

Peter S. Winokur, Chairman
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**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

Washington, DC 20004-2901



March 8, 2012

The Honorable Steven Chu
Secretary of Energy
U. S. Department of Energy
Forrestal Bldg. Room 7A-257
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 March 7, 2012). 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 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

Peter S. Winokur, Chairman
Jessie H. Roberson, Vice Chairman
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**DEFENSE NUCLEAR FACILITIES
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March 07, 2012

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 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 December 2011 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 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 two issues were resolved. Enclosure 1 to this report provides a concise summary of significant unresolved issues for current design and construction projects. Enclosure 2 summarizes issues resolved by DOE on current and past design and construction projects. Past projects include those completed by DOE, as well as those delayed or abandoned.

PROJECTS WITH THE MOST SIGNIFICANT UNRESOLVED ISSUES

The Board is again highlighting the seismic evaluation and upgrade of Los Alamos National Laboratory's (LANL) Plutonium Facility and the Hanford Site's Waste Treatment and Immobilization Plant (WTP) as those projects with the most significant unresolved safety issues.

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 addressed 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 the Recommendation. DOE has submitted all but one of the Implementation Plan deliverables to the Board. The remaining deliverable addresses the initiation of glovebox stand upgrades.

In May 2007, prior to the issuance of Recommendation 2009-2, LANL updated the site's Probabilistic Seismic Hazard Analysis (PSHA). LANL revised the update in December 2009 as part of the design certification for the Chemistry and Metallurgy Research Replacement Facility. The 2007/2009 PSHA update demonstrated a significant increase in the potential ground motion at the site. LANL initiated the Seismic Analysis of Facilities and Evaluation of Risk (SAFER) project to evaluate the resulting increase in seismic risk to facilities at the laboratory. The SAFER project's analysis of the Plutonium Facility's structural integrity was included as a deliverable in the Implementation Plan for Recommendation 2009-2. LANL completed the analysis in May 2011 and identified nine seismic vulnerabilities that could render the Plutonium Facility's structure unable to maintain its safety-class confinement function during postulated seismic events.

In light of these vulnerabilities, the National Nuclear Security Administration (NNSA) approved a Justification for Continued Operation (JCO) for the Plutonium Facility in July 2011, authorizing operations until December 9, 2011. The JCO identified interim compensatory measures to help mitigate the increased seismic risk and outlined a plan for addressing the structure's seismic vulnerabilities. In accordance with this plan, the laboratory modified and strengthened the roof to prevent one mechanism for a seismically-induced collapse.

On December 8, 2011, NNSA approved a revision to the JCO, authorizing operations at the Plutonium Facility through May 11, 2012. The revision maintains applicable compensatory measures, but, based on the roof modification, no longer postulates a seismically-induced facility collapse scenario. However, NNSA has agreed that additional structural analysis, such as a non-linear seismic analysis of the facility's structure, is needed to ensure that any remaining structural vulnerabilities that can lead to a seismically-induced collapse or a loss of confinement are identified and addressed. This additional analysis is expected to be completed by June 2012. Until LANL's ongoing efforts are complete this issue remains a Board concern. NNSA plans to resubmit the detailed Project Execution Plan for Recommendation 2009-2 in August 2012, outlining the strategy, cost, scope, and schedule for reducing the consequences from seismically-induced events. This plan will capture any additional upgrades identified by the non-linear seismic analysis.

In October 2011, NNSA approved a revision to the Documented Safety Analysis for the Plutonium Facility. This update postulates a mitigated dose to the public below the Evaluation Guideline but will not be implemented until the JCO expires in May 2012.

Hanford Site, Waste Treatment and Immobilization Plant. During this reporting period, DOE made progress toward resolving several issues identified by the Board with respect to the WTP project. For example, DOE submitted a proposed Implementation Plan for Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*. The plan provides a framework for using large-scale testing to inform the design of pulse jet mixed vessels. In addition, DOE began experimental testing activities to support the resolution of issues associated with the accident analysis for pipe leaks that produce sprays. DOE also adequately addressed issues concerning the use of the Low-Order Accumulation Model (LOAM) in the design of pulse jet mixed vessels by committing to abandon the model for further design work.

DOE, however, continues to experience delays in addressing other issues, such as implementation of the necessary controls for the Hydrogen in Piping and Ancillary Vessels design approach. The Board has observed that Bechtel National, Incorporated (BNI) is using more complex computational models to resolve technical issues but is not always establishing an adequate technical basis, such as sufficient experimental data, to support their use. Complex models require greater technical justification of inputs, assumptions, and methods than simpler models or calculations based on conservative assumptions. The status of some of the Board's outstanding issues with the WTP project is discussed in greater detail below. Note that the Board's concerns with erosion/corrosion wear allowances at WTP documented in a January 2012 letter to DOE will be discussed in the next periodic report.

Mixing in Process Vessels

On December 17, 2010, the Board issued Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*, to address potential nuclear safety hazards arising from inadequate pulse jet mixing at WTP. These hazards included a nuclear criticality accident, an explosion of flammable gases, and a material failure of process vessel components. During the past year, the Board has worked with DOE to clarify the intent of the Recommendation and develop a strategy for an acceptable Implementation Plan. On November 10, 2011, DOE transmitted the Implementation Plan for Recommendation 2010-2 to the Board. The Board evaluated the plan and found that it meets the substantive criteria of the Board's Policy Statement 1, *Criteria for Judging the Adequacy of DOE Responses and Implementation Plans for DNFSB Recommendations*.

Hydrogen in Piping and Ancillary Vessels

Flammable gases generated by the wastes treated in WTP will accumulate in process piping whenever flow is interrupted or in regions of the piping system that do not experience flow, such as piping dead legs. In February 2010, DOE approved a revision to the hydrogen control strategy for piping systems. The revision allows hydrogen explosions in piping under certain conditions and relies on a quantitative risk analysis and other modeling tools to predict the magnitude of the explosion and the piping system's response. The Board is concerned with the revised approach, particularly the quantitative risk analysis, because there are no DOE standards and requirements to govern its use or control the assumptions that underpin the analysis in the WTP safety basis. In April 2010, BNI chartered a 12-member review team to conduct an independent evaluation of the revised hydrogen control strategy. The resolution of technical issues identified by this team was delayed but has recently been completed. BNI has not yet implemented the revised hydrogen control strategy including the development of the necessary safety-related controls. In addition, BNI has not yet completed a major testing effort to determine the response of components such as valves and instrumentation to hydrogen explosions.

The Board is concerned that additional delays are likely as BNI encounters unanticipated technical issues in implementing the revised hydrogen control strategy. For example, project documents indicate that BNI's Environmental and Nuclear Safety organization has concerns regarding

the implementation of the quantitative risk analysis in the safety basis. Resolution likely will require a revision to the recently issued technical basis supporting the revised hydrogen control strategy. Given this situation and the need to complete remaining testing, BNI has decided to continue installing active hydrogen controls, such as vents, in accordance with the original design. BNI plans to abandon these controls in place once the revised hydrogen control strategy has been approved.

Spray Leak Analysis

In a letter to DOE dated April 5, 2011, the Board identified issues related to the WTP-specific methodology for estimating radiological consequences to the offsite receptor from spray leak accidents. As a result, the Board believed that safety-class controls may be required for certain spray leak accident scenarios. DOE responded to the Board's letter on June 3, 2011, and committed to resolving these issues through an active test program. DOE has begun spray leak testing at Pacific Northwest National Laboratory, and the Board anticipates that a final report on the results of this testing will be available early in 2012. DOE's letter to the Board also stated that DOE's Office of Health, Safety and Security planned to address complex-wide issues associated with sprays and leaks identified by the Board. The Board is awaiting this response from DOE.

Heat Transfer Analysis for Process Vessels in the Pretreatment Facility

In a letter dated August 3, 2011, the Board communicated to DOE issues related to heat transfer calculations used to establish post-accident hydrogen mixing requirements in Pretreatment Facility process vessels. Without defensible calculations, the design of the mixing controls in process vessels that prevent potential hydrogen explosions may not be adequate. The Board concluded that BNI's analyses did not adequately support DOE's decisions related to establishing post-accident safety-related mixing controls. Specifically, the Board's letter stated that BNI needed to (1) select a suitable model with the accuracy and precision required to predict the highly complex heat transfer phenomena within WTP process vessels, and (2) properly verify and validate the model consistent with applicable consensus standards for this application.

On November 16, 2011, DOE responded that the heat transfer calculations used conservative assumptions and bounding sensitivity analyses, and that the modeling approach had been properly verified and validated. DOE committed to further justifying these assumptions through technical or sensitivity analyses to show the conservatism of the modeling approach. DOE directed BNI to issue a revised heat transfer report including the results of these studies by May 31, 2012. The Board remains concerned about the suitability and accuracy of the modeling approach and the inputs, assumptions, and methodologies used in the heat transfer calculations. The Board is working with DOE to resolve these issues.

NEW ISSUES IDENTIFIED DURING THE PERIOD**1. Project: Hanford Site, Waste Treatment and Immobilization Plant—Balance of Facilities**

New Issue—Ammonia Controls. In a September 13, 2011, letter to DOE, the Board expressed concern that the existing design and safety-related controls associated with the large quantities of ammonia to be stored at the WTP site did not adequately protect workers or facilities at WTP. The ammonia to be stored onsite in the Balance of Facilities (BOF) is used to treat off-gas in the Low-Activity Waste and High-Level Waste facilities. The Board noted that (1) in the event of a large ammonia release, the design of the main control room (MCR) ventilation system would be insufficient to protect control room workers; (2) the ammonia-related controls associated with a seismic event and tanker truck spill would be inadequate to protect facility workers; and (3) the project has not performed a hazards analysis on potential interactions between the BOF and other WTP facilities.

In its November 16, 2011, response to the Board's letter, DOE stated that the project team would perform three new hazard analyses to address the Board's concerns. The hazard analyses would cover interactions between the BOF and other WTP facilities; MCR habitability; and transportation events, including ammonia tanker truck accidents. DOE's response also stated that the project team would reassess the seismic classification of the ammonia storage vessels if the hazard analyses showed that failure of the vessels would prevent other safety-class systems from performing their safety function(s). The proposed hazard analyses are expected to be completed by January 1, 2013. The Board will evaluate the hazard analyses and supporting calculations as they are developed.

ISSUES RESOLVED DURING THE PERIOD**1. Project: Hanford Site, Waste Treatment and Immobilization Plant—Pretreatment and High-Level Waste Facilities**

Issue—Inadequate Technical Justification for Deposition Velocity. The WTP project team modified a key input parameter to models that predict the transport of radioactive plumes, and therefore public dose consequences, following an accident. Specifically, DOE revised the value of deposition velocity used in severity level calculations from 0 centimeters/second (cm/sec) to the default value of 1 cm/sec in DOE's atmospheric dispersion model. This change significantly reduced the unmitigated dose consequences to the public. The Board believed the change could not be technically justified for the Hanford Site.

Resolution—On November 23, 2011, the WTP project team issued a letter to DOE specifying a revision to the values of deposition velocity used for accident analyses. Specifically, the project team will use a deposition velocity of 0 cm/sec for gases, 0.1 cm/sec for unmitigated particulate

releases, and 0.01 cm/sec for mitigated particulate releases. This action adequately addresses the Board's concern. This issue is therefore closed.

2. Project: Hanford Site, Waste Treatment and Immobilization Plant—Pretreatment Facility

Issue—Use of Low-Order Accumulation Model. In a letter to DOE dated June 7, 2011, the Board expressed its belief that LOAM was not suitable for predicting the accumulation of solids in either Newtonian or non-Newtonian vessels because it underpredicts the accumulation of solids and has no sound physical basis. The Board noted that DOE had used results from this model as a basis for partial closure of issues concerning solids accumulation associated with the External Flowsheet Review Team's Major Issue 3, "Inadequate Design of Mixing Systems."

Resolution—In its August 5, 2011, response, DOE informed the Board that LOAM would not be used for further design work or verified and validated. The letter also stated that large-scale integrated testing associated with the Board's Recommendation 2010-2 would be used to complete confirmation and performance testing for the WTP vessel design consistent with DOE's Implementation Plan for the Recommendation. The Board concurs with DOE's determination that LOAM should not be used for further design work and considers this issue closed.

NEWLY LISTED PROJECT

1. Project: Hanford Site, Tank Waste Supplemental Treatment Project

Description—The Tank Waste Supplemental Treatment Project will pretreat some liquid waste from the Hanford Tank Farms, allowing the waste to be immobilized as low-activity waste through early operation of WTP's Low-Activity Waste Facility and/or the operation of supplemental immobilization facilities. The process will filter solids to remove insoluble and highly radioactive materials. Captured solids will be returned to the tanks, and the filtered liquid waste will be further treated by an ion exchange process to remove highly radioactive cesium. After the cesium has been removed, the stream will be considered low-activity waste and will proceed to temporary storage until a low-activity waste treatment capability becomes available.

Status of Facility—After establishing the mission need, DOE issued a letter on January 26, 2011, directing the Tank Waste Supplemental Treatment Project to proceed with the alternatives analysis. In September 2011, the project team submitted the conceptual design, technology alternatives, and safety design strategy for the project to DOE for review. DOE indicated that it will not provide comments to the project team until funding for the project has been established. The project team disbanded and will reconstitute once funding is available to respond to DOE's comments.

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

CHANGE IN PROJECT STATUS

1. **Project: Oak Ridge National Laboratory, Building 3019—Uranium-233 Downblending and Disposition Project**

The original goal of the Uranium-233 Downblending and Disposition Project was to downblend and stabilize the entire inventory of uranium-233 in Building 3019 at Oak Ridge National Laboratory. In April 2011, the Deputy Secretary of Energy directed DOE's Oak Ridge Operations Office (ORO) to transfer the Zero Power Reactor material to the Nevada National Security Site (NNSS) to support nuclear criticality experiments and to proceed with the direct disposal at NNSS of a portion of the uranium-233 material that did not require processing. These actions will remove approximately half of the uranium-233 material from Oak Ridge National Laboratory. The Deputy Secretary of Energy also directed ORO to continue an alternatives analysis to identify the preferred method for processing the remaining inventory. ORO subsequently abandoned its plan to modify and expand Building 3019 to perform the processing mission, favoring the use of existing facilities at the laboratory instead. As a result of this change, the Board will no longer track the Uranium-233 Downblending and Disposition Project as a design and construction project.

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

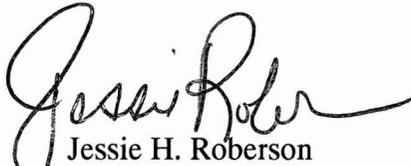
DOE has revised the procurement strategy for the Radioactive Liquid Waste Treatment Facility (RLWTF) Upgrade Project. The strategy splits the original Hazard Category 2 nuclear facility that would have consolidated both transuranic (TRU) and low-level waste processing capabilities into a small Hazard Category 3 TRU waste processing facility and a less than Hazard Category 3 low-level waste processing facility. The modified procurement strategy is expected to reduce cost and provide an earlier operational capability. The Board will focus its future reviews on the Hazard Category 3 TRU waste processing component of the RLWTF Upgrade Project.

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

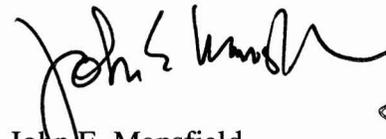
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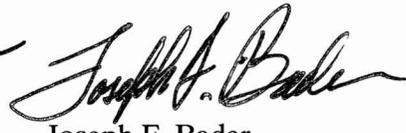
Peter S. Winokur, Ph.D.
Chairman



Jessie H. Roberson
Vice Chairman



John E. Mansfield
Member



Joseph F. Bader
Member

Enclosure

ENCLOSURE 1

**MARCH 2012 REPORT
SUMMARY OF SIGNIFICANT UNRESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES ^b
			Critical Decision (CD) Approved	Design Completion ^a	Construction Completion	
Hanford Site	Waste Treatment and Immobilization Plant (WTP)	12,263			<i>(Operational 2019)</i>	
	a. WTP Pretreatment Facility		CD-3	79% Final Design	40%	5. Hydrogen gas control— <i>(Jun 09)</i> 7. Inadequate mixing— <i>(Apr 10)</i> 9. Inadequacies in the spray leak methodology— <i>(Jun 11)</i> 11. Heat transfer analysis for process vessels— <i>(Sep 11)</i>
	b. WTP High-Level Waste Facility		CD-3	88% Final Design	37%	5. Hydrogen gas control— <i>(Jun 09)</i> 8. Inadequacies in the spray leak methodology— <i>(Jun 11)</i>
	c. WTP Low-Activity Waste Facility		CD-3	91% Final Design	66%	3. Instrumentation and control system design— <i>(Sep 11)</i>
	d. WTP Analytical Laboratory		CD-3	82% Final Design	70%	No open issues remain
	e. WTP Balance of Facilities		CD-3	72% Final Design	63%	1. Ammonia controls— <i>(Mar 12)</i>

^aThe percent of design completion is an estimate for the particular stage of design (conceptual, preliminary, or final).

^bDates in parentheses indicate the periodic report in which an issue was first identified. The number assigned to each issue indicates the order in which the issue was identified. Issues not listed have been resolved by DOE and are summarized in Enclosure 2.

MARCH 2012 REPORT
SUMMARY OF SIGNIFICANT UNRESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES ^b
			Critical Decision (CD) Approved	Design Completion ^a	Construction Completion	
Hanford Site (continued)	K-Basin Closure Sludge Treatment Project	268	Phase 1: CD-1 Phase 2: CD-0	Phase 1: 100% Preliminary Design Phase 2: 33% Conceptual Design	Phase 1: <i>(Operational 2013)</i> Phase 2: <i>(Operational to be determined)</i>	3. Inadequacies in integration of safety into the design process— <i>(Jun 11)</i> 4. Inadequacies in safety basis development— <i>(Jun 11)</i>
	Waste Feed Delivery System	469	Most subprojects not formally implementing CD process	Various degrees of completion	Various degrees of completion and operations	No open issues remain
	Tank Waste Supplemental Treatment Project	110-310	Not formally implementing CD process	100% Conceptual Design	<i>(Operational 2018)</i>	No issues identified
Idaho National Laboratory	Integrated Waste Treatment Unit Project (IWTU)	570.9	CD-3	100% Final Design	100% <i>(Operational 2012)</i>	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
Los Alamos National Laboratory	Chemistry and Metallurgy Research Replacement Project—Nuclear Facility	3,710-5,860 Undergoing DOE review	CD-1	70% Final Design	Some ground work <i>(Operational to be determined)</i>	No open issues remain

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SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES ^b
			Critical Decision (CD) Approved	Design Completion ^a	Construction Completion	
Los Alamos National Laboratory (continued)	Technical Area-55 Reinvestment Project (TRP)	TRP-II: 99	TRP-II: Phase A: CD-3 Phase B: CD-2 Phase C: CD-1	Various degrees of completion	<i>(TRP-II Complete 2016)</i>	2. Inadequate approach to ensure timely improvements to the safety posture— <i>(Feb 09)</i>
	Upgrades to Pit Manufacturing Capability at the Plutonium Facility (Technical Area-55)	Annual funding	Not formally implementing CD process	Various degrees of completion	Work ongoing	No open issues remain
	Radioactive Liquid Waste Treatment Facility Upgrade Project—Transuranic Waste Processing Facility	Undergoing DOE review	CD-1	0% Preliminary Design	<i>(Operational 2021)</i>	No open issues remain
	Transuranic Waste Facility	71–124	Phase A: CD-2 Phase B: CD-1	Phase A: 100% Final Design Phase B: 100% Preliminary Design	<i>(Operational 2015–2018)</i>	No open issues remain
Savannah River Site	Pit Disassembly and Conversion Project (in existing K-Area facilities)	Undergoing DOE review	CD-0	95% Conceptual Design	<i>(Operational to be determined)</i>	No issues identified
	Salt Waste Processing Facility	1,340	CD-3	99% Final Design	53% <i>(Operational 2015)</i>	5. Flammable gas control— <i>(Jun 09)</i> 7. Operator actions following a seismic event— <i>(Jun 09)</i> 8. Mixing system controls and operational parameters— <i>(Apr 10)</i>

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SUMMARY OF SIGNIFICANT UNRESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS			ISSUES ^b
			Critical Decision (CD) Approved	Design Completion ^a	Construction Completion	
Savannah River Site (continued)	Waste Solidification Building	345	CD-2/3	100% Final Design	74% <i>(Operational 2013)</i>	No open issues remain
Y-12 National Security Complex	Uranium Processing Facility	4,200–6,500 Undergoing DOE review	CD-1	62% Final Design	<i>(Operational 2022)</i>	3. Structural and geotechnical engineering— <i>(Apr 10)</i>
Multiple Sites	Multiple Sites	N/A	N/A	N/A	N/A	1. Deficiencies with the System for the Analysis of Soil-Structure Interaction (SASSI) computer software— <i>(Jun 11)</i>

ENCLOSURE 2

MARCH 2012 REPORT SUMMARY OF RESOLVED ISSUES WITH NEW DEFENSE NUCLEAR FACILITIES

SITE	FACILITY	RESOLVED ISSUES ^a
Hanford Site	Waste Treatment and Immobilization Plant (WTP)	
	a. WTP Pretreatment Facility	<ol style="list-style-type: none"> 1. Seismic ground motion—resolved Feb 08. The initial ground motion for the design basis earthquake was not technically defensible. Geologic work was completed in early 2007. The resulting data were used to develop final seismic ground motion criteria. 2. Structural engineering—resolved Dec 09. The Board found weaknesses in the structural design, including the modeling, the lack of a clear load transfer capability in the structure, and an inadequate finite element analysis. DOE revised the analyses and prepared summary structural reports showing that the reinforced concrete sections of the facility met structural design requirements. 3. Chemical process safety—resolved Oct 07. The Board was concerned about hydrogen accumulation in plant equipment. In response, DOE developed a conservative design criterion. (Note: this issue was reopened in the June 22, 2009, periodic report to Congress as “hydrogen gas control” when DOE changed the design approach.) 4. Fire safety design for ventilation systems—resolved Dec 09. The Board was concerned about the means of protecting the final exhaust high-efficiency particulate air (HEPA) filters of the confinement ventilation system from fires. DOE developed and approved design changes to provide adequate protection of the filters from fires. 6. Structural steel analysis and design—resolved Dec 10. The Board identified issues related to the adequacy of the structural steel design. BNI subsequently incorporated more realistic composite construction modeling and demonstrated that the design margin was adequate to compensate for the inadequacies of the finite-element model. 8. Deposition velocity—resolved Mar 12. The Board was concerned that a decision by the WTP project team to change the value for deposition velocity from 0 cm/sec to 1 cm/sec was not technically justified. The project team subsequently changed the deposition velocity to an acceptable value. 10. Use of Low-Order Accumulation Model—resolved Mar 12. The Board was concerned about DOE’s use of the Low-Order Accumulation Model for design work on the WTP project because the model underpredicted solids accumulation and had no physical basis. DOE subsequently abandoned the use of the model for design work on the project.
	b. WTP High-Level Waste Facility	<ol style="list-style-type: none"> 1. Seismic ground motion—resolved Feb 08. See Item 1 for the Pretreatment Facility. 2. Structural engineering—resolved Dec 09. See Item 2 for the Pretreatment Facility. 3. Fire protection—resolved Jun 09. The Board was concerned that DOE lacked an adequate technical basis for not providing fireproof coatings on structural steel members. The project developed a new fire protection strategy. The Board reviewed it and found it to be acceptable. 4. Fire safety design for ventilation systems—resolved Dec 09. See Item 4 for the Pretreatment Facility. 6. Structural steel analysis and design—resolved Dec 10. See Item 6 for the Pretreatment Facility. 7. Deposition velocity—resolved Mar 12. See Item 8 for the Pretreatment Facility.

^a Dates in bold indicate the periodic report in which an issue was reported as resolved. The number assigned to each issue indicates the order in which the issue was identified. Issues not listed are unresolved and are summarized in Enclosure 1.

**MARCH 2012 REPORT
SUMMARY OF RESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

SITE	FACILITY	RESOLVED ISSUES ^a
Hanford Site (continued)	c. WTP Low-Activity Waste Facility	<ol style="list-style-type: none"> 1. Fire protection—<i>resolved Jun 09</i>. See Item 3 for the High-Level Waste Facility. 2. Structural steel analysis and design—<i>resolved Dec 10</i>. See Item 6 for the Pretreatment Facility.
	d. WTP Analytical Laboratory	<ol style="list-style-type: none"> 1. Fire protection—<i>resolved Jun 09</i>. See Item 3 for the High-Level Waste Facility.
	Demonstration Bulk Vitrification System Project	<ol style="list-style-type: none"> 1. Confinement strategy—<i>resolved May 08</i>. The early design of the facility had a number of major vulnerabilities with regard to the confinement of hazardous wastes. DOE developed a confinement strategy that led to improvements in the confinement design. <p>This project was removed from this periodic report as of September 2010 after DOE decided to hold Critical Decision-2 in abeyance until it had completed additional studies and made a decision regarding the preferred strategy for pretreating and immobilizing the low-activity waste.</p>
	Interim Pretreatment System	<p>This project was removed from this periodic report as of September 2010 because DOE withdrew funding for the project after establishing the mission need. No detailed reviews were completed.</p>
	K-Basin Closure Sludge Treatment Project	<ol style="list-style-type: none"> 1. Completeness of Preliminary Documented Safety Analysis—<i>resolved Oct 07</i>. The Preliminary Documented Safety Analysis was not based on the project design. DOE subsequently re-established the project at the conceptual design stage, with plans to develop a new safety analysis. This action eliminated the issue. 2. Adequacy of project management and engineering—<i>resolved Sep 10</i>. Persistent technical and project management problems delayed the project and resulted in a design that could not meet project requirements. DOE subsequently implemented a formal project management approach in accordance with departmental directives, which led to an acceptable conceptual design.
	Large Package and Remote Handled Waste Packaging Facility	<p>This project was removed from this periodic report as of June 2011 after DOE placed conceptual design activities in abeyance until 2013. No detailed reviews were completed.</p>
	Waste Feed Delivery System	<ol style="list-style-type: none"> 1. Design pressure rating of waste transfer system <i>resolved Oct 07</i>. The analysis performed to determine the pressure rating of the waste transfer system was inadequate. DOE performed additional analyses and conducted sufficient testing and modeling to determine the minimum design pressure accurately.
Immobilized High-Level Waste Interim Storage Facility	<p>This project was removed from this periodic report as of September 2010 after DOE abandoned it, with plans to initiate a new capability to fulfill the mission at a later date. No detailed reviews were completed.</p>	
Idaho National Laboratory	Integrated Waste Treatment Unit Project	<ol style="list-style-type: none"> 1. Pilot plant testing—<i>resolved Feb 09</i>. During pilot plant testing, an over-temperature condition developed in the charcoal adsorber bed. DOE investigated the cause of the over-temperature condition and proposed adequate controls to prevent/mitigate such an occurrence in the full-scale facility. 2. Waste characterization—<i>resolved Feb 09</i>. Characterization of the waste to be processed was necessary to ensure that the process will be operated within the bounds of its safety basis. Additional sampling data were compiled and analyzed to show that the control strategy for the facility is adequate. 3. Distributed Control System design—<i>resolved Feb 09</i>. DOE had not demonstrated that the safety-related Distributed Control System was capable of placing the process in a safe configuration, if necessary. DOE changed the design of the control system and added new design requirements to ensure the operational reliability of the safety-related control system.

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SUMMARY OF RESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

SITE	FACILITY	RESOLVED ISSUES ^a
Los Alamos National Laboratory	Chemistry and Metallurgy Research Replacement Project—Nuclear Facility	<ol style="list-style-type: none"> 1. Design-build acquisition strategy—<i>resolved Jun 07</i>. NNSA’s acquisition strategy combined Critical Decision-2 (approval of performance baseline) and Critical Decision-3 (approval to start construction), which essentially eliminated formal review of the final design prior to construction. NNSA directed the project team to revise its acquisition strategy to a more traditional approach. 2. Site characterization and seismic design—<i>resolved Dec 09</i>. A technically defensible seismic design of the facility was needed to ensure that safety-related structures, systems, and components could perform their intended safety functions when subjected to the ground motion of the design basis earthquake. See comment below. 3. Safety-significant active ventilation system—<i>resolved Dec 09</i>. The safety-significant active ventilation system needed to remain operable and perform its intended safety functions following design basis accidents. See comment below. 4. Safety-class fire suppression system— <i>resolved Dec 09</i>. This facility has the first safety-class fire suppression system in a new facility in the DOE complex. The fire suppression system needed to remain operable and perform its intended safety functions following design basis accidents. See comment below. 5. Safety-class and safety-significant container design— <i>resolved Dec 09</i>. The safety strategy for the facility relied on containers to prevent the release of large fractions of material. See comment below. 6. Deficiencies in Draft Preliminary Documented Safety Analysis— <i>resolved Dec 09</i>. Safety requirements from the safety analysis did not flow adequately into the system design descriptions to ensure that they were incorporated into the design. See comment below. <p>Comment: The Board issued its Certification Review Report, <i>Chemistry and Metallurgy Research Replacement Facility Project Los Alamos National Laboratory</i>, to the congressional defense committees on September 4, 2009. In this report, the Board concluded that its concerns regarding the design of CMRR up to that point had been resolved, and this was the basis for closing issues 2-6 above.</p>
	Technical Area-55 Reinvestment Project	<ol style="list-style-type: none"> 1. Adequacy of safety systems—<i>resolved Sep 08</i>. The scope and timing of this project warranted reconsideration to ensure that the project would address deficiencies with safety systems. NNSA subsequently developed and executed an Integrated Priority List to manage the safety system upgrades within the scope of the Technical Area-55 Reinvestment Project, as well as safety system upgrades managed through other means. The Board therefore closed this issue for the Reinvestment Project and committed to reevaluating its issues with respect to the Integrated Priority List process. (Note: The Board subsequently raised an issue, “Inadequate approach to ensure timely improvements to the safety posture” concerning the Integrated Priority List process in its February 2009 periodic report to Congress.)
	Upgrades to Pit Manufacturing Capability at the Plutonium Facility (Technical Area-55)	<ol style="list-style-type: none"> 1. Lack of adherence to DOE Order 413.3A—<i>resolved Sep 08</i>. The project had not demonstrated formal mechanisms for ensuring that design requirements and interfaces would be appropriately managed and controlled. NNSA committed to managing the upgrades using a tailored approach to the Order and to developing an Integrated Nuclear Planning process to improve coordination among the projects. The Board decided to decouple this issue from the project and track it through the course of its normal oversight of the Integrated Nuclear Planning process.

**MARCH 2012 REPORT
SUMMARY OF RESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

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Los Alamos National Laboratory (continued)	Radioactive Liquid Waste Treatment Facility Upgrade Project	<ol style="list-style-type: none"> 1. Weak project management and federal project oversight—<i>resolved Sep 10</i>. The federal Integrated Project Team was not well established or providing effective oversight of the design process. NNSA assigned additional personnel to the team and increased the team's involvement in project oversight. 2. Weak integration of safety into the design process—<i>resolved Sep 10</i>. The integration of the safety and design processes for the project was weak. The project team subsequently developed and implemented appropriate tools for tracking and managing key assumptions and design requirements, developed an adequate technical basis for material selection, identified appropriate seismic criteria, and implemented appropriate hazard analysis techniques.
	Transuranic Waste Facility	<ol style="list-style-type: none"> 1. Inadequate integration of safety into the design process—<i>resolved Sep 10</i>. The project had not developed adequate information and design specificity for its safety systems to demonstrate integration of safety into the design. NNSA changed the scope of the project such that the Board no longer considered this issue relevant.
	Nuclear Material Safeguards and Security Upgrades Project, Phase 2	<p>The Board's interest in this project stemmed from the potential of upgrades to impact safety-related aspects of Plutonium Facility operations. After a review, the Board did not identify any adverse safety impacts, so the project was removed from this periodic report as of September 2010.</p>
	Technical Area-55 Radiography Project	<p>This project was removed from this periodic report as of September 2010 after DOE placed the conceptual design on hold. An interim radiography capability in Technical Area-55 is fulfilling the current requirements. No detailed reviews were completed.</p>
Nevada National Security Site (formerly Nevada Test Site)	Device Assembly Facility—Criticality Experiments Facility	<ol style="list-style-type: none"> 1. Structural cracks—<i>resolved Feb 09</i>. The structure has numerous cracks in the concrete that are abnormal for a nuclear facility. Such cracking could indicate improper curing during construction that degrades the strength of the concrete. NNSA performed a comparative evaluation of uncracked and cracked portions of the facility. This evaluation revealed that the cracked and uncracked concrete had comparable strength. 2. Deficiencies in fire protection system water supply—<i>resolved Sep 11</i>. Safety issues were associated with the fire protection water supply to the facility, including susceptibility to single-point failure, use of unlisted components, and deterioration of the lead-in supply lines. NNSA completed an evaluation for the water supply system and developed recommendations for correcting these deficiencies. This assessment and proposed improvements were acceptable. NNSA authorized startup of the Criticality Experiments Facility on May 9, 2011. The Board will continue to report on the deficiencies of the fire protection water supply in its periodic <i>Report to Congress: Summary of Significant Safety-Related Infrastructure Issues at Operating Defense Nuclear Facilities</i>.
Oak Ridge National Laboratory	Building 3019—Uranium-233 Downblending and Disposition Project	<ol style="list-style-type: none"> 1. Deficiencies in Preliminary Documented Safety Analysis—<i>resolved Sep 11</i>. The Preliminary Documented Safety Analysis was based on incomplete information and lacked detail on safety-related controls to ensure that safety systems were adequate to protect the workers. DOE changed the scope of the project such that the safety basis issue was no longer considered relevant. <p>As a result of changes in scope, this project was removed from this periodic report as of March 2012.</p>

**MARCH 2012 REPORT
SUMMARY OF RESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

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Pantex Plant	Component Evaluation Facility	This project was removed from this periodic report as of September 2010 because DOE had made little progress beyond the initial mission need approval and has no plans to move forward with the project. No detailed reviews were completed.
Savannah River Site	Pit Disassembly and Conversion Facility	<p>1. Assumption on combustible loading for seismically induced fire—<i>resolved Apr 10</i>. The project team had not validated assumptions in the safety basis regarding combustible loading to support the facility's safety control strategy for a seismically induced facility fire. NNSA changed the scope of the project such that the combustible loading issue was no longer relevant.</p> <p>On November 22, 2009, DOE approved combining the Pit Disassembly and Conversion Facility Project and the Plutonium Preparation Project into a new project called the Pit Disassembly and Conversion Project. The Pit Disassembly and Conversion Facility Project was therefore removed from this periodic report as of April 2010.</p>
	Salt Waste Processing Facility	<p>1. Geotechnical investigation—<i>resolved Feb 08</i>. The geotechnical reports required to support the design of the project were not complete, precluding the ability to make a final determination of the design basis earthquake and design settlement. The project team completed the reports and finalized the design basis earthquake and design settlement.</p> <p>2. Structural evaluation—<i>resolved Dec 09</i>. Initial reviews of the structural design documentation for the main processing facility revealed several significant errors and deficiencies in the structural analysis. DOE brought appropriate structural design expertise and oversight to bear on the project, and issued summary structural reports showing that the facility meets the structural design requirements.</p> <p>3. Quality assurance—<i>resolved Jun 07</i>. Quality assurance requirements were not implemented, as evidenced by inadequate calculations and the project team's failure to report unrealistic predictions by software and use of unapproved software. DOE completed a corrective action program to address these quality assurance issues.</p> <p>4. Hydrogen generation rate—<i>resolved Jun 09</i>. The project team failed to adequately consider or quantify the hydrogen generation rate from thermolysis, which can occur when organic solvent material is heated in the presence of radiation, in the project safety control strategy. Idaho National Laboratory performed testing that demonstrated the adequacy of the hydrogen generation rate used in the design.</p> <p>6. Fire protection for final HEPA filters—<i>resolved Sep 10</i>. The design of the confinement ventilation system failed to implement all features required by DOE directives to protect the final HEPA filter stage from potential fires, or demonstrate the equivalency of the design to the requirements in DOE directives. The project team implemented design changes and documented the equivalency of the design to the requirements in DOE directives.</p>

**MARCH 2012 REPORT
SUMMARY OF RESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

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Savannah River Site (continued)	Container Surveillance and Storage Capability Project	<ol style="list-style-type: none"> 1. Fire protection strategy—<i>resolved Jun 08</i>. The project's fire protection strategy, including the design of the safety-class fire detection and gaseous suppression system, was not sufficiently mature to demonstrate that containers of radioactive material would be protected during postulated fire events. The issue was removed from the periodic report when the project was subsumed by the Plutonium Preparation Project. 2. Preliminary hazards analysis—<i>resolved Jun 08</i>. The Board identified several deficiencies with the preliminary hazards analysis, including the project's failure to address all hazards (e.g., loss of rack storage cooling, toxicological hazards from process gasses) and failure to incorporate DOE guidance on preliminary consequence calculations supporting the early identification of safety systems. The issue was removed from the periodic report when the project was subsumed by the Plutonium Preparation Project. 3. Criticality safety—<i>resolved Feb 08</i>. The project team intended to rely on administrative controls to justify excluding nuclear incident monitors from the facility's design. This approach was inconsistent with industry criticality standards. DOE subsequently decided to include nuclear incident monitors in the design. 4. Design process controls—<i>resolved Jun 07</i>. The project team lacked an appropriate system for tracking design inputs and assumptions to ensure that the safety-related structures, systems, and components would be designed and fabricated to meet the requirements. The project team committed to maintaining inputs and assumptions, documenting their origin, and tracking them through completion of the design. <p>Comment: On June 27, 2008, DOE approved a revised alternative for the Plutonium Preparation Project that subsumed the Container Surveillance and Storage Capability (CSSC) Project and revised the scope of the Plutonium Disposition Project. The CSSC project was therefore removed from this periodic report as of September 2008.</p>
	Tank 48 Treatment Process Project	<ol style="list-style-type: none"> 1. Project delays—<i>resolved Jun 11</i>. DOE's delay in recovering Tank 48 and returning it to service had the potential to impact high-level waste cleanup at the site and posed a safety risk to workers and the environment. DOE revised its Implementation Plan for the Board's Recommendation 2001-1, <i>High-Level Waste Management at the Savannah River Site</i>. DOE also took actions to mitigate many of the risks associated with Tank 48 project delays, such as committing to making Tank 50 available for high-level waste service. <p>DOE suspended this project in July 2011 because of budget constraints, identification of a promising new technology for treating the waste, and an improved projection of the volume of available high-level waste tank space resulting from enhancements at the Defense Waste Processing Facility. This project was therefore removed from this periodic report as of September 2011.</p>
	Plutonium Preparation Project (formerly the Plutonium Disposition Project)	<p>On November 22, 2009, DOE approved combining the Pit Disassembly and Conversion Facility Project and the Plutonium Preparation Project into a new project called the Pit Disassembly and Conversion Project. The Plutonium Preparation Project was therefore removed from this periodic report as of April 2010.</p>

**MARCH 2012 REPORT
SUMMARY OF RESOLVED ISSUES
WITH NEW DEFENSE NUCLEAR FACILITIES**

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Savannah River Site (continued)	Waste Solidification Building	<ol style="list-style-type: none"> 1. Structural design—<i>resolved Jun 09</i>. The analysis for the structural design of the roof and the design of the facility to withstand potential settlement was inadequate. NNSA directed the project team to alter the design of the roof and correct the settlement analysis. The revised settlement analysis identified the need for design changes to structural members; these changes were subsequently incorporated into the facility design. 2. Deficiencies in Preliminary Documented Safety Analysis—<i>resolved Feb 09</i>. The Preliminary Documented Safety Analysis did not include an appropriate analysis of hydrogen explosion scenarios to ensure confinement of material, and did not include an adequate demonstration of compliance with DOE Standard 1189 with respect to chemical hazards. NNSA directed the project team to revise its hydrogen explosion calculations to ensure confinement and to demonstrate compliance with the standard for chemical hazards.
Y-12 National Security Complex	Highly Enriched Uranium Materials Facility (HEUMF)	<ol style="list-style-type: none"> 1. Water supply for fire protection system—<i>resolved Sep 08</i>. The water supply for the safety-significant fire suppression system was not classified as safety-significant consistent with the design basis requirements. NNSA committed to connecting the system to the safety-significant water supply planned for the Uranium Processing Facility, to providing a safety-significant water supply pressure monitor, and to incorporating safety-related configuration controls to ensure the availability of a single dedicated flow path in the system. <p>HEUMF began operation in January 2010.</p>
	Uranium Processing Facility	<ol style="list-style-type: none"> 1. Preliminary hazards analysis development—<i>resolved Jun 07</i>. The draft preliminary hazards analysis was insufficient to support the development of the design by ensuring the integration of safety and the appropriate specification of safety controls. NNSA subsequently developed a safety evaluation report that contained an appropriate hazards evaluation and adequate safety controls. 2. Nonconservative values for airborne release fraction and respirable release fraction—<i>resolved Sep 08</i>. The project team used an airborne release fraction and respirable fraction for its preliminary hazards analysis that were not based on values in the DOE handbook. NNSA subsequently agreed to use the appropriate bounding values from the DOE handbook.