

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

Washington, DC 20004-2901



May 16, 2014

The Honorable Ernest Moniz  
Secretary of Energy  
U. S. Department of Energy  
Forrestal Bldg. Room 7A-257  
1000 Independence Avenue, SW  
Washington, DC 20585

Dear Secretary Moniz:

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 May 16, 2014). 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,

A handwritten signature in black ink, appearing to read "P. S. Winokur".

Peter S. Winokur, Ph.D.  
Chairman

Enclosure: as stated

c: Mr. Joe Olencz

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May 16, 2014

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) to present the status of significant unresolved safety issues concerning the design and construction of DOE's defense nuclear facilities. This periodic report builds on the Board's December 26, 2013, report and earlier reports to summarize the status of significant unresolved safety issues through March 31, 2014. The status of many issues has not changed significantly during this reporting period. However, progress is being made on unresolved issues, except where specifically noted.

The phrase "unresolved safety issue" does not mean the Board and DOE disagree on resolution. Some of the issues noted in these reports simply await final resolution through further development of the facility design. The significant unresolved safety issues discussed herein have been formally communicated to DOE. Lesser issues that can be easily resolved and that have an agreed-upon path forward are excluded from this periodic report. The Board will follow these items as part of its normal design review process.

The Board may identify additional issues during future design reviews. For this reporting period, no new issues were identified, and two issues were resolved. One additional issue was closed due to DOE's pursuit of a new project alternative. Enclosure 1 of this report identifies significant unresolved safety issues for current design and construction projects. Enclosure 2 of this report summarizes significant unresolved safety issues that have been resolved by DOE on current and past design and construction projects. Past projects include those completed, delayed, or abandoned by DOE.

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

The following projects have the most significant unresolved safety issues:

- Los Alamos National Laboratory's (LANL) Plutonium Facility (PF-4) seismic evaluation and upgrades; and
- Hanford Site's Waste Treatment and Immobilization Plant (WTP).

As a result of the National Nuclear Security Administration's (NNSA) progress in resolving the Board's safety issues with the Y-12 National Security Complex's Uranium Processing Facility (UPF, also referred to as the Uranium Capabilities Replacement Project) and NNSA's efforts to develop UPF alternatives, the Board no longer considers UPF to be among DOE's projects with the most significant unresolved safety issues. A more detailed discussion of this project's status is provided later in this report.

***Los Alamos National Laboratory, Plutonium Facility Seismic Safety.*** Since October 2009, the Board has worked with DOE on several seismic safety issues that challenge whether adequate protection is being provided for the public and workers at PF-4. DOE and NNSA have made progress in addressing a number of these safety issues, but the Board remains concerned that PF-4 is vulnerable to seismic collapse. The large plutonium inventory of PF-4, coupled with the facility's proximity to the public, creates the potential for high off-site radiological consequences. DOE is pursuing actions to address the collapse vulnerability, but maintains that PF-4 is safe to operate in the interim and complies with DOE standards for seismic performance. The Board communicated to DOE in a letter dated July 17, 2013, that it does not agree with the basis for this conclusion as expressed by the former Secretary of Energy in his March 27, 2013, letter to the Board. The Board has supported NNSA efforts to complete a new seismic analysis that is necessary to fully evaluate the vulnerability of PF-4 to collapse following a design basis earthquake. During this reporting period, LANL personnel completed upgrades to strengthen eight columns located in the PF-4 basement that were identified as a potential seismic collapse mechanism. NNSA continues to make progress with the new seismic analysis and facility upgrades. The Board focused its resources on ensuring the adequacy and completeness of the alternate seismic analysis during this reporting period.

***Inadequate Seismic Safety Posture***—On October 26, 2009, the Board issued Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, identifying the need for DOE to reduce the potential high radiological consequences to the public from a seismically-induced fire at PF-4. This scenario, as analyzed in the facility's 2008 safety basis, assumed that the PF-4 structure remained intact. LANL undertook a series of actions to improve the safety posture of PF-4 in response to the seismic threat beginning in 2009. These actions included efforts to reduce the likelihood and severity of a post-seismic fire and upgrades to improve the seismic performance of the glovebox, fire suppression, and active confinement ventilation systems. LANL also initiated a revision of the PF-4 safety basis to refine the dose consequences associated with a post-seismic fire, again assuming that the structure remained intact. After conducting a review of the revised safety basis, the Board communicated deficiencies in the revised PF-4 documented safety analysis in a June 18, 2012, letter to NNSA. On September 30, 2013, LANL submitted a revision to the PF-4 documented safety analysis to NNSA, which is intended to address the safety basis issues raised by the Board. The Board plans to complete a review of the revised safety basis following a review of the adequacy and completeness of the new seismic analysis.

In 2011, an updated probabilistic seismic hazard analysis for the site indicated a significant increase in the seismic ground motion that could lead to collapse of PF-4, amplifying the Board's concerns regarding a seismic event at PF-4. DOE's initial attempts to model the seismic response of PF-4 identified structural vulnerabilities that could result in loss of confinement capability or collapse. Subsequently, LANL initiated upgrades to address the vulnerabilities. The Board, in a July 18, 2012, letter, expressed concern that NNSA's latest seismic analysis was proceeding without adequate definition and technical justification. Subsequently the Deputy Secretary of Energy, in his September 28, 2012, response to the Board, directed the NNSA to initiate action to further evaluate PF-4 using a second modeling approach.

As reported in the December 2013 periodic report, the Secretary of Energy transmitted a letter to the Board on March 27, 2013, stating that PF-4 was safe for continued operation based on the current structural analysis. The Board replied in a July 17, 2013, letter to the Secretary of Energy, stating that it did not agree with the LANL contractor's methodology upon which the Secretary of Energy based his conclusions. The Board also stated that it did not agree with NNSA's conclusion that the modeling results demonstrate compliance with DOE standards for confinement integrity following a design basis earthquake. However, the letter affirmed that the Board was encouraged by DOE's decision to conduct the alternate analysis using a second modeling approach that the Board believes is essential to ensure that all seismic vulnerabilities and necessary structural upgrades are identified to prevent the collapse of PF-4. The Deputy Secretary of Energy responded to the Board in a September 3, 2013, letter, which provided the schedule for the alternate analysis and identified a completion date in December 2013. NNSA recently informed the Board that completion is estimated for June 2014. The Board intends to use the outcome of this analysis to guide its future actions.

***Hanford Site, Waste Treatment and Immobilization Plant.*** During this reporting period, DOE made little progress in addressing the Board's nine open safety issues with the WTP design. For example, in July 2013, DOE elected to use Probabilistic Risk Assessment (PRA) techniques to resolve safety issues with hydrogen gas accumulation and criticality in process vessels. In February 2014, after reviewing the contractor's proposed PRA plan, DOE concluded that the use of PRA methodologies for these issues is not yet supported and requested that the contractor modify the plan to address a more limited set of issues. As an additional example, DOE made significant changes to the technical approach for resolving safety issues with pulse-jet mixing identified in the Board's Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*. Recognizing that these changes alter the technical basis upon which the Recommendation was based, the Board closed the Recommendation in a January 28, 2014, letter to the Secretary of Energy. In its letter, the Board reaffirmed that the underlying safety issues with pulse-jet mixing remain unresolved.

To mitigate the impact of DOE's delay in resolving these and other technical issues, DOE began pursuing major changes to its strategy for treating tank waste at Hanford as described in the September 2013 *Hanford Tank Waste Retrieval, Treatment, and Disposition Framework* (Framework). For example, DOE proposed two new capabilities to support start-up of WTP's Low-Activity Waste (LAW) facility and potentially the High-Level Waste (HLW) facility sooner than would be achievable with the current approach. The capabilities include the LAW Pretreatment System (LAWPS) and the Tank Waste Characterization and Staging (TWCS) capability. On March 17, 2013, DOE approved Critical Decision-0 (CD-0) for the LAWPS capability, formally establishing its mission need. For additional information on this new project see the section of this report, *Newly Listed Project*. The TWCS capability would receive, stage, mix, blend, sample, and characterize the waste with high solids concentration, allowing for waste to be fed either directly to the HLW facility or indirectly through the Pretreatment (PT) facility.



The Board's safety issues apply to several WTP facilities, including the Balance of Facilities as well as the LAW, HLW, and PT facilities. DOE may also need to address these safety issues in the design of the newly proposed capabilities.

The following is a listing of the status of the Board's safety issues with WTP.

*Mixing in Process Vessels*—In a January 6, 2010, letter to DOE, the Board identified safety issues related to the inadequate performance of mixing systems at WTP. These issues are: 1) accumulation of fissile material at the bottom of the vessels, potentially leading to criticality; 2) generation and accumulation of hydrogen resulting from the accumulation of solids, potentially leading to explosions; 3) accumulation of solids that interfere with the pulse jet mixer control system, causing frequent overblows (i.e., discharge of air from the pulse jet mixer) that may lead to equipment damage; and 4) the ability to obtain representative samples as a prerequisite for meeting safety-related aspects of the Waste Acceptance Criteria (WAC) and management of criticality hazards. On December 17, 2010, the Board approved Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*, calling on the Secretary of Energy to 1) complete a large-scale test program to inform the design and resolve technical issues related to pulse jet mixing, 2) establish the WTP WAC to support the test results, 3) demonstrate the ability to obtain representative samples from WTP vessels and the Waste Feed Delivery System to support safe plant operation and compliance with the WAC, and 4) develop a path forward for resolving technical issues after completing the test program.

In December 2013, DOE proposed a new technical approach to resolve safety-related pulse jet mixing issues. In this new approach, resolution of mixing issues relies upon new facilities or capabilities (e.g., addressing the WAC issue by implementing the TWCS capability), potential application of PRA techniques, and evaluation of a single pulse jet mixer vessel design to replace eight process vessels at the PT facility that contain high solids concentration. The Board determined that DOE's revised technical approach differs significantly from the technical basis upon which Recommendation 2010-2 was originally constructed such that individual sub-recommendations were no longer relevant. In a January 28, 2014, letter to the Secretary of Energy, the Board closed Recommendation 2010-2 and also expressed concern that the underlying safety-related pulse jet mixing issues remain unresolved.

DOE has acknowledged that mixing issues require resolution prior to resumption of engineering, procurement, and construction (EPC) work at the PT and HLW facilities. The Board is monitoring DOE's efforts to resolve safety-related pulse jet mixing issues.

*Hydrogen Gas Control*—Flammable gases generated by the wastes treated in WTP will accumulate in process piping whenever flow is interrupted and in regions that do not experience flow, such as piping dead legs. The WTP project refers to this hazard as hydrogen in pipes and ancillary vessels (HPAV). In February 2010, DOE approved a strategy that allows for hydrogen explosions in piping under certain conditions. This strategy relies on an application of PRA and other complex models to predict the magnitude of the explosion and the response of the piping system. In August 2013, DOE requested the WTP contractor to prepare and submit a plan for

conducting PRA analyses for DOE approval. Recently, in February 2014, DOE concluded that the use of PRA methodologies at WTP at this time should be limited to addressing HPAV issues only and requested the contractor to modify the PRA plan accordingly.

*Inadequacies in the Spray Leak Methodology*—In an April 5, 2011, letter to DOE, the Board identified safety issues related to DOE's model for estimating radiological consequences to the public from spray leak accidents in the PT and HLW facilities of WTP. DOE completed a two-phase spray leak testing program at Pacific Northwest National Laboratory (PNNL) and is currently incorporating the PNNL test results into spray leak assessments at WTP.

*Heat Transfer Analysis for Process Vessels*—In an August 3, 2011, letter to DOE, the Board identified safety issues related to the heat transfer calculations used to establish post-accident hydrogen mixing requirements. These requirements are necessary to prevent explosions in process vessels in the PT facility with waste properties that exhibit settling behavior, i.e., wastes that develop distinct sludge and supernatant layers if not agitated. DOE revised the heat transfer calculations and, based upon these results, plans to revise the hydrogen generation calculations to establish post-accident hydrogen mixing requirements.

*Instrumentation and Control System Design*—In a May 5, 2011, letter to DOE, the Board identified certain instances where independent protection layers (IPLs) could fail in a manner that causes the very hazards the protection layers were designed to prevent. In addition, the Board identified IPLs that are not designated as safety-related, but are relied upon when deriving the design requirements for other safety-related instrumentation and control systems. The non-safety IPLs are not specified or maintained in the safety basis such that their operation is assured under expected operating conditions. DOE developed a plan that will address the issues raised by the Board. The Board is monitoring the implementation of DOE's plan to resolve this safety issue.

*Ammonia Controls*—In a September 13, 2011, letter to DOE, the Board communicated its concern that the design and safety-related controls for potential releases of large quantities of ammonia at the WTP site did not adequately protect workers and facilities. DOE stated that the project team would perform three new hazard analyses to address the Board's concerns. The Board is awaiting DOE's completion of these hazard analyses.

*Erosion and Corrosion of Piping, Vessels, and Pulse Jet Mixer Nozzles*—In a January 20, 2012, letter to DOE, the Board communicated its concern that design information for WTP does not provide confidence that wear allowances are adequate to ensure that piping, vessels, and components located in black cells are capable of confining radioactive waste over the 40-year design life of the facility. DOE identified these issues as requiring resolution to enable resumption of EPC work at the PT and HLW facilities. The Board is monitoring the developments in DOE's efforts to resolve corrosion/erosion issues.

*Design and Construction of the Electrical Distribution System*—In an April 13, 2012, letter to DOE, the Board identified several issues related to the operability and safety of the

electrical distribution system for WTP. DOE's response to the letter included a plan to address these issues, but the schedule to implement the plan will take several years to complete. The Board will monitor DOE's implementation of the plan.

*Formation of Sliding Beds in Process Piping*—In an August 8, 2012, letter to DOE, the Board communicated its concern that the design of the WTP slurry pipeline system is susceptible to frequent formation of sliding beds of solids on the bottom of the piping. Sliding beds can increase wear from erosion and corrosion, and can increase the likelihood of pipeline plugging. Also, prolonged operation of a centrifugal pump with a plugged process line could cause the pump to fail catastrophically. This failure would result in the loss of primary confinement of radioactive waste and damage adjacent structures, systems, and components. The Board also observed that DOE has not incorporated new information on waste properties into the design of the slurry transport system. Also, DOE identified these issues as requiring resolution to enable resumption of EPC work at the PT and HLW facilities. The Board received DOE's response to the letter on April 28, 2014.

***Y-12 National Security Complex, Uranium Processing Facility.*** During this reporting period, NNSA initiated efforts to develop alternatives to the UPF design. On January 15, 2014, the Acting Administrator of NNSA directed an independent team to review the UPF project and recommend an alternative approach that prioritizes transition of Building 9212 capabilities. NNSA has also directed the UPF contractor to cease design work on processes and capabilities unlikely to endure once an alternative is selected.

Also during this reporting period, NNSA resolved one safety issue regarding the technical bases for structural modeling assumptions. The Board is hopeful this effort will be a valuable tool in support of future UPF designs. In addition, NNSA has made significant progress in resolving the Board's issue with integration of safety into the UPF design, and until the design of the alternative matures, it is unclear to what extent the Board's concerns remain applicable. The Board is therefore closing this issue and no longer considers UPF to be among DOE's projects with the most significant unresolved safety issues. The Board is closely monitoring NNSA's efforts to develop alternatives, and will review the safety aspects of those alternatives when available.

## **SAFETY ISSUES RESOLVED DURING THE PERIOD**

### **1. Project: Y-12 National Security Complex, Uranium Processing Facility**

***Issue—Integration of Safety into the Design.*** In an April 2, 2012, letter to NNSA, the Board identified a number of deficiencies with the UPF Preliminary Safety Design Report (PSDR) and design requirements that led the Board to conclude that the UPF project team had not adequately integrated safety into the preliminary design. The UPF project team revised the PSDR and supporting hazard and accident analyses to address these issues. In the spring of 2013, the Board reviewed the revised PSDR and concluded that, while NNSA made progress in resolving the safety issues identified in the April

2012 letter, new safety issues concerning the effectiveness of UPF's safety controls required additional action by NNSA to ensure the integration of safety into the UPF design. In an August 26, 2013, letter to NNSA, the Board requested that NNSA provide a plan and schedule for addressing these new safety issues.

**Resolution**—On November 21, 2013, NNSA provided the Board its plans to improve the effectiveness of UPF safety controls. The Board found that NNSA laid out a path forward for each issue identified in the August 26, 2013, letter that would lead to adequate resolution of the Board's concerns. Because NNSA is pursuing new alternatives for UPF, it is unclear to what extent the Board's concerns remain applicable. The Board will reassess issues associated with the integration of safety into the UPF design as the design of the alternative progresses. The Board closed this issue in an April 21, 2014, letter to NNSA.

## 2. **Project: Y-12 National Security Complex, Uranium Processing Facility**

**Issue—Validation of Local Analysis/Design Modeling Assumptions.** In a letter to NNSA dated September 6, 2012, the Board identified issues with the UPF project's approach to validating structural modeling assumptions for analyses and design. These assumptions, if left unjustified, could impact the predicted behavior of local areas of the structure and lead to failure of safety-related systems and components attached to the structure.

**Resolution**—On November 5, 2012, NNSA provided the Board with an acceptable plan for validating the UPF structural modeling assumptions and design techniques. Through implementation of the plan, the UPF project team prepared a comprehensive list of modeling assumptions and developed technically defensible studies for those needing additional justification. The Board believes that this new process for systematically validating modeling assumptions will strengthen the UPF project's structural analysis and design process. The Board closed this issue in an April 21, 2014, letter to NNSA.

## 3. **Project: Hanford Site, K-Basin Closure Sludge Treatment Project**

**Issue—Safety Instrumented Systems.** The safety basis for the K-Basin Closure Sludge Treatment Project (STP) preliminary design credited instrumented systems with performing safety-significant safety functions. In a letter to DOE dated July 31, 2012, the Board identified that the preliminary design did not include design requirements or performance criteria for certain key attributes of safety instrumented systems such as overall system reliability or independence from non-safety systems. Objective design criteria are necessary to assure that safety systems reliably perform their intended safety function(s) as required by DOE directives.

**Resolution**—On July 9, 2013, the STP project submitted a revised Preliminary Documented Safety Analysis and a CD-2/3 package to DOE. DOE issued its approval of



these documents on February 3, 2014. The revised safety basis and final design include design criteria for all key attributes of safety instrumented systems as specified in applicable DOE directives. The final design includes application of industry consensus standards usually reserved for safety-class applications modified to include replacement of the safety-class requirement for redundancy with a requirement for fail-safe operation on all loss-of-power scenarios. These actions adequately address the Board's concern. The Board closed this issue in an April 23, 2014, letter to DOE.

## **NEWLY LISTED PROJECT**

### **1. Project: Hanford Site, Low Activity Waste Pretreatment System**

*Description*—The Low Activity Waste Pretreatment System (LAWPS) capability at the Hanford Site will supply low-activity waste feed from the Hanford Tank Farms directly to the LAW facility at WTP. The LAWPS capability is consistent with the alternative approach described in the Framework and will provide direct-feed of the LAW facility, enabling LAW vitrification in advance of PT facility operations. The LAWPS capability will remove solids as well as strontium and cesium salts from the low-activity waste feed prior to transfer to the LAW facility. LAWPS also replaces the Tank Waste Supplemental Treatment Project and absorbs many of its previously intended functions. Therefore, the Board is removing the Tank Waste Supplemental Treatment Project from the listing of projects in Enclosure 1 of this report.

*Status of Facility*—DOE approved CD-0 on March 17, 2014.

*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, Transuranic Waste Processing Center Sludge Processing Facility Buildouts Project**

In August 2013, DOE directed the Transuranic Waste Processing Center (TWPC) operating contractor to stop work on the design of the TWPC Sludge Processing Facility Buildouts (SL-PFB) project. DOE plans to award a separate contract for design of the SL-PFB project in Fiscal Year 2015. Prior to the stop work order, the operating contractor prepared a CD-1 package for the project, which DOE is currently reviewing. The Board will follow preliminary design activities of the SL-PFB project once the new contract is awarded.

**2. Project: Los Alamos National Laboratory, Chemistry and Metallurgy Research Replacement Project**

The House and Senate Appropriations Committees recommended no funds for the Chemistry and Metallurgy Research Replacement Nuclear Facility (CMRR-NF) for Fiscal Year 2014; therefore, the Board is removing CMRR-NF from the listing of projects in Enclosure 1 of this report. The Board will continue to follow the development of NNSA's replacement strategy for the Chemistry and Metallurgy Research Facility.

Respectfully submitted,



Peter S. Winokur, Ph.D.  
Chairman



Jessie H. Roberson  
Vice Chairman



Sean Sullivan  
Member

Joseph F. Bader\*  
Member

Enclosures

\*Board Member Joseph F. Bader took no part in the consideration or decision of this report.

**ENCLOSURE 1**

**MAY 2014 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 to be determined)</i>	
	a. WTP Pretreatment (PT) Facility		CD-3	85% Final Design	43%	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> 12. Erosion and corrosion— <i>(Jun 12)</i> 14. Design and construction of electrical distribution system— <i>(Jun 12)</i> 15. Formation of sliding beds in process piping— <i>(Dec 12)</i>
	b. WTP High-Level Waste (HLW) Facility		CD-3	89% Final Design	43%	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> 10. Erosion and corrosion— <i>(Jun 12)</i> 12. Design and construction of electrical distribution system— <i>(Jun 12)</i>

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

<sup>b</sup>Dates 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.

**MAY 2014 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 (continued)	c. WTP Low-Activity Waste Facility		CD-3	81% Final Design	71%	3. Instrumentation and control system design— <i>(Sep 11)</i> 4. Erosion and corrosion— <i>(Jun 12)</i> 5. Design and construction of electrical distribution system— <i>(Jun 12)</i>
	d. WTP Analytical Laboratory		CD-3	80% Final Design	88%	2. Design and construction of electrical distribution system— <i>(Jun 12)</i>
	e. WTP Balance of Facilities		CD-3	82% Final Design	79%	1. Ammonia controls— <i>(Mar 12)</i> 2. Design and construction of electrical distribution system— <i>(Jun 12)</i>
	K-Basin Closure Sludge Treatment Project	337	Phase 1: CD-1  Phase 2: CD-0	Phase 1: 100% Final Design  Phase 2: 33% Conceptual Design	Phase 1: 22% <i>(Operational 2017)</i>  Phase 2: <i>(Operational to be determined)</i>	No open issues remain.
	Waste Feed Delivery System	660	Not formally implementing CD process	Various degrees of completion	Various degrees of completion and operations	No open issues remain.
	Low Activity Waste Pretreatment System	243–375	CD-0	0% Conceptual Design	<i>(Operational 2020)</i>	No issues identified.
	Idaho National Laboratory	Integrated Waste Treatment Unit (IWTU)	570.9	CD-4	100% Final Design	100% <i>(Operational 2014)</i>
Calcine Disposition Project		900–2,000	CD-0	< 30% Conceptual Design	Will utilize portions of the IWTU <i>(Operational 2024)</i>	No issues identified.

**MAY 2014 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	
Los Alamos National Laboratory	Plutonium Facility (PF-4) Seismic Upgrades	Building structure: 15–20  Fire suppression system: 6  Active confinement ventilation system: 60–145	Not formally implementing CD process	Various degrees of completion	Various degrees of completion	2. Inadequate seismic safety posture— <i>(Jun 12)</i>
	Radioactive Liquid Waste Treatment Facility Upgrade Project— Transuranic Liquid Waste Facility	62-96	CD-1	100% Conceptual Design	<i>(Operational 2020)</i>	No open issues remain.
	Transuranic Waste Facility	106.9	Phase A: CD-4  Phase B: CD-2	Phase A: 100% Final Design  Phase B: 100% Final Design	Phase A: 100%  Phase B: <i>(Operational 2016)</i>	2. Deficiencies in the Preliminary Safety Design Report— <i>(Dec 12)</i>
Oak Ridge National Laboratory	Transuranic Waste Processing Center Sludge Project	>100	CD-1	20% Final Design	<i>(Operational 2020)</i>	No issues identified.
Savannah River Site	Salt Waste Processing Facility	1,340	CD-3	99% Final Design	72% <i>(Operational 2018)</i>	No open issues remain.
	Waste Solidification Building	414.1	CD-2/3	100% Final Design	94% <i>(Operational 2015)</i>	No open issues remain.
Y-12 National Security Complex	Uranium Processing Facility	4,200–6,500	CD-1	76% Final Design	<i>(Operational 2025)</i>	No open issues remain.
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**

**MAY 2014 REPORT  
SUMMARY OF RESOLVED ISSUES  
WITH NEW DEFENSE NUCLEAR FACILITIES**

SITE	FACILITY	RESOLVED ISSUES <sup>a</sup>
<b>Hanford Site</b>	<b>a. Waste Treatment and Immobilization Plant (WTP) Pretreatment Facility</b>	<ol style="list-style-type: none"> <li>1. Seismic ground motion—<b>resolved Feb 08</b>. 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.</li> <li>2. Structural engineering—<b>resolved Dec 09</b>. 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.</li> <li>3. Chemical process safety—<b>resolved Oct 07</b>. The Board was concerned about hydrogen accumulation in plant equipment. In response, DOE developed a conservative design criterion. This issue was reopened in the June 22, 2009, periodic report to Congress as “hydrogen gas control” when DOE changed the design approach.</li> <li>4. Fire safety design for ventilation systems—<b>resolved Dec 09</b>. 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.</li> <li>6. Structural steel analysis and design—<b>resolved Dec 10</b>. The Board identified issues related to the adequacy of the structural steel design. The project team 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.</li> <li>8. Deposition velocity—<b>resolved Mar 12</b>. 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.</li> <li>10. Use of Low-Order Accumulation Model—<b>resolved Mar 12</b>. The Board was concerned about DOE’s use of the Low-Order Accumulation Model for design work on the WTP project because the model under-predicted solids accumulation and had no physical basis. DOE subsequently abandoned use of the model for design work on the project.</li> <li>13. Selection of validation set for computational fluid dynamics model—<b>resolved July 13</b>. The Board was concerned that DOE’s plans to validate a computational fluid dynamics model to confirm the performance of pulse jet mixing systems were inadequate. The Secretary of Energy subsequently changed the design verification strategy for pulse jet mixing to a full-scale testing program.</li> </ol>
<b>Hanford</b>	<b>b. WTP High-Level Waste Facility</b>	<ol style="list-style-type: none"> <li>1. Seismic ground motion—<b>resolved Feb 08</b>. See Item 1 for the Pretreatment Facility.</li> <li>2. Structural engineering—<b>resolved Dec 09</b>. See Item 2 for the Pretreatment Facility.</li> <li>3. Fire protection—<b>resolved Jun 09</b>. 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 this strategy and found it to be acceptable.</li> <li>4. Fire safety design for ventilation systems—<b>resolved Dec 09</b>. See Item 4 for the Pretreatment Facility.</li> <li>6. Structural steel analysis and design—<b>resolved Dec 10</b>. See Item 6 for the Pretreatment Facility.</li> <li>8. Deposition velocity—<b>resolved Mar 12</b>. See Item 8 for the Pretreatment Facility.</li> <li>11. Selection of validation set for computational fluid dynamics model—<b>resolved July 13</b>. See</li> </ol>

<sup>a</sup> 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.



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Site (continued)	Waste Facility (continued)	Item 13 for the Pretreatment Facility.
	c. WTP Low-Activity Waste Facility	<ol style="list-style-type: none"> <li>1. Fire protection—<i>resolved Jun 09</i>. See Item 3 for the High-Level Waste Facility.</li> <li>2. Structural steel analysis and design—<i>resolved Dec 10</i>. See Item 6 for the Pretreatment Facility.</li> </ol>
	d. WTP Analytical Laboratory	<ol style="list-style-type: none"> <li>1. Fire protection—<i>resolved Jun 09</i>. See Item 3 for the High-Level Waste Facility.</li> </ol>
	Demonstration Bulk Vitrification System Project	<ol style="list-style-type: none"> <li>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.</li> </ol> <p>This project was removed from this periodic report as of September 2010. This removal occurred after DOE placed 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. The capabilities planned for this project were later subsumed by the Tank Waste Supplemental Treatment Project.</p>
	K-Basin Closure Sludge Treatment Project	<ol style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>3. Inadequacies in integration of safety into the design—<i>resolved Jun 12</i>. Design documentation did not contain sufficient information with which to verify the ability of safety systems to perform their safety functions. Through application of a tailoring strategy for project acquisition, the project team had eliminated key safety-in-design deliverables. DOE and the project team subsequently developed the appropriate safety-in-design documents and provided sufficient design detail to verify the adequacy of safety systems.</li> <li>4. Inadequacies in safety basis development—<i>resolved Jun 12</i>. Safety basis information lacked adequate rigor and conservatism to ensure that DOE had selected the appropriate type and level of controls to protect the public, workers, and the environment from potential hazards. DOE subsequently revised the safety basis using more defensible parameters and identified additional safety controls in the design and operation of the facility to provide the required protection.</li> <li>5. Non-bounding spray leak consequence analyses—<i>resolved Nov 13</i>. The unmitigated spray leak accident analysis lacked conservatism and improperly relied on active engineered controls and operator actions. The project subsequently revised the accident analysis to produce bounding spray leak accident consequences and no longer credits active engineered controls or operator actions in the unmitigated analysis.</li> <li>6. Safety instrumented systems—<i>resolved Apr 14</i>. The safety basis for the preliminary design credited instrumented systems with performing safety-significant safety functions but did not include design requirements or performance criteria for certain key attributes of safety</li> </ol>

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<b>Hanford Site (continued)</b>	<b>K-Basin Closure Sludge Treatment Project (continued)</b>	instrumented systems. DOE approved a revised safety basis and final design, which included design criteria for all key attributes of safety instrumented systems.
	<b>Large Package and Remote Handled Waste Packaging Facility</b>	This project was removed from this periodic report as of June 2011. This removal occurred after DOE placed conceptual design activities in abeyance. No detailed reviews were completed.
	<b>Waste Feed Delivery System</b>	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.
	<b>Immobilized High-Level Waste Interim Storage Facility</b>	This project was removed from this periodic report as of September 2010. This removal occurred after DOE abandoned it. DOE plans to initiate a new capability to fulfill the mission at a later date. No detailed reviews were completed.
	<b>Interim Hanford High-Level Waste Storage Project</b>	This project was removed from this periodic report as of December 2012. This removal occurred after DOE issued a notification of suspension for the project. DOE anticipates that design activities will resume by Fiscal Year 2015. No detailed reviews were completed.
	<b>Tank Waste Supplemental Treatment Project</b>	This project was removed from the report as of April 2014. This removal occurred after DOE approved CD-0 for the Low Activity Waste Pretreatment System, which replaces the Tank Waste Supplemental Treatment Project and absorbs many of its previously intended functions.
<b>Idaho National Laboratory</b>	<b>Integrated Waste Treatment Unit (IWTU) Project</b>	<ol style="list-style-type: none"> <li>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.</li> <li>2. Waste characterization—<i>resolved Feb 09</i>. Characterization of the waste to be processed was necessary to ensure that the process would 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 was adequate.</li> <li>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.</li> </ol>
<b>Los Alamos National Laboratory</b>	<b>Chemistry and Metallurgy Research Replacement (CMRR) Project—Nuclear Facility</b>	<ol style="list-style-type: none"> <li>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 reflect a more traditional approach.</li> <li>2. Site characterization and seismic design—<i>resolved Dec 09</i>. A technically defensible seismic design for 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.</li> <li>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.</li> <li>4. Safety-class fire suppression system—<i>resolved Dec 09</i>. This facility has the first safety-class</li> </ol>

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Los Alamos National Laboratory (continued)	Chemistry and Metallurgy Research Replacement Project—Nuclear Facility (continued)	<p>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.</p> <p>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.</p> <p>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 the requirements were incorporated into the design. See comment below.</p> <p>The Board submitted 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. This project was removed from this periodic report as of April 2014. This removal occurred after the House and Senate Appropriations Committees recommended no funds for CMRR for Fiscal Year 2014.</p>
	Technical Area-55 Reinvestment Project	<p>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 issues with respect to the Integrated Priority List process. 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.</p> <p>2. Inadequate approach to ensure timely improvements to the safety basis—<i>removed Jun 12</i>. The Board lacked confidence that safety system vulnerabilities at Technical Area-55 identified during efforts to upgrade the safety basis would be eliminated in a timely manner. DOE successfully improved its processes for identifying and prioritizing safety system upgrades. The Board, however, remained concerned about the timely completion of upgrades necessary to improve the seismic performance of PF-4, particularly upgrades associated with the building structure and the fire suppression and active confinement ventilation systems. Therefore, the Board’s generic issue concerning the adequacy of the approach to ensuring timely improvements to the safety posture at Technical Area-55 was removed from this report. The Board’s remaining concerns were incorporated into an issue concerning the seismic safety posture of PF-4.</p> <p>In the June 2012 periodic report, the Board replaced the entry for Technical Area-55 Reinvestment Project with an entry dedicated to seismic upgrades at PF-4 titled, Plutonium Facility (PF-4) Seismic Upgrades, because not all of the seismic upgrades of concern to the Board were captured under the Technical Area-55 Reinvestment Project.</p>

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Los Alamos National Laboratory (continued)	Upgrades to Pit Manufacturing Capability at the Plutonium Facility (Technical Area-55)	<p>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.</p> <p>As a result of changes to NNSA’s plutonium strategy, including NNSA’s planned 5-year deferral of the CMRR Project, NNSA’s plans to increase pit manufacturing are no longer valid. This project was removed from this report as of July 2013.</p>
	Radioactive Liquid Waste Treatment Facility Upgrade Project	<p>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.</p> <p>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.</p>
	Transuranic Waste Facility	<p>1. Inadequate integration of safety into the design process—<i>resolved Sep 10</i>. The project team had not developed adequate information and design specificity for its safety systems to demonstrate the integration of safety into the design. NNSA changed the scope of the project such that the Board no longer considered this issue relevant.</p>
	Nuclear Material Safeguards and Security Upgrades Project, Phase 2	<p>This project was removed from this periodic report as of September 2010. The Board’s interest in this project stemmed from the potential for upgrades that would impact safety-related aspects of PF-4 operations. The Board’s review revealed no adverse safety impacts.</p>
	Technical Area-55 Radiography Project	<p>This project was removed from this periodic report as of September 2010. The removal occurred 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	<p>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.</p> <p>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>.</p>

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Oak Ridge National Laboratory	Building 3019—Uranium-233 Downblending and Disposition Project	<p>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 necessary to ensure that safety systems would be adequate to protect workers. DOE changed the scope of the project such that the Board no longer considered this issue to be relevant.</p> <p>As a result of changes in scope, this project was removed from this periodic report as of March 2012.</p>
Pantex Plant	Component Evaluation Facility	<p>This project was removed from this periodic report as of September 2010. The removal occurred because DOE had made minimal progress beyond the initial mission need approval and has no plans to move forward with the project. No detailed reviews were completed.</p>
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 this 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 removed from this periodic report as of April 2010.</p>
	Salt Waste Processing Facility (SWPF)	<p>1. Geotechnical investigation—<i>resolved Feb 08</i>. The geotechnical reports required to support the design of the project were incomplete, 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 SWPF project team failed to adequately consider or quantify in the project safety control strategy the hydrogen generation rate from thermolysis, which can occur when organic solvent material is heated in the presence of radiation. Idaho National Laboratory performed testing that demonstrated the adequacy of the hydrogen generation rate used in the design.</p> <p>5. Flammable gas control—<i>resolved July 13</i>. The SWPF project team did not have a defensible strategy for controlling flammable gases generated in piping and vessels. The SWPF strategy was inadequate because it (1) failed to consider heat input from air pulse agitators in determining flammable gas generation rates, (2) failed to include deflagration-to-detonation transitions and reflections due to piping configuration and obstructions when modeling explosions, and (3) allowed plastic deformation of piping in the event of explosions. In response to these issues, DOE (1) accounted for air pulse agitator heat input in determining flammable gas generation rates, (2) included deflagration-to-detonation transition and reflection in the evaluation of flammable gas hazards, and (3) prohibited plastic deformation of piping in the event of an explosion.</p>

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Savannah River Site (continued)	Salt Waste Processing Facility (continued)	<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 to 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> <p>7. Operator actions following a seismic event—<i>resolved Jun 12</i>. The design of the facility failed to ensure that all operator actions required to prevent explosions following a seismic event could be accomplished. DOE performed an additional analysis and implemented a number of design changes to ensure that the required actions could be completed. Examples included incorporating seismically qualified interlocks and switches for process pumps into the design and adding a seismically qualified connection for a portable air compressor to the air dilution and ventilation systems to maintain operability after a seismic event.</p> <p>8. Mixing system controls and operational parameters—<i>resolved Dec 12</i>. The SWPF project team’s selection of controls and operational parameters for the air pulse agitators did not account for the limitations of mixing tests and modeling. DOE performed additional tests to demonstrate acceptable mixing performance and committed to implementing appropriate process controls during facility operations.</p>
	Container Surveillance and Storage Capability (CSSC) Project	<p>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. This issue was removed from this periodic report when the project was subsumed by the Plutonium Preparation Project.</p> <p>2. Preliminary hazards analysis—<i>resolved Jun 08</i>. The Board identified several deficiencies with the preliminary hazards analysis, including the project team’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. This issue was removed from this periodic report when the project was subsumed by the Plutonium Preparation Project.</p> <p>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.</p> <p>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 safety-related structures, systems, and components would be designed and fabricated to meet requirements. The project team committed to maintaining inputs and assumptions, documenting their origin, and tracking them through completion of the design.</p> <p>On June 27, 2008, DOE approved a revised alternative for the Plutonium Preparation Project that subsumed the CSSC Project and revised the scope of the Plutonium Disposition Project. The CSSC Project was removed from this periodic report as of September 2008.</p>



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Savannah River Site (continued)	Tank 48 Treatment Process Project	<p>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> <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 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 removed from this periodic report as of April 2010.</p>
	Waste Solidification Building	<p>1. Structural design—<i>resolved Jun 09</i>. The analysis for the structural design of the roof and the design of the facility with respect to withstanding 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.</p> <p>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, nor did it 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.</p>
	Pit Disassembly and Conversion Project (in existing K-Area facilities)	<p>NNSA closed the Pit Disassembly and Conversion Project on September 30, 2012, and the Board has discontinued its oversight. The Pit Disassembly and Conversion Project was removed from this report as of December 2012.</p>
Y-12 National Security Complex	Highly Enriched Uranium Materials Facility (HEUMF)	<p>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 in accordance with the design basis requirements. NNSA committed to connecting the system to the safety-significant water supply planned for the Uranium Processing Facility (UPF), 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> <p>HEUMF began operation in January 2010.</p>

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Y-12 National Security Complex (continued)	Uranium Processing Facility	<ol style="list-style-type: none"> <li>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.</li> <li>2. Non-conservative 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.</li> <li>3. Structural and geotechnical engineering—<i>resolved Dec 12</i>. NNSA had not demonstrated that the following had been properly considered in the design of the UPF structure: (1) the effects of the weathered shale on the building’s response; (2) the spacing between the UPF structure and adjacent buildings to accommodate the predicted horizontal seismic motion; (3) the finite element modeling requirements; (4) the sizing of structural members; and (5) controls for internal blasts. NNSA subsequently took appropriate actions to demonstrate that: (1) the weathered shale will not significantly affect the response of the building; (2) sufficient spacing exists between the UPF structure and adjacent buildings; (3) the finite element modeling requirements are appropriate; (4) the main building is adequately designed for seismic and other anticipated loads; and (5) internal blasts will be prevented by process controls.</li> <li>5. Validation of local analysis/design modeling assumptions—<i>resolved Apr 14</i>. The UPF project lacked a rigorous approach for identifying and technically justifying structural modeling and analysis assumptions. NNSA provided the Board with an acceptable plan for validating the UPF structural modeling assumptions and design techniques. Through implementation of the plan, the UPF project team prepared a comprehensive list of modeling assumptions and developed technically defensible studies for those needing additional justification.</li> <li>6. Integration of safety into the design— <i>resolved Apr 14</i>. The Board identified a number of deficiencies with the UPF Preliminary Safety Design Report (PSDR) and design requirements that led the Board to conclude that the UPF project team had not adequately integrated safety into the preliminary design. The UPF project team revised the PSDR and supporting hazard and accident analyses to address these issues. In the spring of 2013, new safety issues concerning the effectiveness of UPF’s safety controls required additional action by NNSA to ensure the integration of safety into the UPF design. NNSA laid out a path forward that would lead to adequate resolution of the Board’s concerns. Subsequent to the Board identifying this issue, NNSA began pursuing alternatives to the UPF design. Until the design of the UPF alternative matures, it is unclear to what extent the Board’s concerns with the integration of safety into the UPF design remain applicable. The Board will reassess this issue as the design of the alternative progresses.</li> </ol>