

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

**DEFENSE NUCLEAR FACILITIES  
SAFETY BOARD**

Washington, DC 20004-2901



September 30, 2011

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 second periodic Report to Congress: Summary of Significant Safety-Related Infrastructure Issues at Operating Defense Nuclear Facilities in the Department of Energy's Aging 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 to keep all parties apprised of the Board's concerns regarding aging DOE defense nuclear facilities. As such, 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: as stated

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**DEFENSE NUCLEAR FACILITIES  
SAFETY BOARD**

Washington, DC 20004-2901



September 28, 2011

To the Congress of the United States:

This is the Defense Nuclear Facilities Safety Board's (Board) 2<sup>nd</sup> periodic report on the status of Department of Energy (DOE) facilities whose infrastructure is aging, yet continue to be relied upon to carry out the nation's national security and legacy-waste cleanup missions. Two of the most critical of these facilities are the Chemistry and Metallurgy Research Facility at Los Alamos National Laboratory (LANL) (nearly 60 years old) and the 9212 Complex at the Y-12 National Security Complex (portions of which have been in operation for more than 60 years). The Board recognizes that Congress has authorized replacements for each of these facilities, but the fact remains that both will be called upon to support essential mission work for at least another decade.

In addition, DOE's contractor completed the Seismic Analysis of Facilities and Evaluation of Risk (SAFER) Project at LANL's Plutonium Facility in May 2011. This analysis identified the potential for significant post-seismic damage that could result in breach of the facility confinement boundary; damage to the facility's nuclear material vault, ventilation system, and fire suppression system; and even collapse of the facility. LANL issued a Justification for Continued Operations on June 6, 2011, that identified compensatory measures to reduce these risks, including significant new limits on the quantity of nuclear material allowed in the building. LANL and the National Nuclear Security Administration also are aggressively pursuing structural upgrades to address these newly identified vulnerabilities.

Other facilities that merit continued attention are the high-level waste tank farms at both the Hanford Site and the Savannah River Site, the Radioactive Liquid Waste Treatment Facility at LANL, and waste treatment and packaging operations at the Hanford Site.

The Board continues to maintain a dedicated focus on these and the other facilities cited later in this report, and to urge DOE to continue to support safety and infrastructure improvements and consider ways to reduce risks to the public, workers, and the environment.

### **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.

- **Los Alamos National Laboratory, Plutonium Facility**—seismic fragility of building; seismic qualification of fire suppression and ventilation systems
- **Los Alamos National Laboratory, Chemistry and Metallurgy Research Facility**—seismic fragility of building; building end of life

- **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)**—weak structure
- **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**

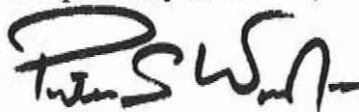
- **Los Alamos National Laboratory, Plutonium Facility**—seismically-induced failure/collapse of facility

**ISSUES RESOLVED DURING THE PERIOD**

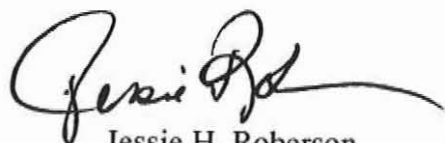
None

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

Respectfully submitted,



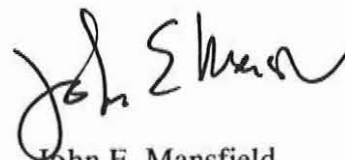
Peter S. Winokur, Ph.D.  
Chairman



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Vice Chairman



Joseph F. Bader  
Member



John E. Mansfield  
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
Los Alamos National Laboratory (LANL)	Chemistry and Metallurgy Research (CMR) Facility	1952	Until replaced by CMR Replacement Facility, date to be determined (TBD)	<p><b>End of life:</b> There is a 1 in 55 chance of seismic collapse during a 10-year time frame, which would result in release of nuclear material and injury/death of facility workers.</p> <p>Reference: Letters from the Defense Nuclear Facilities Safety Board (Board) dated October 23, 2007, and December 7, 2010</p>	The Defense Nuclear Facilities Safety Board (Board) is concerned that prolonged operations in the existing CMR Facility pose a serious safety risk. In late 2010, in response to a review by the Board's staff, LANL 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.
	Plutonium Facility (PF-4)	1978	Approximately 30 years	<p><b>Post-seismic facility integrity:</b> Seismic analysis of PF-4 found in May 2011 that seismic events could result in significant damage to the facility and more severe accidents than had previously been identified.</p> <p>Reference: LANL Justification for Continued Operations dated June 6, 2011</p> <p><b>Safety system reliability:</b> The facility lacks a set of safety controls 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> dated October 26, 2009</p>	<p>LANL has begun to implement compensatory measures, including significant new limits on the MAR allowed in the building to reduce the risk of these newly postulated seismic accidents, including facility collapse. The National Nuclear Security Administration (NNSA) is aggressively pursuing structural upgrades to address these risks and ensure that PF-4 would maintain its confinement of nuclear material during a large seismic event.</p> <p>The Board issued Recommendation 2009-2 on October 26, 2009, to communicate clearly its concern regarding the limited progress made to date in reducing the risk to the public and workers following a seismic event. The Board accepted DOE's Implementation Plan for Recommendation 2009-2 on December 17, 2010. 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</p>

**NATIONAL NUCLEAR SECURITY ADMINISTRATION SITES**

SITE	FACILITY	BEGAN SERVICE	REMAINING SERVICE	INFRASTRUCTURE WEAKNESS	COMMENTS
					system and key portions of the active confinement ventilation system.
	Radioactive Liquid Waste Treatment Facility (RLWTF)	1963	Until replaced by Radioactive Liquid Waste Treatment Upgrade Facility (currently under review)	<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.</p> <p>Reference: Letter from the Board dated March 5, 2008</p>	Cost growth associated with the original RLWTF Upgrade Facility project has resulted in NNSA evaluating alternative approaches. This facility collects waste water from the entire LANL site, so its failure could place the mission of the entire site at risk.
Nevada National Security Site	Device Assembly Facility (DAF)	1996	Until replaced—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.</p> <p>Reference: Letter from the Board dated January 18, 2008</p> <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 fire suppression water in the event of a fire. Two lead-ins are currently 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>The water tank has corrosion 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. NNSA is planning to make interim repairs, but has not yet submitted a line-item budget request to replace the tank.</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, which has led to corrosion problems. The Mission Need Statement (CD-0) for the lead-in Replacement Project was approved on May 18, 2011. The replacement is undefined. Alternative evaluation and selection is ongoing. NNSA estimates completion of the project in 2017.</p>

**NATIONAL NUCLEAR SECURITY ADMINISTRATION SITES**

SITE	FACILITY	BEGAN SERVICE	REMAINING SERVICE	INFRASTRUCTURE WEAKNESS	COMMENTS
<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 fire suppression water to the bays and cells in the event of a fire. There have been 27 corrosion-induced leaks since 1995.</p> <p>Reference: Letter from the Board dated September 23, 2002</p>	The fire suppression system's piping lead-ins to the nuclear explosive bays and cells are susceptible to failure. NNSA has not funded the replacement project. Piping lead-ins continue to fail periodically.
<b>Y-12 National Security Complex</b>	9212 Complex	1951	Until replaced by the Uranium Processing Facility (UPF) in 2021	<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 indefinitely.</p> <p>Reference: Letters from the Board dated March 13, 2007, November 28, 2005, and April 20, 2005.</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 also has initiated a line-item project to upgrade certain systems in the 9212 Complex based on a facility risk review; however, the facilities still have a sizable maintenance backlog. Construction of the new UPF is the long-term solution to this issue. Even if the UPF schedule undergoes no further slippage, the 9212 Complex must function at least until 2021.

**ENVIRONMENTAL MANAGEMENT SITES**

<b>SITE</b>	<b>FACILITY</b>	<b>BEGAN SERVICE</b>	<b>REMAINING SERVICE</b>	<b>INFRASTRUCTURE WEAKNESS</b>	<b>COMMENTS</b>
<b>Hanford Site</b>	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.</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>Weak structure:</b> Portions of the T Plant structure do not meet minimum reinforcement requirements of American Concrete Institute (ACI) code ACI 318.</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.
<b>Savannah River Site</b>	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.</p> <p>Reference: Letter from the Board dated April 29, 2010</p>	DOE continued some processing of uranium materials in H-Canyon through fiscal year 2011, but may place H-Canyon in cold standby in fiscal year 2012 if it does not receive sufficient funding. The Board believes DOE should maintain H-Canyon in a high-state of readiness as required by Public Laws 106-398 and 108-136 to process legacy items and spent fuel. At the Board’s suggestion, DOE directed the contractor to develop a resumption plan so as to be prepared for possible future operations. The Board remains concerned about how DOE will maintain aging process and safety systems in operable condition during an indeterminate shutdown period.

**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 systems and structures:</b> The Type-I, -II, and -IV tanks containing high-level radioactive waste are beyond their design lives, and some have leaked.</p> <p>Reference: Letter from the Board dated January 6, 2010</p>	DOE continues to store liquid waste in some of the old, noncompliant tanks. DOE expects that these old tanks will contain waste through 2018. 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.