Project Review.

NEW ISSUES IDENTIFIED DURING THE PERIOD

1. Project: Hanford Site, Waste Treatment and Immobilization Plant

New Issue—Fire Safety Design for Ventilation Systems. In January 2008, the contractor (Bechtel National Incorporated) submitted a request to modify fire safety design requirements for the Waste Treatment and Immobilization Plant (WTP) for protection of confinement ventilation systems from the effects of a fire. The intent of the request was to obtain approval for an alternative means of protecting the final exhaust high-efficiency particulate air (HEPA) filters of the confinement ventilation systems in a manner equivalent to that of the features prescribed in DOE Standard 1066, *Fire Protection Design Criteria.* In a letter to DOE dated June 24, 2008, the Board noted that this standard permits the use of equivalent (or superior) methods of fire protection for nuclear final filter plenums. However, the Board identified significant issues pertaining to the proposed tailoring of the standard, adherence to higher-tier policies, and the underlying technical justification for the request. The DOE-Office of River Protection noted similar issues and subsequently rejected the contractor's request. DOE and the contractor are now working to resolve outstanding technical issues and prepare a revised proposal that addresses the issues identified by DOE and the Board. While these issues apply to all WTP facilities, they are associated primarily with the High Level Waste and Pretreatment facilities. Technical resolution for these issues is scheduled to be completed in March 2009, and will include supporting calculations and a revised proposal by the contractor.

2. Project: Savannah River Site, Waste Solidification Building

The Waste Solidification Building (WSB) being constructed at the Savannah River Site will treat aqueous waste streams from the Mixed-Oxide Fuel Fabrication Facility and the Pit Disassembly and Conversion Facility. In WSB, the aqueous waste will be concentrated, neutralized, and solidified in 55-gallon drums. These drums will be either buried on site as low-level waste, or shipped to the Waste Isolation Pilot Plant in Carlsbad, New Mexico.

New Issue—Structural Design. In a letter dated June 25, 2008, the Board raised several issues concerning the structural design of WSB. The main issues were related to inconsistency between the roof design and the design analysis, and to the design for potential settlement due to the unique soil conditions at the Savannah River Site. The Board's staff and project personnel have reached agreement on a path forward for resolving these issues. The roof design has been changed to be consistent with the design analysis. The Board expects to validate the proposed design revisions in the near future.

New Issue—Preliminary Documented Safety Analysis Deficiencies. In a letter dated July 15, 2008, the Board raised several issues regarding the Preliminary Documented Safety Analysis for WSB. NNSA has already begun to address some of these issues through revisions to the safety analysis. However, several significant concerns are still being evaluated: (1) the criterion used to analyze hydrogen explosion scenarios in unvented pipes and vessels does not preserve the confinement integrity of the primary boundary, and (2) it is not yet clear what impact the application of DOE-STD-1189 may have on the identification and classification of safety-related controls, particularly for chemical hazards. NNSA and the Board's staff are discussing these concerns and expect to reach an agreement on their resolution in the near future.

ISSUES RESOLVED DURING THE PERIOD

1. Project: Los Alamos National Laboratory, Technical Area 55 (TA-55) Reinvestment Project

Issue—The Board believed that the scope and timing of the TA-55 Reinvestment Project warranted reconsideration to ensure that the project would address deficiencies of safety systems identified during upgrades to the safety basis and other reviews conducted within the last few years. In addition, the baseline assumptions regarding the programmatic mission for TA-55 have changed substantially, reinforcing the need to realign the scope and timing of subprojects with safety upgrades.

Resolution—NNSA has elected to resolve issues regarding the adequacy of safety systems through the development and execution of an Integrated Priority List for safety system upgrades at TA-55. While this list includes several subprojects under the TA-55 Reinvestment Project, it also includes a significant number of TA-55 safety systems upgrades that are funded and managed through other means. Given that NNSA has chosen to manage the upgrades to the safety systems in this fashion, the Board has decided to oversee the upgrades to safety systems through the Integrated Priority List effort as a whole and therefore will remove this item as an issue associated specifically with the TA-55 Reinvestment Project. The Board remains concerned about the adequacy of safety systems at TA-55 and will conduct a detailed review of the Integrated Priority List effort prior to the next quarterly report. Specific issues (if any) associated with the adequacy of safety systems that are identified during this review will be reported in the next quarterly report.

2. Project: Los Alamos National Laboratory, Upgrades to Pit Manufacturing Capability at TA-55

Issue—The Board was originally concerned that NNSA had failed to demonstrate formal mechanisms for ensuring that design requirements and interfaces would be appropriately managed and controlled across the suite of projects contributing to the future plutonium processing infrastructure at Los Alamos National Laboratory. The Board believed that adherence to DOE Order 413.3A could alleviate this concern.

Resolution—The Board reviewed the upgrades to the pit manufacturing capability at TA-55 and evaluated whether the lack of adherence to DOE Order 413.3A was adversely impacting the integration of safety into the design of the upgrades. NNSA has stated that the upgrades will be managed using a tailored approach to the Order; however, the upgrades are currently on hold pending policy and funding decisions. Further, NNSA has taken steps to develop an Integrated Nuclear Planning process to improve coordination among its projects as national security mission requirements are refined. While the Integrated Nuclear Planning process is immature and not yet adequate, it is intended to help resolve the Board's concern. This issue will therefore be decoupled from the pit manufacturing capability program and considered within the Board's ongoing oversight of operations and the Integrated Nuclear Planning process at Los Alamos National Laboratory. The Board will conduct a more detailed review in the near future during which specific technical safety issues associated with pit manufacturing will be identified. These issues will be discussed in the next quarterly report, as appropriate.

3. Project: Y-12 National Security Complex, Highly Enriched Uranium Materials Facility

Issue—The Board had noted that the water supply for the safety-significant fire suppression system in the Highly Enriched Uranium Materials Facility was not classified as safety-significant consistent with design basis requirements. This safety classification would help ensure the reliability of the water supply system through more rigorous design, construction, maintenance, and configuration control.

Resolution—NNSA briefed the Board on May 15, 2008, on actions being taken and planned to increase the reliability of the fire protection water supply system for the Highly Enriched Uranium Materials Facility. These actions include a commitment to connect to safety-significant water supply tanks planned for the Uranium Processing Facility when completed, to provide a safety-significant water supply pressure monitor, and to incorporate safety-related configuration controls to ensure the availability of a single dedicated flow path in the current supply system. The Board believes these actions address the Board's concern regarding the water supply system and considers this item closed.

4. Project: Y-12 National Security Complex, Uranium Processing Facility

Issue—In developing the preliminary hazards analysis for the Uranium Processing Facility, the project used an airborne release fraction and respirable fraction for bulk uranium metal that were inconsistent with the values in DOE Handbook 3010-94 (DOE-HDBK-3010-94), *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. Use of the values in DOE-HDBK-3010-94 could require additional safety controls not reflected in the safety basis.

Resolution—In a letter dated May 15, 2008, NNSA informed the Board that it has agreed to use the bounding values for the airborne release fraction and respirable fraction from DOE-HDBK-3010-94 for the Uranium Processing Facility and other facilities at Y-12. The Board considers this issue closed.

NEWLY LISTED PROJECT

1. Project: Hanford, Interim Pretreatment System

Description: The Interim Pretreatment System will pretreat waste from tanks at the Hanford Tank Farms that have liquid waste with lower concentrations of cesium and strontium. The system will remove sufficient solids and radioactivity to allow immobilization of the waste through early operation of WTP's Low Activity Waste Facility and/or the operation of supplemental low activity waste immobilization facilities.

Status of Facility: The project received CD-0 approval on December 21, 2007. The project is currently developing technology alternatives and the safety design strategy. Although CD-0 has been approved, DOE has informed the Board that no firm decision to proceed with interim pretreatment has been made.

Status of Significant Issues: The Board has initiated its review of this project and has identified no outstanding issues at this time.

CHANGE IN PROJECT STATUS

On June 27, 2008, the Under Secretary of Energy approved a revised preferred alternative for the Plutonium Preparation Project at the Savannah River Site. This revised alternative will provide equipment and upgrades to the K-Area complex that will allow excess plutonium materials to be dispositioned in part through the Mixed-Oxide Fuel Fabrication Facility and in part through the existing H-Canyon facility. This action subsumes the Container Surveillance and Storage Capability Project and revises the scope of the Plutonium Disposition Project.

Accordingly, the Container Surveillance and Storage Capability Project will be deleted from the Board's quarterly report. The title of the revised alternative is the Plutonium Preparation Project.

As directed by Congress, the Board will continue to exercise its existing statutory authority.

Respectfully submitted,

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Chairman

John E. Mansfield
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Larry W. Brown
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Enclosure

ENCLOSURE

SIXTH QUARTERLY REPORT
SUMMARY OF SIGNIFICANT UNRESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES[b]
			Critical Decision Approved	Design Completion[a]	Construction Completion	
Hanford Site	**Waste Treatment and Immobilization Plant**	12,263			***(Operational 2019)***	
	a. Pretreatment Facility		CD-3	65%	24%	1. ~~Seismic ground motion~~—***resolved*** **(4)** 2. Structural engineering 3. ~~Chemical process safety~~—***resolved*** **(3)** 4. Fire safety design for ventilation systems—***new issue*** **(6)**
	b. High Level Waste Treatment Facility		CD-3	84%	19%	1. ~~Seismic ground motion~~—***resolved*** **(4)** 2. Structural engineering 3. Fire protection 4. Fire safety design for ventilation systems—***new issue*** **(6)**
	c. Low Activity Waste Facility		CD-3	94%	60%	1. Fire protection
	d. Analytical Laboratory Facility		CD-3	89%	50%	1. Fire protection
	Demonstration Bulk Vitrification System Project	224	CD-1	95%	***(Operational to be determined)***	1. ~~Confinement strategy~~—***resolved*** **(5)** No design issues remain
	Interim Pretreatment System	182–310	CD-0	<5%	(Operational 2014)	No issues identified

a. Percent of design complete is an estimate of completion for the particular stage of design, i.e., if CD-0 is approved the percent represents the completion of conceptual design, if CD-1 is approved the percent represents the completion of preliminary design, if CD-2 is approved the percent represents the completion of final design, if CD-3 is approved the design is typically 90% or greater of the final design.

b. Numbers in parentheses indicate the quarterly report in which an issue was considered resolved or a new issue was identified.

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES[b]
			Critical Decision Approved	Design Completion[a]	Construction Completion	
Hanford Site (continued)	**K-Basin Closure Sludge Treatment Project**	220 (Estimated using new conceptual design)	Returned to CD-0	0%	Starting (***Operational to be determined***)	1. ~~Completeness of Preliminary Documented Safety Analysis —review terminated; document not relevant to new conceptual design (3)~~ 2. Adequacy of project management and engineering
	Large Package and Remote Handled Waste Packaging Facility	390	CD-0	0%	Deferred (***Operational to be determined***, **post-2016**)	No issues identified
	Tank Retrieval and Waste Feed Delivery System	1,140	One subproject not using the formal CD process	Various degrees of completion	Various degrees of completion and operations	1. ~~Design pressure rating of waste transfer system —*resolved* (3)~~ No issues remain
	Immobilized High-Level Waste Interim Storage Facility	100	CD-3	90%	Deferred (***Operational to be determined***)	No issues identified
Idaho National Laboratory	**Integrated Waste Treatment Unit Project**	461 (Being reevaluated)	CD-3	>90%	15% (***Operational 2011***)	1. Pilot plant testing 2. Waste characterization 3. Distributed control system design
Los Alamos National Laboratory	**Chemistry and Metallurgy Research Replacement Project**	725–975 (Being reevaluated)	CD-1	90%	Some ground work (***Operational 2016***)	1. ~~Design-build acquisition strategy —*resolved* (2)~~ 2. Site characterization and seismic design 3. Safety-significant active ventilation system ~~—*resolved (2)*~~ ***reopened because of issue 6 (3)*** 4. Safety-class fire suppression system 5. Safety-class and safety-significant container design 6. Deficiencies in Draft Preliminary Documented Safety Analysis

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES[b]
			Critical Decision Approved	Design Completion[a]	Construction Completion	
Los Alamos National Laboratory (continued)	**Technical Area-55 Reinvestment Project**	72	Phase A: CD-2; Phase B: CD-0	60%	(*Complete 2010*) (*Complete 2015*)	1. ~~Adequacy of safety systems—~~*resolved* (6)
	Upgrades to Pit Manufacturing Capability at Technical Area-55	Annual funding	Not formally implementing CD process		Work ongoing	1. ~~Lack of adherence to DOE Order 413.3A—~~*resolved* (6)
	Radioactive Liquid Waste Treatment Facility Upgrade Project	96	CD-1	30%	(*Operational 2012*)	1. Weak project management and federal project oversight 2. Weak integration of safety into the design process
	New Solid Transuranic Waste Facility Project	40	CD-0	60%	(*Operational 2012*)	No detailed review completed
	Nuclear Material Safeguards and Security Upgrades Project, Phase 2	240	CD-1	30%	(*Operational 2013*)	No detailed review completed
	Technical Area-55 Radiography Project	38	CD-0	90% On hold	*On hold*	No detailed review completed
Nevada Test Site	**Device Assembly Facility—Criticality Experiments Facility**	150	CD-2/3A–D	90%	Long-lead procurement and facility modification in process (*Operational 2011*)	1. Structural cracks 2. Deficiencies in fire protection system
Oak Ridge National Laboratory	**Building 3019—Uranium-233 Downblending and Disposition Project**	371	CD-2/3A	60%	(*Operational 2012*)	1. Deficiencies in Preliminary Documented Safety Analysis
Pantex Plant	**Weapon Surveillance Facility (previously called Component Evaluation Facility)**	112	CD-0	On hold	*(Operational on hold)*	No detailed review completed

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES[b]
			Critical Decision Approved	Design Completion[a]	Construction Completion	
Savannah River Site	**Pit Disassembly and Conversion Facility**	2,450	CD-1	50%	(***Operational on hold***)	1. Assumption on combustible loading for seismically induced fire
	Salt Waste Processing Facility	900	CD-2/3A	80%	**Site preparation work started (*Operational 2013*)**	1. ~~Geotechnical investigation—*resolved (4)*~~ 2. Structural evaluation 3. ~~Quality assurance—*resolved* (2)~~ 4. Hydrogen generation rate
	Plutonium Preparation Project	340–540	CD-1A	10%	Not started (***Operational 2014***)	No issues identified
	Waste Solidification Building	245–330	CD-1	90%	Not started (***Operational 2012***)	1. Structural design—***new issue*** **(6)** 2. Deficiencies in Preliminary Documented Safety Analysis—***new issue*** **(6)**
Y-12 National Security Complex	**Highly Enriched Uranium Materials Facility**	549	CD-3	100%	60% (***Operational 2009***)	1. ~~Water supply for fire protection system—*resolved (6)*~~
	Uranium Processing Facility	1,400–3,500	CD-1	10%	(***Operational 2017***)	1. ~~Preliminary hazards analysis development—*resolved(2)*~~ 2. ~~Nonconservative values for airborne release fraction and respirable release fraction—*resolved(6)*~~