

Peter S. Winokur, Chairman  
Jessie H. Roberson, Vice Chairman  
John E. Mansfield  
Joseph F. Bader  
Larry W. Brown

**DEFENSE NUCLEAR FACILITIES  
SAFETY BOARD**

Washington, DC 20004-2901




December 30, 2010

The Honorable Steven Chu  
Secretary of Energy  
U. S. Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585

Dear Secretary Chu,

The Defense Nuclear Facilities Safety Board (Board) is pleased to enclose a copy of our Report to Congress on the Status of Significant Unresolved Issues with the Department of Energy's Design and Construction Projects (dated December 30, 2010). In the Conference Report accompanying the FY 2007 National Defense Authorization Act, the conferees directed the Board to provide quarterly reports until the Department of Energy (DOE) and the Board submit a joint report "on their efforts to improve the timeliness of issue resolution, including recommendations, if any, for legislation that would strengthen and improve technical oversight of the Department's nuclear design and operational activities." The joint report was submitted to the congressional defense committees on July 19, 2007. While the conferees did not require the Board to continue providing quarterly reports, the Board believes these reports provide an appropriate means to keep all parties apprised of the Board's concerns with new designs for DOE defense nuclear facilities. The Board has received encouraging feedback from Congress. As such, the Board intends to continue issuing these reports to Congress and DOE.

Sincerely,



Peter S. Winokur, Ph.D.  
Chairman

Enclosure: as stated

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December 30, 2010

To the Congress of the United States:

The Defense Nuclear Facilities Safety Board (Board) provides periodic reports to Congress and the Department of Energy (DOE) on the status of significant unresolved technical differences between the Board and DOE on issues concerning the design and construction of DOE's defense nuclear facilities. This periodic report builds on earlier reports to summarize the status of issues raised through the end of November 2010 and identifies 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.

In this report, the phrase "unresolved issue" does not necessarily mean that the Board has a disagreement with DOE or believes DOE's path forward to resolution is inappropriate. Some of the issues noted in these reports simply await final resolution through further development of the facility design. All of the significant unresolved issues discussed herein have been communicated to DOE. Lesser 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 these items 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 reports are noted below, as well as those issues the Board believes have been resolved. For this reporting period, no new issues were identified, and one issue was resolved. The enclosure to this report provides a concise summary of significant unresolved issues.

## **PROJECTS WITH THE MOST SIGNIFICANT UNRESOLVED ISSUES**

The Board is highlighting the following as the most significant unresolved safety issues concerning the design and construction of DOE's defense nuclear facilities: (1) the National Nuclear Security Administration's (NNSA) efforts to revise the seismic safety strategy for Los Alamos National Laboratory's Plutonium Facility and (2) design issues at the Hanford Waste Treatment and Immobilization Plant (WTP) that affect the facility's safety basis.

***Los Alamos National Laboratory, Technical Area-55/Plutonium Facility.*** On October 26, 2009, the Board issued Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, which addresses the need to reduce the potential consequences to the public from a seismic event at the Plutonium Facility. On July 13, 2010, DOE provided the Board its Implementation Plan for Recommendation 2009-2 setting forth the long-term safety strategy for the facility. The Board noted deficiencies in the plan and sought clarification from DOE on the criteria DOE will use to evaluate and select safety systems to

protect the public from seismically induced accidents. DOE provided this clarification in two subsequent letters, committing to ensuring transparency during the development of the selection criteria for safety systems and to furnishing the Board with a documented alternatives analysis of options for a seismic safety strategy before making a final selection. Based on these commitments, the Board finds the Implementation Plan for Recommendation 2009-2 acceptable.

***Hanford Site, Waste Treatment and Immobilization Plant.*** On October 7–8, 2010, the Board conducted a series of public meetings and hearings to review outstanding safety-related technical issues in the areas of pulse jet mixing (PJM), hydrogen control strategy, design complexity, and changes in the WTP safety and design bases.

The primary safety-related issue with WTP of concern to the Board involves the PJM system design. The Board formally communicated this issue to DOE in a January 6, 2010, letter after becoming aware of the project's intent to reduce conservatism in the acceptance criteria for adequate mixing. Pacific Northwest National Laboratory (PNNL) experts and the Consortium for Risk Evaluation and Stakeholder Participation (CRESP), independent technical consultants to the WTP project, identified issues similar to those noted by the Board in its January 2010 letter.

In its May 17, 2010, response, DOE committed to conducting integrated PJM testing on a large scale. This testing can address the issues identified by the Board, but DOE's response did not include important details such as scope and schedule that the Board needed to fully understand the commitment. During the public meeting and hearing, DOE indicated that it will establish the test objectives and schedule for the large-scale testing by January 2011. DOE's commitment to conducting large-scale testing is a positive development. DOE's development of an appropriate, detailed test plan will be a key milestone. The Board believes that DOE must resolve PJM issues identified by the Board, PNNL, and CRESP during the testing program, and formally communicated this position to the Secretary of Energy on December 17, 2010, through Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*.

The Hydrogen in Piping and Ancillary Vessels Independent Review Team (HIRT), chartered by DOE's Office of River Protection and Bechtel National, Incorporated (BNI) in April 2010, issued its final report on July 12, 2010. On September 16, 2010, BNI completed a formal closure plan to address the HIRT's findings and recommendations. The Board reviewed this plan and is following the resolution of the HIRT's findings. As noted in the Board's September 3, 2010, periodic report to Congress, the Board observed that many of the HIRT's findings require a great deal of effort and time to implement properly. BNI is addressing the HIRT's findings, and plans to finalize corrective actions in early 2011.

The Board remains concerned about the use of quantitative risk analysis (QRA) as part of the hydrogen control strategy for WTP. The use of QRA as a risk assessment tool is a first use for DOE. There are no DOE standards and requirements for the use of QRA, nor for controlling the assumptions that underpin the QRA in the safety basis. The impact of QRA on WTP safety basis implementation remains unresolved.

## ISSUES RESOLVED DURING THE PERIOD

### 1. **Project: Hanford Site, Waste Treatment and Immobilization Plant—Pretreatment, High-Level Waste, and Low-Activity Waste Facilities**

*Issue—Structural Steel Analysis and Design.* In a letter dated December 2, 2009, the Board identified issues related to the inadequacy of the structural steel designs for the Pretreatment, High-Level Waste, and Low-Activity Waste facilities. The finite-element models used in the structural analyses did not reflect the composite construction of the concrete floor slabs and supporting structural steel beams.

*Resolution*—Based on calculations incorporating more realistic composite construction modeling, BNI demonstrated to the Board that the design margin was adequate to compensate for the inadequacies of the finite-element model used in the design of the WTP facilities. The Board considers this issue closed.

## CHANGE IN PROJECT STATUS

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

The Radioactive Liquid Waste Treatment Facility (RLWTF) Upgrade Project is on hold. The Los Alamos Site Office (LASO) has directed the RLWTF Upgrade Project contractor, Los Alamos National Security, LLC (LANS), to suspend ongoing design efforts and consider alternatives. The suspension is the result of a high total project cost estimate (approximately \$350M) which substantially exceeds the Critical Decision-1 estimated cost range (\$82M–104M). The NNSA project sponsor does not consider the project affordable at this cost.

Consequently, LASO has directed LANS to shift project resources toward evaluation of options that would reduce cost while still providing a long-term capability for processing the site's radioactive liquid waste. In response, LANS has chartered a joint NNSA/LANS Radioactive Liquid Waste Strategy Task Team to develop and evaluate options. The team's efforts are expected to be completed by the end of 2010.

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

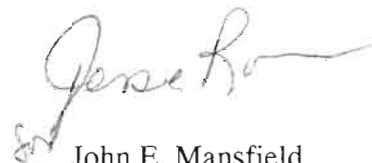
Respectfully submitted,



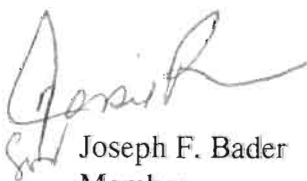
Peter S. Winokur, Ph.D.  
Chairman



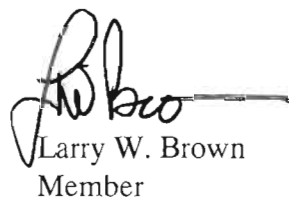
Jessie H. Roberson  
Vice Chairman



John E. Mansfield  
Member



Joseph F. Bader  
Member



Larry W. Brown  
Member

Enclosure

## ENCLOSURE

### DECEMBER 2010 REPORT SUMMARY OF SIGNIFICANT UNRESOLVED ISSUES WITH NEW DEFENSE NUCLEAR FACILITIES

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES <sup>b</sup>
			Critical Decision (CD) Approved	Design Completion <sup>a</sup>	Construction Completion	
Hanford Site	Waste Treatment and Immobilization Plant (WTP)	12,263			<i>(Operational 2019)</i>	
	a. WTP Pretreatment Facility		CD-3	82% Final Design	34%	<ol style="list-style-type: none"> <li>1. Seismic ground motion —<i>resolved (Feb 08)</i></li> <li>2. Structural engineering —<i>resolved (Dec 09)</i></li> <li>3. Chemical process safety —<i>resolved (Oct 07)</i></li> <li>4. Fire safety design for ventilation systems —<i>resolved (Dec 09)</i></li> <li>5. Hydrogen gas control</li> <li>6. Structural steel analysis and design —<i>resolved (Dec 10)</i></li> <li>7. Inadequate mixing</li> <li>8. Deposition velocity</li> </ol>
	b. WTP High-Level Waste Facility		CD-3	87% Final Design	32%	<ol style="list-style-type: none"> <li>1. Seismic ground motion —<i>resolved (Feb 08)</i></li> <li>2. Structural engineering —<i>resolved (Dec 09)</i></li> <li>3. Fire protection —<i>resolved (Jun 09)</i></li> <li>4. Fire safety design for ventilation systems —<i>resolved (Dec 09)</i></li> <li>5. Hydrogen gas control</li> <li>6. Structural steel analysis and design —<i>resolved (Dec 10)</i></li> <li>7. Deposition velocity</li> </ol>

<sup>a</sup>The percent of design completion is an estimate for the particular stage of design (conceptual, preliminary, and final).

<sup>b</sup>Dates in parentheses indicate the periodic report in which an issue was considered resolved or a new issue was identified.

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES <sup>b</sup>
			Critical Decision (CD) Approved	Design Completion <sup>a</sup>	Construction Completion	
Hanford Site (continued)	c. WTP Low-Activity Waste Facility		CD-3	93% Final Design	65%	1. Fire protection —resolved (Jun 09) 2. Structural steel analysis and design —resolved (Dec 10) No open issues remain
	d. WTP Analytical Laboratory		CD-3	82% Final Design	68%	1. Fire protection —resolved (Jun 09) No open issues remain
	K-Basin Closure Sludge Treatment Project	268	Phase 1: CD-1  Phase 2: CD-0	Phase 1: 40% Preliminary Design  Phase 2: 5% Conceptual Design	Phase 1: <i>(Operational 2013)</i>  Phase 2: <i>(Operational to be determined)</i>	1. Completeness of Preliminary Documented Safety Analysis —review terminated; <i>document not relevant to new conceptual design (Oct 07)</i> 2. Adequacy of project management and engineering —resolved (Sep 10) No open issues remain
	Large Package and Remote Handled Waste Packaging Facility	390	CD-0	0% Conceptual Design	Deferred <i>(Operational to be determined)</i>	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 (Oct 07) No open issues remain
Idaho National Laboratory	Integrated Waste Treatment Unit Project (IWTU)	570.9	CD-3	100% Final Design	90% <i>(Operational 2011)</i>	1. Pilot plant testing —resolved (Feb 09) 2. Waste characterization —resolved (Feb 09) 3. Distributed control system design —resolved (Feb 09) No open issues remain
	Calcine Disposition Project	600–900	CD-0	< 30% Conceptual Design	Will utilize portions of IWTU <i>(Operational 2022)</i>	No issues identified

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES <sup>b</sup>
			Critical Decision (CD) Approved	Design Completion <sup>a</sup>	Construction Completion	
Los Alamos National Laboratory	Chemistry and Metallurgy Research Replacement Project—Nuclear Facility	>2,000 Being reevaluated	CD-1	100% Preliminary Design	Some ground work <i>(Operational to be determined)</i>	<ol style="list-style-type: none"> <li>Design build acquisition strategy —resolved (Jun 07)</li> <li>Site characterization and seismic design —resolved (Dec 09)</li> <li>Safety significant active ventilation system—resolved (2) reopened due to issue 6 (Oct 07) —resolved (Dec 09)</li> <li>Safety class fire suppression system —resolved (Dec 09)</li> <li>Safety class and safety significant container design —resolved (Dec 09)</li> <li>Deficiencies in Draft Preliminary Documented Safety Analysis —resolved (Dec 09)</li> </ol> No open issues remain
	Technical Area-55 Reinvestment Project	Phase 2: 100	Phase 2: CD-2A	Various degrees of completion	<i>(Phase 2 Complete 2016)</i>	<ol style="list-style-type: none"> <li>Adequacy of safety systems —resolved (Sep 08)</li> <li>Inadequate approach to ensure timely improvements to the safety posture</li> </ol>
	Upgrades to Pit Manufacturing Capability at Technical Area-55	Annual funding	Not formally implementing CD process	Various degrees of completion	Work ongoing	<ol style="list-style-type: none"> <li>Lack of adherence to DOE Order 413.3A —resolved (Sep 08)</li> </ol> No open issues remain
	Radioactive Liquid Waste Treatment Facility Upgrade Project	Under Review	CD-1	99% Preliminary Design	On hold <i>(Operational to be determined)</i>	<ol style="list-style-type: none"> <li>Weak project management and federal project oversight —resolved (Sep 10)</li> <li>Weak integration of safety into the design process —resolved (Sep 10)</li> </ol> No open issues remain



SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES <sup>b</sup>
			Critical Decision (CD) Approved	Design Completion <sup>a</sup>	Construction Completion	
Los Alamos National Laboratory (continued)	Transuranic Waste Facility	71-124	CD-1	Phase A: 35% Preliminary Design  Phase B: 5% Preliminary Design	<i>(Operational 2015)</i>	1. Inadequate integration of safety into the design process — <i>issue not relevant to revised project scope (Sep 10)</i> No open issues remain
Nevada National Security Site	Device Assembly Facility—Criticality Experiments Facility	150	CD-3	100% Final Design	100% <i>(Operational 2011)</i>	1. Structural cracks — <i>resolved (Feb 09)</i> 2. Deficiencies in fire protection system water supply
Oak Ridge National Laboratory	Building 3019—Uranium-233 Downblending and Disposition Project	477	CD-2/3A	85% Final Design	<i>(Operational 2014)</i>	1. Deficiencies in Preliminary Documented Safety Analysis
Savannah River Site	Pit Disassembly and Conversion Project (in existing K-Area facilities)	Under evaluation	CD-0	90% Conceptual Design	<i>(Operational being evaluated)</i>	1. Assumption on combustible loading for seismically induced fire — <i>review of Pit Disassembly and Conversion Facility terminated; not relevant to new conceptual design (Apr 10)</i> No open issues remain
	Salt Waste Processing Facility	1,340	CD-3	>98% Final Design	35% <i>(Operational 2015)</i>	1. Geotechnical investigation — <i>resolved (Feb 08)</i> 2. Structural evaluation — <i>resolved (Dec 09)</i> 3. Quality assurance — <i>resolved (Jun 07)</i> 4. Hydrogen generation rate — <i>resolved (Jun 09)</i> 5. Flammable gas control 6. Fire protection for final HEPA filters — <i>resolved (Sep 10)</i> 7. Operator actions following a seismic event 8. Mixing system controls and operational parameters

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES <sup>b</sup>
			Critical Decision (CD) Approved	Design Completion <sup>a</sup>	Construction Completion	
Savannah River Site (continued)	Tank 48 Treatment Process Project	156-181	CD-1	35% Preliminary Design	<i>(Operational 2016)</i>	1. Project delays
	Waste Solidification Building	345	CD-2/3	100% Final Design	42% <i>(Operational 2013)</i>	1. Structural design —resolved (Jun 09) 2. Deficiencies in Preliminary Documented Safety Analysis —resolved (Feb 09) No open issues remain
Y-12 National Security Complex	Uranium Processing Facility	1,400-3,500	CD-1	48% Preliminary Design	<i>(Operational 2018)</i>	1. Preliminary hazards analysis development —resolved (Jun 07) 2. Nonconservative values for airborne release fraction and respirable release fraction —resolved (Sep 08) 3. Structural and geotechnical engineering