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**DEFENSE NUCLEAR FACILITIES  
SAFETY BOARD**

Washington, DC 20004-2901



October 31, 2012

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

Dear Secretary Chu:

The Defense Nuclear Facilities Safety Board (Board) is pleased to enclose our third periodic *Report to Congress: Summary of Significant Safety-Related Infrastructure Issues at Operating Defense Nuclear Facilities*. The Board has fashioned this report after its *Quarterly Report to Congress on the Status of Significant Unresolved Issues with the Department of Energy's Design and Construction Projects*. The Board believes this report provides an appropriate means of keeping all parties apprised of the Board's safety-related concerns regarding aging Department of Energy (DOE) defense nuclear facilities. The Board intends to issue this report to Congress and DOE on a periodic basis—once per year, or more frequently if warranted.

Sincerely,



Peter S. Winokur, Ph.D.  
Chairman

Enclosure

To the Congress of the United States:

This is the Defense Nuclear Facilities Safety Board's (Board) third periodic report on safety issues associated with aging infrastructure at Department of Energy (DOE) defense nuclear facilities. DOE relies on several facilities that are at or near their end of life, but still must carry out national security and legacy-waste cleanup missions.

Two of the most critical of these facilities are the Chemistry and Metallurgy Research (CMR) Facility at Los Alamos National Laboratory (LANL) (constructed in 1952) and the 9212 Complex at the Y-12 National Security Complex, comprised of Building 9212 and 13 collocated buildings (portions of which have been in operation for more than 60 years). The Uranium Processing Facility is scheduled to replace the 9212 Complex, but DOE plans to continue operations in the 9212 Complex through 2023. DOE deferred funding for the Chemistry and Metallurgy Research Replacement Project for 5 years, and expects to operate the existing CMR Facility through 2019.

A third facility of the highest concern to the Board is the Plutonium Facility (PF-4), built in the 1970s at LANL. In a seismic event, PF-4 potentially exposes the public to very high radiological dose consequences. Accordingly, a seismic scenario resulting in facility collapse is of great concern to the Board. In 2007, the National Nuclear Security Administration (NNSA) learned of an increased seismic hazard at LANL, and in May 2011, LANL site analysts completed a simple (static, linear) seismic analysis of PF-4 and identified nine vulnerabilities potentially leading to a loss of confinement or facility collapse. Subsequently, NNSA completed structural upgrades at PF-4 to address each of these issues. The Board pointed out that the simplistic (static, linear) seismic modeling did not adequately provide a full understanding of the structural behavior of PF-4 during a seismic event. NNSA then began a more detailed (static, nonlinear) seismic analysis to fully identify PF-4 vulnerabilities. NNSA completed the first portion of this analysis in late August 2012 and identified additional weaknesses in the support columns and roof girders of PF-4. NNSA is developing a plan to address these weaknesses and intends to perform additional seismic analysis.

Other facilities meriting continued attention are the older high-level waste tank farms at both the Hanford Site and the Savannah River Site, the Radioactive Liquid Waste Treatment Facility at LANL, and the T Plant (waste treatment and packaging operations) at the Hanford Site.

Although not yet included in this report, safety risks posed by the newer, double-shell tanks at Hanford may become a cause for concern to the Board. Recent, preliminary information indicates high-level waste may have leaked into the secondary containment of one double-shell tank. In September 2012, the Board also issued Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Safety Strategy*; DOE's implementation of the Recommendation may uncover additional equipment with age-related degradation.

**SIGNIFICANT SAFETY-RELATED INFRASTRUCTURE ISSUES**

The following are the most significant safety-related infrastructure issues that exist today in the DOE defense nuclear complex. The enclosure to this letter provides additional detail on these issues.

- **Los Alamos National Laboratory, Plutonium Facility**—seismic fragility of building; degraded safety system reliability
- **Los Alamos National Laboratory, Chemistry and Metallurgy Research Facility**—seismic fragility of building
- **Los Alamos National Laboratory, Radioactive Liquid Waste Treatment Facility**—building and equipment end of life
- **Nevada National Security Site, Device Assembly Facility**—degradation of fire suppression water tank and fire suppression system lead-ins
- **Pantex Plant, Site-Wide Fire Suppression System**—degradation of fire suppression system lead-ins
- **Y-12 National Security Complex, 9212 Complex**—seismic, high wind fragility of building; building and equipment end of life
- **Hanford Site, Single-Shell Tank Farms**—aging tanks and systems
- **Hanford Site, T Plant (Waste Treatment and Packaging Operations)**—seismic fragility of building
- **Savannah River Site, H-Canyon**—aging systems and structures
- **Savannah River Site, Concentration, Storage, and Transfer Facility (Type I, II, and IV Tanks)**—aging tanks and systems

**NEW ISSUES IDENTIFIED DURING THE PERIOD**

- None

**ISSUES RESOLVED DURING THE PERIOD**

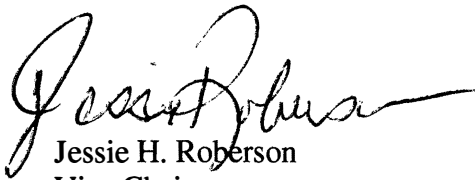
- None

As directed by Congress, the Board will continue to exercise its existing statutory authority in addressing these and other safety-related issues within the DOE defense nuclear complex.

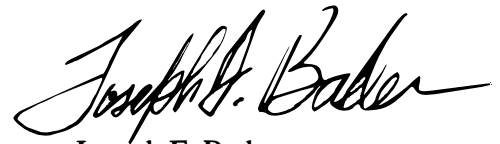
Respectfully submitted,



Peter S. Winokur, Ph.D.  
Chairman



Jessie H. Roberson  
Vice Chairman



Joseph F. Bader  
Member



John E. Mansfield, Ph.D.  
Member



Sean Sullivan  
Member

Enclosure

## ENCLOSURE

### SUMMARY OF SIGNIFICANT SAFETY-RELATED INFRASTRUCTURE ISSUES AT OPERATING DEFENSE NUCLEAR FACILITIES

NATIONAL NUCLEAR SECURITY ADMINISTRATION SITES					
SITE	FACILITY	BEGAN SERVICE	REMAINING SERVICE	INFRASTRUCTURE WEAKNESS	COMMENTS
<b>Los Alamos National Laboratory</b>	Plutonium Facility (PF-4)	1978	Approximately 30 years	<p><b>Seismic fragility of building:</b> Seismic analyses of PF-4 in May 2011 and August 2012 found that seismic events could result in significant damage to the facility and high radiological dose consequences to the workers and public.</p> <p>Reference: The Board's Recommendation 2009-2, <i>Los Alamos National Laboratory Plutonium Facility Seismic Safety</i>, October 26, 2009; letter from the Board dated July 18, 2012.</p> <p><b>Safety system reliability:</b> The facility lacks a set of safety controls (fire suppression system and active confinement ventilation system) that would adequately protect the public and workers from the consequences associated with post-seismic accidents.</p> <p>Reference: The Board's Recommendation 2009-2, <i>Los Alamos National Laboratory Plutonium Facility Seismic Safety</i>, October 26, 2009.</p>	<p>The National Nuclear Security Administration (NNSA) aggressively completed structural upgrades that addressed each of the nine building vulnerabilities identified in the May 2011 seismic analysis. In August 2012, NNSA completed a static, nonlinear seismic analysis that identified new collapse mechanisms associated with the facility captured columns and roof girders. The timely identification and remediation of any structural vulnerabilities will have profound implications for ensuring public health and safety.</p> <p>In parallel with efforts to address the issue of potential collapse of the structure noted above, NNSA is continuing to evaluate options for seismic upgrade of the fire suppression system and key portions of the active confinement ventilation system.</p>

## NATIONAL NUCLEAR SECURITY ADMINISTRATION SITES

SITE	FACILITY	BEGAN SERVICE	REMAINING SERVICE	INFRASTRUCTURE WEAKNESS	COMMENTS
	Chemistry and Metallurgy Research (CMR) Facility	1952	Until replaced by CMR Replacement Project, date to be determined (TBD)	<p><b>Seismic fragility of building:</b> There is a 1 in 55 chance of seismic collapse during a 10-year timeframe, which would result in release of nuclear material and injury/death of facility workers.</p> <p>Reference: Letters from the Board dated October 23, 2007 and December 7, 2010.</p>	<p>The Board is concerned that prolonged operations in the existing CMR Facility pose a serious safety risk. In late 2010, NNSA limited material-at-risk (MAR) in the facility to reduce the public dose consequence following an accident to a value below the Evaluation Guideline of 25 rem.</p> <p>In February 2012, NNSA deferred the CMR Replacement Project for a minimum of 5 years, but committed to ceasing nuclear operations in CMR by 2019.</p>
	Radioactive Liquid Waste Treatment Facility (RLWTF)	1963	Until replaced by Radioactive Liquid Waste Treatment Upgrade Project (expected in 2020)	<p><b>Building and equipment end of life:</b> RLWTF has reached its end of life and, despite ongoing life extension efforts, requires replacement to support future laboratory missions reliably. Equipment failures pose a risk to facility workers.</p> <p>Reference: Letter from the Board dated March 5, 2008.</p>	<p>Cost growth associated with the original RLWTF Upgrade Project has resulted in NNSA evaluating alternative approaches. This facility collects liquid radioactive waste-water from many LANL nuclear facilities, so its failure would significantly impact missions. NNSA is considering splitting the replacement project into separate facilities for low-level waste and transuranic waste.</p>
Nevada National Security Site	Device Assembly Facility (DAF)	1996	Enduring facility—remaining service date TBD	<p><b>Degradation of fire suppression water tank:</b> The water tank cannot be relied upon to provide fire suppression water in the event of a fire in DAF. Fires at DAF pose a risk to facility workers.</p> <p>Reference: Letter from the Board dated January 18, 2008.</p>	<p>The water tank is corroded on interior and exterior surfaces. The tank also is in violation of standards of the Occupational Safety and Health Administration and noncompliant with standards of the American Water Works Association. The tank does not meet seismic requirements.</p>

**NATIONAL NUCLEAR SECURITY ADMINISTRATION SITES**

SITE	FACILITY	BEGAN SERVICE	REMAINING SERVICE	INFRASTRUCTURE WEAKNESS	COMMENTS
				<p><b>Degradation of fire suppression lead-ins:</b> The lead-ins are susceptible to corrosion failure and cannot be relied upon to provide water in the event of a fire. Two lead-ins are leaking, and the associated portion of the fire suppression system is out of service.</p> <p>Reference: Letter from the Board dated January 18, 2008.</p>	<p>NNSA has placed interim repairs and replacement on hold until planning for improvements to other components of the fire suppression system is more complete.</p> <p>The lead-ins are susceptible to failure due to potential corrosion throughout the entire fire suppression system. Internal coatings of pipes failed almost immediately after installation because of improper welding. The Mission Need Statement (CD-0) for the lead-in replacement project was approved on May 18, 2011. NNSA began to make repairs in 2012 but faces limited funding for the overall project.</p>
<b>Pantex Plant</b>	Site-Wide Fire Suppression System	1950s	Until replaced— date TBD	<p><b>Degradation of fire suppression system lead-ins:</b> The lead-ins are susceptible to corrosion failure and cannot be relied upon to provide water in the event of a fire. Fires at Pantex pose a risk to facility workers.</p> <p>Reference: Letter from the Board dated September 23, 2002.</p>	<p>The piping lead-ins to the nuclear explosive bays and cells are degraded and corroded and have experienced an increasing number of failures since 1995. NNSA is proposing to initiate a project in fiscal year (FY) 2013 to repair the lead-ins. This Capabilities Based Facilities and Infrastructure (CBFI) project is not yet funded, and progress has been slow.</p>

**NATIONAL NUCLEAR SECURITY ADMINISTRATION SITES**

SITE	FACILITY	BEGAN SERVICE	REMAINING SERVICE	INFRASTRUCTURE WEAKNESS	COMMENTS
<p><b>Y-12 National Security Complex</b></p>	<p>9212 Complex (Building 9212 and 13 collocated buildings)</p>	<p>1951</p>	<p>Until replaced by the Uranium Processing Facility (UPF); full replacement of 9212 Complex process capability expected no earlier than 2023</p>	<p><b>Seismic, High Wind Fragility of Building:</b> Results of analyses of the building's structure indicate that it would not withstand performance category-2 seismic loads and that many of the building's systems and components have insufficient seismic restraint. Also, the roof would be damaged by a performance category-2 wind event. Failure of the buildings or systems could lead to unacceptable consequences for facility workers.</p> <p>Reference: Letters from the Board dated March 13, 2007; November 28, 2005; and April 20, 2005.</p> <p><b>Building and equipment end of life:</b> The 9212 Complex has reached its end of life and cannot be relied upon to provide a safe operating environment. Facility systems and components continue to deteriorate and further increase operational safety risk.</p> <p>Reference: Letters from the Board dated March 13, 2007; November 28, 2005; and April 20, 2005.</p>	<p>The 9212 Complex cannot meet existing requirements for Hazard Category 2 nuclear facilities. NNSA has taken actions to reduce the radioactive material in the facilities. NNSA concluded that major structural and process modifications would be impractical because of the cost involved and the likelihood that construction could significantly disrupt important national security missions. Construction of the new UPF is the long-term solution to this issue. Per the plan <i>Acceleration of the Uranium Processing Facility Project to Support Building 9212 Transition</i>, full replacement of 9212 Complex process capabilities in UPF is expected no earlier than FY2023.</p> <p>The 9212 complex is more than 60 years old and is continuing to deteriorate. NNSA has initiated a project to upgrade certain systems in the 9212 Complex based on a facility risk review. Construction of the new UPF in conjunction with continued efforts to analyze and address the risk posed by deteriorating systems is the long-term solution to this issue. Full replacement of 9212 Complex process capabilities in UPF is expected no earlier than FY2023.</p>



## ENVIRONMENTAL MANAGEMENT SITES

SITE	FACILITY	BEGAN SERVICE	REMAINING SERVICE	INFRASTRUCTURE WEAKNESS	COMMENTS
Hanford Site	Single-Shell Tank Farms	1943–1964	Until cleaned and closed: 2019–2043	<p><b>Aging tanks and systems:</b> The older, single-shell tanks containing high-level radioactive waste are beyond their design lives, and some have leaked. Waste leaks from the tanks pose a hazard to facility workers and the environment.</p> <p>Reference: Letter from the Board dated January 6, 2010.</p>	The Department of Energy (DOE) is transferring radioactive waste from 149 older, single-shell tanks to 28 newer, double-shell tanks to reduce environmental risk. DOE plans to use single-shell tanks until at least 2041 and is evaluating options for extending the lives of the single-shell tanks. The Board issued a letter dated January 6, 2010, encouraging DOE to develop more efficient tank inspection techniques.
	T Plant (waste treatment and packaging operations)	1944	Until storage mission is complete—TBD	<p><b>Seismic fragility of building:</b> Portions of the T Plant structure do not meet minimum reinforcement requirements of American Concrete Institute (ACI) code ACI 318 and are susceptible to failure in an earthquake. Structural failures pose a risk to facility workers.</p> <p>Reference: Letter from the Board dated April 4, 2003.</p>	T Plant is more than 60 years old, and the Board is concerned about the structure’s suitability for new missions that may involve treatment of significant quantities of radioactive material from the K-West Basin.
Savannah River Site	H-Canyon	1955	Until processing mission is complete—TBD	<p><b>Aging systems and structures:</b> H-Canyon is exhibiting degradation of systems and structures that, if not addressed, could challenge safe operations, and pose a risk to facility workers. Components showing localized degradation include canyon wall concrete, the sand filter ceiling, electrical wiring, and the canyon roof liner.</p> <p>Reference: Letter from the Board dated April 29, 2010.</p>	DOE has decided to continue operations at H-Canyon. DOE started processing certain high-risk types of spent nuclear fuel in FY 2012. DOE is also completing preparations for a new plutonium mission in H-Canyon. To safely complete these new missions and any further missions, DOE will need to maintain and potentially upgrade aging process and safety systems.

**ENVIRONMENTAL MANAGEMENT SITES**

<b>SITE</b>	<b>FACILITY</b>	<b>BEGAN SERVICE</b>	<b>REMAINING SERVICE</b>	<b>INFRASTRUCTURE WEAKNESS</b>	<b>COMMENTS</b>
	Concentration, Storage, and Transfer Facility (Type I, II, and IV Tanks)	1954–1962	Until cleaned and closed: 2012–2026	<p><b>Aging tanks and systems:</b> The Type-I, -II, and -IV Tanks containing high-level radioactive waste are beyond their design lives, and some have leaked. Waste leaks from the tanks pose a hazard for facility workers and the environment.</p> <p>Reference: Letter from the Board dated January 6, 2010.</p>	DOE closed 2 of 24 old-style tanks in 1997 (Tanks 17 and 20), and two more in 2012 (Tanks 18 and 19). However, DOE continues to store liquid waste in some of the old, noncompliant tanks. DOE expects that these old tanks will contain waste through 2022 and be closed by 2026. Support systems require increased attention for monitoring and repair. The Board issued a letter dated January 6, 2010, encouraging DOE to develop more efficient tank inspection techniques.