

Peter S. Winokur, Chairman
Jessie H. Roberson, Vice Chairman
Sean Sullivan

**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

Washington, DC 20004-2901



August 7, 2014

The Honorable Frank G. Klotz
Administrator
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Administrator Klotz:

As you mark the end of your first 100 days in office, the Defense Nuclear Facilities Safety Board (Board) is looking forward to a positive and productive working relationship with you as Administrator of the National Nuclear Security Administration (NNSA). The Board would like to provide you with a brief summary of its views on the current challenges NNSA faces in the area of safety at its defense nuclear facilities.

In particular, the Board draws your attention to the Plutonium Facility at Los Alamos National Laboratory, which analysis shows may be vulnerable to collapse as a consequence of a design basis seismic earthquake, and the many challenges brought on by aging infrastructure across the nuclear weapons complex. A summary of the Board's oversight priorities on these and other major issues is provided as an enclosure to this letter. This enclosure is intended to supplement the discussion provided to you in our letter of April 30, 2014, regarding safety at the Pantex Plant and the Y-12 National Security Complex in light of the recent contract transition.

The Board looks forward to providing you with independent analysis and advice, and is committed to work with you toward our common goal of providing adequate protection of public health and safety while maintaining a strong nuclear security enterprise.

Sincerely,

Peter S. Winokur, Ph.D.
Chairman

Enclosure

c: Mr. Joe Olencz

OVERSIGHT PRIORITIES OF THE DEFENSE NUCLEAR FACILITIES SAFETY BOARD AT THE NATIONAL NUCLEAR SECURITY ADMINISTRATION'S DEFENSE NUCLEAR FACILITIES

Part 1 – Broad, Multi-Site Safety Issues

Aging or Degraded Infrastructure:

Many aging National Nuclear Security Administration (NNSA) facilities are unsound and the transition to new facilities will take decades. For example, the Chemical and Metallurgy Research (CMR) Facility at Los Alamos National Laboratory (LANL) and the 9212 Complex at the Y-12 National Security Complex are of particular concern because of their deficient structures and advanced age. NNSA and the Defense Nuclear Facilities Safety Board (Board) are continually evaluating the rigor and maintenance of a robust safety posture in such facilities to minimize potential threats to public and worker health and safety.

The Board discussed its concerns about the 9212 Complex in its letter of April 30, 2014. At CMR, the Board is concerned that prolonged operations in the existing facility pose a serious safety risk to workers. In late 2010, NNSA limited material-at-risk in the facility to reduce the public dose consequence following an earthquake to a value below the Evaluation Guideline of 25 rem total effective dose equivalent that is used to determine the need for safety class controls. Current operations include analytical chemistry and material characterization, which are planned to migrate to other LANL facilities, and cleanout of contaminated confinement test vessels. NNSA has committed to cease operations in CMR by 2019.

Within NNSA's aging facilities, there are many examples of structures, systems, and components that warrant NNSA management attention. Examples range from fire suppression systems to confinement ventilation systems to radioactive waste handling systems. The Board discussed Pantex Plant fire suppression systems in its letter of April 30, 2014. The fire suppression system at the Device Assembly Facility (DAF) on the Nevada National Security Site (NNSS) has several known deficiencies and continues to suffer from a significant number of physical failures each year. Necessary upgrades to the active confinement ventilation system at LANL's Plutonium Facility have not yet begun. Age-related reliability issues threaten the ability of the Radioactive Liquid Waste Treatment Facility at LANL to support key Laboratory missions.

Emergency Preparedness and Response:

The Board continues to stress the importance of emergency preparedness and response. It is critical that management at NNSA headquarters and NNSA's defense nuclear facilities prepare for and respond to severe events. As part of its engagement with the Department of Energy (DOE) on this topic, the Board reviewed the emergency preparedness and response capabilities of various sites, and identified weaknesses and vulnerabilities, such as problems with assessments, drills and exercises, as well as corrective actions. The Board shared its concerns with DOE and its contractors through Board correspondence, public hearings and meetings, and Board site visits. Since NNSA is responsible for those defense nuclear facilities that comprise the active nuclear security enterprise, and NNSA headquarters is responsible for emergency

preparedness and response policy and headquarters emergency response operations, NNSA plays a key role in emergency preparedness and response capabilities across all of DOE.

Safety of Nuclear Explosive Operations:

NNSA uses two key programs to ensure that safety vulnerabilities associated with nuclear explosive operations (NEOs) are identified, mitigated, and/or controlled: the *Nuclear Safety Management Rule*, and the Nuclear Explosive Safety (NES) Program. The Board has become increasingly concerned with NNSA's execution of the rule, and the NES program in applications involving NEOs.

In an April 5, 2011, letter to NNSA, the Board identified shortcomings in the implementation of *Hazard Analysis Reports for Nuclear Explosive Operations* (DOE-NA-STD-3016-2006) by the nuclear weapon design agencies. The Board noted NNSA does not comply with its own requirements for adequate documentation of technical bases for weapon responses, thorough technical peer reviews of weapons responses and their technical bases, and control of the software tools used to develop weapon response data as safety software under the requirements of DOE Order 414.1D, *Quality Assurance*. These problems persist—overall, more NNSA oversight of the weapon response process is necessary.

In a November 7, 2011, letter to NNSA, the Board identified discrepancies in the application of categorization criteria by NES Study Groups versus NNSA management, and the tracking and closure process for NES findings and Senior Technical Advisor comments. In a March 2, 2012, letter, the Board discussed concerns that Babcock & Wilcox Technical Services Pantex, LLC (B&W), conducted NEOs that exceeded the boundaries approved in the associated NES study despite objections expressed by personnel from LANL and B&W. Many of the Board's concerns related to categorization of NES findings, tracking of NES corrective actions, and execution of the defined NES processes remain unaddressed.

The Board's public meeting and hearing in Amarillo, Texas, on March 14, 2013, highlighted concern that NNSA management has failed to adequately address safety-related findings by NES experts, maintain up-to-date NES authorizations, and support a sufficient number of NES experts. During the preparation phase for this hearing, NNSA restructured the nuclear explosive safety program to address many of the concerns that had been raised informally via technical interchanges between the Board's staff and NNSA's staff. NNSA management assured the Board that these changes would improve the visibility and the independence of the current process and should lead to improvements in all of these areas.

However, to date, the effort to update the NES directives remains a slow process, in part because senior NNSA managers have not reached agreement on several foundational policies and requirements.

Meanwhile, the Board's concerns with execution of the NES program have continued to mount. In a letter dated June 2, 2014, the Board discussed the fact that since 2006, ten NES evaluations have documented concerns related to the "falling man" safety analysis. In a letter to NNSA dated July 6, 2010, the Board also communicated concerns associated with this same analysis. This issue has lingered too long.

In summary, your leadership in this area is vital to restoring the NES program to its necessary strength and stature.

Early Integration of Safety in Design:

Early integration of safety in large, complex design projects and timely resolution of safety-related issues is key to providing adequate protection of public and worker health and safety. NNSA has struggled with the early integration of safety into its large, complex design projects and with the timely resolution of safety-related issues. The Board will continue to provide project letters associated with Critical Decisions for NNSA design and construction projects. For example, the Board is currently considering correspondence that would discuss the Transuranic Waste Facility project at LANL.

Activity-Level Work Planning and Control:

The Board's Technical Report 37, *Integrated Safety Management at the Activity Level: Work Planning and Control*, issued on August 28, 2012, illustrated weaknesses in work planning and control and summarized lessons learned across DOE's defense nuclear facilities. DOE responded by developing new implementation and oversight guidance in DOE's directives system, and emphasizing the need for rigorous oversight of activity-level work planning and control by headquarters, field offices, and contractors. These efforts have the potential to achieve sustained improvements in the control of activity-level hazards for worker safety at defense nuclear facilities. The Board will continue to assess performance at NNSA's defense nuclear facilities. NNSA must continue to emphasize the importance of this functional area to achieve and sustain the improvements that will ensure worker safety at its sites.

Maintaining Robust Federal Oversight:

The Board encourages continued vigilance in safety oversight to assure public and worker protection. The security incident of July 2012 at the Y-12 complex has been attributed in part to confusion over the effectiveness of contractor assurance systems and a reduction in independent federal oversight for security. Regarding federal oversight for nuclear safety, DOE Guide 226.1-2A, *Federal Line Management Oversight of Department of Energy Nuclear Facilities*, contains detailed guidance for federal oversight in core performance areas including: operability of safety systems, implementation of Technical Safety Requirements, effectiveness of safety management programs, and (as of April 2014) work planning and control. Effective federal oversight in these core performance areas using DOE Guide 226.1-2A is vital to assuring adequate protection of the public and workers. The Board will continue to monitor NNSA's oversight regarding nuclear safety and will promptly bring any issues to your attention.

Safety Culture:

The Board has encouraged DOE to strengthen its safety culture throughout the defense nuclear complex and to develop tools to sustain a strong safety culture. The Board issued Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant (WTP)*, following an investigation into the safety culture of the WTP project at the Hanford site.

DOE subsequently assessed safety culture at Hanford WTP and at other locations across the complex, including the NNSA sites. NNSA also conducted a safety culture assessment of all of its federal offices and staff. The assessments consistently found significant safety culture issues. The issues found at the Pantex Plant are of particular concern.

The Board believes your leadership in this area is vital to correcting the identified issues and to establishing a strong safety culture throughout NNSA. Creating lasting changes in any organization's culture requires vision, attention, and persistent reinforcement.

Part 2 – Safety Issues at Specific NNSA Sites Hosting Defense Nuclear Facilities¹

The list of NNSA sites below is provided in alphabetical order.

Lawrence Livermore National Laboratory (LLNL):

A robust safety basis is a fundamental cornerstone of safe operations at defense nuclear facilities. On August 30, 2012, the Board identified systemic deficiencies related to the development, review, and approval of safety control strategies for nuclear operations in the Tritium Facility and the Plutonium Facility at LLNL. The Board observed that insufficient rigor and conservatism was being applied in safety basis processes at LLNL. In response to these concerns, NNSA performed reviews of the nuclear safety basis processes at both the Laboratory and the LLNL Field Office. These safety basis reviews were completed in 2013 and the results were evaluated by the Board. The Board noted that the reviews identified a number of recommendations for improvement by the Laboratory and LLNL Field Office that, if implemented over the long term, should result in improved safety of nuclear operations. The Board will continue its reviews of safety bases at LLNL, focusing on the waste storage facility in the near term, as well as overall nuclear safety basis performance at LLNL.

Los Alamos National Laboratory (LANL):

Continued dialogue with NNSA is necessary to fully resolve issues regarding adequate protection of public health and safety in the event of an earthquake affecting LANL's Plutonium Facility (PF-4). The design basis seismic accident scenario for PF-4 results in unacceptably large offsite dose consequences to the public. In Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, the Board identified the need to improve the safety posture of this facility. NNSA completed several actions to reduce consequences and developed a plan for longer-term upgrades. However, subsequent LANL analysis concluded that seismic events result in worse damage than previously believed. As currently configured, facility collapse is credible in the design basis earthquake scenario. As a result, NNSA is pursuing structural upgrades and additional seismic analysis. In September 2013, the Deputy Secretary of Energy directed that an alternate seismic analysis of PF-4 be conducted. This analysis is nearing completion and is expected to inform the appropriate path ahead for continued safe operation of the facility.

¹ The Board discussed safety issues associated with the Pantex Plant and the Y-12 Nuclear Security Complex in the letter to NNSA dated April 30, 2014. Those issues will not be repeated here.

Since 2005, NNSA has recognized that LANL's criticality safety program does not fully comply with applicable requirements. A severe staffing shortage in the Laboratory's criticality safety group in the last several years has inhibited progress in correcting the deficiencies in this program. In May 2013, the Board reviewed the criticality safety program at PF-4 and identified several new criticality safety concerns, including widespread weaknesses in conduct of operations. Subsequent to this review, Laboratory management performed an extent-of-condition assessment that found additional deficiencies in criticality safety and conduct of operations, including several instances in which operating procedures could not be executed as written. On June 27, 2013, the Laboratory Director paused all programmatic activities in PF-4. Laboratory management is in the process of resuming operations in PF-4, but has not yet settled on a path forward to address several outstanding issues, such as utilization of procedures while performing fissionable material operations, and development of compliant criticality safety evaluations that include analysis of all credible abnormal conditions. In a letter dated May 16, 2014, the Board communicated concern regarding NNSA's short-term plans for resuming operations. Given the length of time over which NNSA has struggled to address this issue, the Board remains concerned that it will be difficult for LANL to sustain the improvements in its Nuclear Criticality Safety Program over the long term. A viable Nuclear Criticality Safety Program is necessary to ensure safe operations in this key part of NNSA's plutonium strategy.

NNSA and LANL management must place priority on the resolution of identified safety basis issues and problems with engineered safety systems at the Weapons Engineering Tritium Facility (WETF). Both the Board and NNSA recognize that operations at WETF are essential to reducing the risk posed by a large inventory of legacy tritium-containing items, many of which are approaching the limits of their design life.

Area G is a limited life facility at LANL used to receive, process, store, ship, and dispose of radioactive waste. On November 19, 2012, the Board issued a letter to NNSA regarding the safety basis at Area G. In this letter, the Board noted inconsistencies between the safety basis and the objectives described in DOE standards. These inconsistencies included unanalyzed hazards and the underestimation of the calculated dose consequence of potential accidents, both of which led to an inadequate control set to protect both the public and the workers. NNSA responded on January 16, 2013, committing to resolve the majority of the Board's issues during the next safety basis update, while deferring the rest of the issues to future updates.

Nevada Nuclear Security Site (NNSS):

The Board continues to evaluate NNSA's efforts to improve operations at the National Criticality Experiments Research Center (NCERC)—efforts that NNSA began in response to a Board letter dated August 5, 2010. Areas of concern included the adequacy of the safety analysis, classification of controls, and the reliability of instrumentation and control systems. NNSA identified corrective actions for each of the Board's concerns and in FY 2013, NNSA implemented several improvements to the safety analysis and controls at NCERC. The NNSS contractor recently submitted, and the NNSS Field Office approved, the long-awaited update to the NCERC Documented Safety Analysis (DSA).

The Board and its staff have long noted deficiencies in the DAF fire suppression system at the NNSS that should be corrected before beginning more hazardous operations. NNSA

initiated a project to assess the condition of the system, analyze and prioritize needed improvements, develop improvement options, and begin improvements to the system. In FY 2013, NNSA approved a new comprehensive project plan that should address the full scope of the deficiencies. The Board remains concerned with the priority applied to execute this plan.

Sandia National Laboratories (SNL):

The Board sent a letter to NNSA dated February 28, 2012, expressing concerns related to the DSA and instrumentation and controls (I&C) in place at the Annular Core Research Reactor Facility (ACRRF) at SNL. The Board identified multiple issues with the reactor accident analyses, including a non-conservative evaluation of the reactor's experimental operating envelope. Additionally, the Board expressed concern with the reliability of I&C related to two key ACRRF safety systems. While several I&C improvements have been completed, NNSA is still evaluating the need for further improvements to the ACRRF rod control systems. Several DSA upgrades remain outstanding, including completion of a reactor accident computer code. The Board will continue to review improvements as they are developed and integrated into a revised DSA.

As conveyed in a letter dated May 12, 2014, the Board found several issues with the conduct of operations and maintenance programs at Technical Area-V at SNL. The Board communicated concern with DOE and contractor oversight of conduct of operations and maintenance programs, the quality of technical procedures, and the performance of work in accordance with technical procedures. SNL management entered the Board's findings into its internal condition reporting system and committed to a series of corrective actions, including developing an update to its conduct of operations program document. Opportunities for improvement exist in both of these programs.

Savannah River Field Office:

Tritium operations at Savannah River are an important part of NNSA's defense nuclear complex. Over the past two years, Savannah River Site (SRS) personnel have been re-evaluating the input assumptions and methodologies used to calculate the radiological dose consequences from an accidental release from facilities at the SRS. SRS personnel developed a report that tabulated the radiological dose per unit curie of source material released using the revised methodologies. Based on these results, the radiological dose consequences for SRS tritium facilities will increase by a factor of three or four to a member of the public, and by approximately a factor of seven to the collocated worker. This new analysis may result in the need for changes to the controls in the DSA, which is scheduled to be revised over the next two years.