DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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February 12, 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 fourth such quarterly report, reflecting the status of issues through the end of November 2007. 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, one new issue was identified, and three issues were resolved. Prior to the discussion of these issues, the status of DOE Standard 1189, *Integration of Safety into the Design Process*, is provided.

DEVELOPMENT OF DOE STANDARD 1189

A July 19, 2007, report to Congress prepared jointly by the Board and DOE noted that DOE Standard 1189, *Integration of Safety into the Design Process*, is fundamental to the integration of safety throughout DOE's acquisition process and is key to the timely identification, evaluation, and adjudication of safety-related design issues early in a project's life. This new

standard was entered into DOE's RevCom process for comment in March 2007, and the final standard was expected to be issued late in calender year 2007. However, DOE is likely to delay issuing the standard by several months to address concerns regarding its implementation. Portions of the standard are being revised to clarify the roles and responsibilities of federal and contractor staff. Also, DOE has undertaken a review to address internal concerns that the standard may be too prescriptive in its approach. Further, several issues raised by the Board remain unresolved, including seismic design criteria, applicability of design criteria for chemical hazards, and development of a path forward for addressing changes to existing design standards that will result from the issuance of DOE Standard 1189. Board issues are being actively addressed with DOE staff and should not delay the standard's issuance beyond the time required to address DOE's internal concerns. Moreover, DOE is developing changes to DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, to support full implementation of DOE Standard 1189. Overall, DOE's progress on developing this standard has been slower than anticipated by the Board. However, the issues being addressed are valid, and there appears to be no reason for these delays to persist beyond the first quarter of 2008.

PROJECTS WITH THE MOST SIGNIFICANT UNRESOLVED ISSUES

The two projects highlighted in the last quarterly report, i.e., the Chemistry and Metallurgy Research Replacement Project at Los Alamos and the K-Basin Closure Sludge Treatment Project at Hanford, remain of greatest concern to the Board. These projects have unresolved issues or conditions for which there is no clear path to resolution agreed upon by DOE and the Board. The Board believes these issues and conditions have the potential to result in significant adverse nuclear safety, cost, or schedule impacts, and need to be addressed so that an agreed-upon path forward can be determined as soon as possible.

- ***Los Alamos National Laboratory, Chemistry and Metallurgy Research Replacement Project.*** In the Board's first quarterly report dated February 15, 2007, the Board noted its concern regarding the need to establish conservative design criteria for several of this project's safety-related systems—structure, ventilation, fire suppression, and nuclear material container design. Further, the safety basis documents had deficiencies that made it impractical for the Board to assess the overall approach for selecting safety-related systems and the establishment of conservative design criteria for those systems. Since the last quarterly report, DOE and its contractor have been revising the safety basis documents; drafts of the revised documents are now being reviewed by the Los Alamos Site Office, Los Alamos National Laboratory, and the Board. These and other documents needed by the Board to evaluate the preliminary design should be available in early 2008. At the end of the preliminary design stage, the Board will undertake a detailed review of the project's overall safety strategy, as well as assess the adequacy of the design criteria and the design of the safety-related systems.

- ***Hanford Site, K-Basin Closure Sludge Treatment Project.*** In the last quarterly report, the Board noted its concern regarding the delays in this project, and the adequacy of its project management and engineering. Since that report was issued, DOE provided direction to the project contractor (Fluor Hanford, Inc.) in a letter dated September 19, 2007. This direction halts ongoing analysis of alternatives for treating and packaging sludge and directs the contractor to develop a conceptual design based on directly grouting the sludge, before it is shipped to the Waste Isolation Pilot Plant. DOE also directed Fluor Hanford, Inc. to evaluate the appropriateness of this disposition path for a certain portion of the sludge that may not be acceptable for the Waste Isolation Pilot Plant. DOE's direction pre-selects an alternative in advance of properly (re-)executing Critical Decision-1, *Approve Alternative Selection and Cost Range*. A key principle of DOE's project management approach (as outlined in DOE Order 413.3A) is to ensure appropriate supporting analyses and risk evaluations are available when making a critical decision. This is of particular concern in this case as direct grouting is expected to result in hydrogen generation rates that will exceed shipping limits, at least initially, and extended on-site storage may be necessary until the generation rates have slowed. If some of the sludge cannot be shipped to the Waste Isolation Pilot Plant or if the hydrogen generation rates are excessive, alternative disposition paths will have to be developed that would further delay the project. Ongoing activities to support a critical decision on the conceptual design and approval of the preliminary baseline range are scheduled to be completed by September 2008, shortly before the current contract period with Fluor Hanford, Inc. expires.

NEW ISSUES IDENTIFIED DURING THE PERIOD

1. Project: Nevada Test Site, Device Assembly Facility

New Issue—Fire Protection System Deficiencies. At the Device Assembly Facility (DAF) at the Nevada Test Site, progress continues on modifications needed to support future planned activities, including receipt, storage, and operations involving special nuclear material; nuclear explosive operations; and the installation of equipment for performing criticality experiments. The Board has previously noted issues related to the DAF fire suppression system in letters to the National Nuclear Security Administration (NNSA) dated November 3, 2004, and November 28, 2005.

The Board recently conducted a review of fire protection at DAF and identified several issues concerning the availability and reliability of safety-class and safety-significant fire protection features (e.g., not meeting single-point failure expectations, use of strainers not listed by the Underwriters Laboratories, Inc. for fire service, excessive debris during flushes, and no clear flushing criteria). Further, during 2007, the Nevada Site Office

conducted reviews of vital safety systems, assessments of safety management programs, and a review of the draft update to the DAF safety basis. These reviews and assessments also identified a list of deficiencies in the fire protection system at DAF.

The Board is especially concerned about results of the recent flushing of the fire water supply system. The flushes revealed excessive amounts of debris, which can adversely impact the fire protection system. This finding indicates a continuing degradation of the underground piping that supplies water to the DAF fire protection system. The Board believes that the current approach of periodically flushing and cleaning the strainers is insufficient to ensure that the fire protection system will perform as required.

The Board believes that the long-standing problem with the water supply piping and other deficiencies of the fire protection system need to be resolved before the start of planned hazardous nuclear operations (e.g., nuclear explosive operations or criticality experiments).

ISSUES RESOLVED DURING THE PERIOD

1. Project: Hanford Waste Treatment Plant, Pretreatment Facility and High Level Waste Treatment Facility

Issue—The initial ground motion for the design basis earthquake was not technically defensible. DOE revised the ground motion for the design basis earthquake upward to address uncertainties in the properties of the subsurface soil and rock. Further, to address these uncertainties, DOE initiated a deep drilling program that involved directly measuring soil and rock properties and completing supporting analyses of laboratory samples. These data could affect the specified ground motion for the design basis earthquake.

Resolution—Geologic work was completed in early 2007. The resulting data were used to develop final seismic and ground motion criteria, which was revised upward from the initial estimates. DOE satisfactorily briefed the Board on July 24, 2007, and the Secretary of Energy certified the final seismic and ground motion criteria on August 10, 2007. This issue is now considered resolved.

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

Issue—The geotechnical investigation reports required to support the design of the Salt Waste Processing Facility were not completed. The field work was completed in summer of 2007, but at that time, a final determination of the design basis earthquake and the design settlement that could result from an earthquake had not been made. The

geotechnical investigation reports were significantly behind schedule for the preliminary design stage of the facility design.

Resolution—The design basis earthquake and design settlement were finalized. Two key geotechnical engineering reports were issued: *Geotechnical Investigations Phase II,* dated June 13, 2007, and *Dynamic Settlement Evaluation Report*, K-ESR-J-00002, dated July 2007. The Board reviewed these reports and supporting calculations, and determined that they provide sufficient information to support design of the Salt Waste Processing Facility. Several studies were completed to address the inherent uncertainty in differential settlement that led to the selection of three design settlement profiles to bound settlement demands on the building. The Board believes these recommended settlement profiles are conservative from a design basis perspective. The geotechnical investigation report confirms the magnitude of the design basis earthquake. This issue is now considered resolved.

3. Project: Savannah River Site, Container Surveillance and Storage Capability Project

Issue—Project personnel were intending to request an exemption from the requirement to provide nuclear incident monitors (NIMs) for the Container Surveillance and Storage Capability Project. The justification for this exemption was based on the implementation of criticality safety controls believed to make a criticality event incredible. Reliance on administrative controls as part of the justification for not providing NIMs is inconsistent with industry criticality standards. This exemption request had not been approved by DOE.

Resolution—In March 2007, DOE-Savannah River Site provided formal direction to Washington Savannah River Company to include NIMs in the facility design. A preliminary Nuclear Criticality Safety Evaluation issued in July 2007 and a draft Preliminary Safety Design Report prepared in September 2007 formally documented NIMs as a safety-related control for criticality events. This issue is now considered resolved.

NEWLY LISTED PROJECT

1. Project: Hanford Site, Large Package and Remote Handled Waste Packaging Facility

Description: The Large Package and Remote Handled Waste Packaging Facility will handle solid wastes at Hanford that cannot be handled by current site processing and repackaging capabilities. These include remote handled wastes and large packages of

mixed, low-level, and contact handled transuranic waste. The processing will include removal of noncompliant wastes for alternative treatment, as well as preparation and repackaging of the wastes to allow disposal on site as low-level waste or shipment to the Waste Isolation Pilot Plant as transuranic waste.

Status of Facility: The mission need (Critical Decision 0) was verbally approval in October 2007. Formal approval was provided in early December 2007. The project is currently developing alternatives for analysis and the initial project safety documentation.

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

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

Respectfully submitted,

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Chairman

John E. Mansfield
Vice Chairman

Joseph F. Bader
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Larry W. Brown
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Enclosure

ENCLOSURE

FOURTH 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**	12,200			(*Operational 2019*)	
	a. Pretreatment Facility		CD-3	68%	25%	1. ~~Seismic ground motion—*resolved* (4)~~* 2. Structural engineering 3. ~~Chemical process safety—*resolved* (3)~~
	b. High Level Waste Treatment Facility		CD-3	82%	22%	1. ~~Seismic ground motion—*resolved* (4)~~ 2. Structural engineering 3. Fire protection
	c. Low Activity Waste Facility		CD-3	94%	53%	1. Fire protection
	d. Analytical Laboratory Facility		CD-3	88%	48%	1. Fire protection
	Demonstration Bulk Vitrification System Project	224	CD-1	95%	Some foundation work (*Operational FY 2011*)	1. Confinement strategy
	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	
	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**	462	CD-3	>90%	<10% Placement of foundation started (***Operational 2010*)**	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	80%	Some ground work (***Operational 2014*)**	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
	Technical Area-55 Reinvestment Project	72	Phase A: CD-2 Phase B: CD-0	60%	(***Complete 2010*)** (***Complete 2014*)**	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

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES
			Critical Decision Approved	Design Completion	Construction Completion	
	Radioactive Liquid Waste Treatment Facility Upgrade Project	96	CD-1		(*Operational 2011*)	No detailed review completed
	New Solid Transuranic Waste Facility Project	40	CD-0	60%	(*Operational 2011*)	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	(*Operational 2010*)	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—***new issue*** **(4)**
Oak Ridge National Laboratory	**Building 3019—Uranium-233 Downblending and Disposition Project**	371	CD-2/3A	90%	(*Operational 2012*)	1. Deficiencies in Preliminary Documented Safety Analysis
Pantex Plant	**Component Evaluation Facility**	112	CD-0	Project is 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-1	35%	(*Operational 2013*)	1. ~~Geotechnical investigation~~—***resolved (4)*** 2. Structural evaluation 3. ~~Quality assurance~~—***resolved*** **(2)**
	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)**

SITE	FACILITY	TOTAL PROJECT COST ($M)	STATUS			ISSUES
			Critical Decision Approved	Design Completion	Construction Completion	
	Plutonium Disposition Project	500 Being reevaluated	CD-0	10%	Not started (*Operational 2013*)	No issues identified
	Waste Solidification Building	244	CD-1		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