DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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May 21, 2008

Mr. Mark B. Whitaker, Jr.
Departmental Representative to the DNFSB
U. S. Department of Energy
1000 Independence Avenue, SW
Forrestal Building, Room 6H-025
Washington, DC 20585-1000

Dear Mr. Whitaker:

The Defense Nuclear Facilities Safety Board (Board) is pleased to enclose a copy of our Fifth Quarterly Report to Congress on the Status of Significant Unresolved Issues with the Department of Energy's Design and Construction Projects. Congress mandated that the Board write this report in the House Conference Report 109-702 (Section 3201), on the National Defense Authorization Act for Fiscal Year 2007 (H.R. 5122).

Sincerely,

A. J. Eggenberger
Chairman

Enclosure: as stated

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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 fifth such quarterly report, reflecting the status of issues through the end of February 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 3-month 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 was 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 one issue was resolved.

PROJECTS WITH THE MOST SIGNIFICANT UNRESOLVED ISSUES

The Chemistry and Metallurgy Research Replacement Project at Los Alamos National Laboratory, which was one of the two projects highlighted in the last quarterly report, remains of greatest concern to the Board. This project has unresolved safety issues or conditions for which there is no clear established resolution agreed upon by DOE and the Board. The Board believes these issues and conditions have the potential to result in significant adverse impacts on nuclear

safety, cost, or schedule, and need to be addressed so that an agreed-upon path forward can be determined as soon as possible. The Chemistry and Metallurgy Research Replacement facility is needed so that the current Chemistry and Metallurgy Research facility can be retired. A second project that was highlighted in the last quarterly report is the K-Basin Closure Sludge Treatment Project at the Hanford Site. As noted below, the Board believes recent progress on the K-Basin Closure Sludge Treatment Project will warrant its removal from the Board's list of facilities of greatest concern in the next quarterly report.

- ***Los Alamos National Laboratory, Chemistry and Metallurgy Research Replacement Project.*** In the first quarterly report, the Board noted its concern regarding the 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 drafts of revised safety basis documents were under review. The focus of this review has been on the adequacy of the overall facility safety strategy and proper identification of safety-related structures, systems, and components. The Board has expressed concern regarding the current safety strategy, which relies on passive confinement for some accidents to protect the public. To address this issue, the project has agreed to enhance the design for the active confinement ventilation system, as opposed to relying on passive confinement to mitigate these accidents. Given these changes, the Board anticipates reaching agreement on the overall safety strategy for the facility in the near future. The Board is following efforts of the National Nuclear Security Administration (NNSA) to conduct a formal review of the revised safety basis documents and the adequacy of the design for safety-related systems. In addition, the current plans call for the project to complete a technical independent project review before proceeding to the final design. This independent project review is currently scheduled for fiscal year 2009. As reported in the last quarterly report, the Board will undertake its own independent detailed review of the design of safety-related systems.

- ***Hanford Site, K-Basin Closure Sludge Treatment Project.*** In the last quarterly report, the Board noted an issue with respect to a halt in ongoing analysis of alternatives for treating and packaging sludge. Recently, DOE requested that the project consider additional alternatives that include transferring the sludge to the central plateau with and without its subsequent stabilization into a final waste form. The Board sees this full vetting of alternatives as a positive decision that will allow DOE to consider the potential benefits of integrating the capability to process this material with other needed waste processing capability at Hanford, as well as potentially accelerating closure of the K-West Basin. Since reestablishing the project at the conceptual design stage, the project has demonstrated a commitment to integrating safety into the design at the earliest stages by conducting a hazard analysis on the first subsystem conceptual design—container sludge retrieval—and formally

transmitting the results back to the design team to aid in design development. The Board also notes DOE's commitment to follow the project management approach of DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, in evaluating alternatives to best meet short- and long-term mission needs at Hanford. Consequently, the Board believes the project has implemented processes necessary for continued success in the conceptual design effort. While resolution of the project management and engineering issues associated with the project has not been consistently demonstrated to the extent that closure is warranted at this time, recent progress warrants the removal of this project from the Board's list of facilities of greatest concern in the next quarterly report.

NEW ISSUES IDENTIFIED DURING THE PERIOD

1. Project: Los Alamos National Laboratory, Radioactive Liquid Waste Treatment Facility

The Radioactive Liquid Waste Treatment Facility (RLWTF) project will replace the existing waste treatment facility at Los Alamos National Laboratory that processes transuranic and low-level radioactive liquid wastes produced in the site's plutonium facility.

New Issue—Weak Project Management and Federal Oversight. In a letter dated March 5, 2008, the Board stated that federal oversight of this project required improvement. The federal Integrated Project Team does not appear to be well established or to be providing effective oversight of the design process. The involvement of team members is typically limited to isolated document reviews at critical milestones, rather than a comprehensive and routine involvement in the design process. The team does not meet on a regular basis, and few team members are able to commit significant time to the project.

New Issue—Weak Integration of Safety into the Design Process. In a letter dated March 5, 2008, the Board stated that integration of the safety and design processes for the project was weak. Particular weakness was noted in ensuring that assumptions made during the development of the safety basis were technically justified and factored into the design. Additionally, there were a number of specific safety issues regarding the design's technical aspects and development of the safety basis. These issues included: (1) the lack of a technical basis for the selection of reinforced thermoset plastic as the material for process tanks and piping that serve as the primary confinement boundaries for radioactive wastes and hazardous chemicals; (2) potential inadequacy in the seismic design criteria for several safety-related structures, systems, and components; and

(3) incomplete hazard analysis and evaluation of consequences to workers due to credible accidents.

2. Project: Savannah River Site, Salt Waste Processing Facility

New Issue—Hydrogen Generation Rate. Deflagration or detonation of hydrogen produced during processing is the main process safety issue associated with this facility. An accurate calculation of the hydrogen generation rate is essential to determining the margin of safety provided by process safety controls. The Board does not believe that hydrogen generation from thermolysis (i.e., hydrogen generation that can occur when organic solvent material used in the process is heated in the presence of radiation) has been adequately considered or quantified. The technical basis for estimating hydrogen generation due to thermolysis is best determined by experimentation. The Board informed DOE that irradiation tests had already been performed at Idaho National Laboratory on solvents very similar to those to be used at the Salt Waste Processing Facility. A simple modification of these tests could provide the data needed to estimate thermolysis at the Salt Waste Processing Facility. In December 2007, DOE proposed testing for the effects of thermolysis at Idaho National Laboratory. The Board is following this effort.

ISSUES RESOLVED DURING THE PERIOD

1. Project: Hanford, Demonstration Bulk Vitrification Facility

Issue—The early design of the Demonstration Bulk Vitrification Facility had a number of major vulnerabilities with regard to the overall confinement of the hazardous wastes to be processed.

Resolution—DOE and project personnel developed a confinement strategy that led to improvements in the confinement design. In December 2007, project personnel presented technical analyses and discussions supporting the adequacy of this strategy. The Board is now satisfied that the project's strategy for confinement is adequate.

To the Congress of the United States

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

Respectfully submitted,

A. J. Eggenberger
Chairman

John E. Mansfield
Vice Chairman

Joseph F. Bader
Member

Larry W. Brown
Member

Peter S. Winokur
Member

Enclosure

ENCLOSURE

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

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES
			Critical Decision Approved	Design Completion	Construction Completion	
Hanford Site	**Waste Treatment Plant**	12,263			***(Operational 2019)***	
	a. Pretreatment Facility		CD-3	69%	24%	1. ~~Seismic ground motion—*resolved* (4)~~* 2. Structural engineering 3. ~~Chemical process safety—*resolved* (3)~~
	b. High Level Waste Treatment Facility		CD-3	83%	21%	1. ~~Seismic ground motion—*resolved* (4)~~ 2. Structural engineering 3. Fire protection
	c. Low Activity Waste Facility		CD-3	95%	52%	1. Fire protection
	d. Analytical Laboratory Facility		CD-3	90%	46%	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
	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

* 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
			Critical Decision Approved	Design Completion	Construction Completion	
anford ite ontinued)	**Large Package and Remote Handled Waste Packaging Facility**	390	CD-0	0%	Starting (***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	CD-3	>90%	15% (***Operational 2010; 2-year delay being considered***)	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
			Critical Decision Approved	Design Completion	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
	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
	Radioactive Liquid Waste Treatment Facility Upgrade Project	96	CD-1	30%	(*Operational 2012*)	1. Weak project management and federal project oversight—***new issue*** **(5)** 2. Weak integration of safety into the design process—***new issue*** **(5)**
	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

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES
			Critical Decision Approved	Design Completion	Construction Completion	
Pantex Plant	**Weapon Surveillance Facility (previously called the Component Evaluation Facility)**	112	CD-0	On hold	***(Operational on hold)***	No detailed review completed
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%	***(Operational 2013)***	1. ~~Geotechnical investigation—*resolved (4)*~~ 2. Structural evaluation 3. ~~Quality assurance—*resolved* (2)~~ 4. Hydrogen generation rate—***new issue*** **(5)**
	Container Surveillance and Storage Capability Project	79–97	CD-2A/3A	30%	Building preparations started ***(Operational 2010)***	1. Fire protection strategy 2. Preliminary hazards analysis 3. ~~Criticality safety—*resolved* (4)~~ 4. ~~Design process control—*resolved* (2)~~
	Plutonium Disposition Project	500 Being reevaluated	CD-0	10%	Not started ***(Operational 2013)***	No issues identified
	Waste Solidification Building	245–330	CD-1	90%	Not started ***(Operational 2016)***	No issues identified
Y-12 National Security Complex	**Highly Enriched Uranium Materials Facility**	549	CD-3	100%	60% ***(Operational 2009)***	1. Water supply for fire protection system
	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