
**EIGHTEENTH ANNUAL REPORT
TO CONGRESS**

**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

FEBRUARY 2008

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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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To the Congress of the United States:

The Defense Nuclear Facilities Safety Board is pleased to submit to Congress its Eighteenth Annual Report. The Board is an independent executive branch agency responsible for providing advice and recommendations to the Secretary of Energy, and to the President if necessary, regarding public health and safety issues at the Department of Energy's defense nuclear facilities.

As required by statute, the Board's report summarizes activities during calendar year 2007, assesses improvements in the safety of defense nuclear facilities, and identifies remaining health and safety problems.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "A.J. Eggenberger".

A.J. Eggenberger
Chairman

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John E. Mansfield
Vice-Chairman

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Joseph F. Bader
Member

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Larry W. Brown
Member

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

Peter S. Winokur
Member

PREFACE

Congress created the Defense Nuclear Facilities Safety Board (Board) as an independent agency within the Executive Branch (42 U.S.C. § 2286, *et seq.*) to identify the nature and consequences of potential threats to public health and safety at the Department of Energy's (DOE's) defense nuclear facilities, to elevate such issues to the highest levels of authority, and to inform the public. The Board is required to review and evaluate the content and implementation of health and safety standards, including DOE's orders, rules, and other safety requirements, practices, and events relating to system design, construction, operation, and decommissioning of DOE's defense nuclear facilities. The Board makes recommendations to the Secretary of Energy that the Board believes are necessary to ensure adequate protection of public health and safety. The Board is also empowered to conduct investigations, issue subpoenas, hold public hearings, and establish reporting requirements.

The Board is required by law to submit an annual report to the Committees on Armed Services and Appropriations of the Senate and to the Speaker of the House of Representatives. This report is to include all recommendations made by the Board during the preceding year, and an assessment of: (1) the improvements in the safety of DOE's defense nuclear facilities during the period covered by the report; (2) the improvements in the safety of DOE's defense nuclear facilities resulting from actions taken by the Board or taken on the basis of the activities of the Board; and (3) the outstanding safety problems, if any, of DOE's defense nuclear facilities.

During 2007, Congress directed the Board to prepare several additional reports. House Conference Report 109-702 on the John Warner National Defense Authorization Act for Fiscal Year 2007 (H.R. 5122) directed the Board and DOE to report jointly to the congressional defense committees on their efforts to improve the timeliness of issue resolution, including recommendations, if any, for legislation that would strengthen and improve technical oversight of DOE's nuclear design and operational activities. On July 19, 2007, the Board and DOE issued a joint report identifying actions to promote (1) identification of safety requirements and strategies at the conceptual and preliminary design phases of a project to avoid cost increases and schedule delays, and (2) more effective processes or protocols for the communication to DOE of issues identified by the Board and for the tracking and management of these issues. The Board and DOE are working together to accomplish these objectives.

In addition, Congress directed the Board to provide quarterly reports on the status of significant unresolved technical differences between the Board and DOE on issues concerning the design and construction of defense nuclear facilities. The Board has provided these quarterly reports as directed.

The Board is currently evaluating 25 defense nuclear facility design activities with a total project cost of about \$20 billion, including \$12.2 billion for the Hanford Waste Treatment Plant. The Board believes it is critical that outstanding safety issues associated with defense nuclear projects need to be resolved early in the design phase.

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Responses to Congressional Direction

Joint Board/DOE Report

In the Conference Report for the John Warner National Defense Authorization Act, Fiscal Year 2007, the conferees noted “their concern regarding the untimely resolution by the Department of Energy of technical issues raised by the Board.” This concern arose primarily as a result of significant cost increases and schedule delays due to the untimely resolution of technical safety issues during the design of the Waste Treatment Plant at the Hanford Site. The conferees requested that the Board and DOE report jointly on efforts to improve the timeliness of issue resolution, including recommendations, if any, for legislation that would strengthen and improve technical oversight of DOE's nuclear design and operational activities.

The report was prepared and delivered to Congress on July 19, 2007. Legislative changes were not recommended. The report described actions intended to ensure timely identification and resolution of technical issues raised by the Board:

- DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, was revised to incorporate elements that should help ensure the early integration of safety into the design process.
- DOE Manual 413 .3-1, *Project Management for the Acquisition of Capital Assets*, is being revised and converted to a series of guides to clarify the requirements of the associated DOE Order.
- A new standard, DOE-STD-1189, *Integration of Safety into the Design Process*, is being developed to specify safety-related design information required to meet the requirements of DOE Order 413.3A.
- DOE and the Board are jointly evaluating the effectiveness of DOE Order 413.3A and DOE-STD-1189 as applied to the Integrated Waste Treatment Unit at the Idaho National Laboratory and the Uranium Processing Facility at the Y-12 National Security Complex.
- DOE and the Board have reaffirmed the importance of the Board's ready access to information as described in the Board's legislation.
- The Board has begun issuing “project letters” early in the design process to apprise DOE of the status of safety issues raised by the Board.
- DOE and the Board are conducting joint periodic discussions to review the status of significant unresolved safety issues.

Quarterly Reports

In addition to the joint report, the Board has been providing Congress with quarterly reports on the status of significant unresolved safety issues at defense nuclear facilities. The Board issued four quarterly reports covering 2007, discussing activities through the end of November 2007. Highlighted in the fourth quarterly report (issued February 12, 2008) are two DOE projects facing particular difficulty: the K-Basin Closure Sludge Treatment Project at the Hanford Site (Section 4.3 below) and the Chemistry and Metallurgy Research Replacement Project at Los Alamos National Laboratory (Section 4.6 below). The Board will continue to provide Congress with information on these projects in forthcoming reports.

Summary of the Board's Accomplishments in 2007

The nuclear weapons program of the Department of Energy (DOE), which includes nuclear weapons operations conducted by the National Nuclear Security Administration (NNSA), is a complex and hazardous enterprise. Missions include maintenance of the national nuclear arsenal, dismantlement of surplus weapons, stabilization and storage of surplus nuclear materials, disposition and disposal of hazardous waste, and cleanup of surplus facilities and sites. Some of these missions are carried out with aging facilities while others demand the construction of new facilities. The constant vigilance of the Defense Nuclear Facilities Safety Board (Board) is required to ensure that all of these activities are carried out by DOE in a manner that protects the public, workers, and the environment.

During this past year, actions by the Board resulted in numerous health and safety improvements that are summarized briefly below and in more depth in the main body of the report. These improvements are described in accordance with the Board's four strategic areas of concentration: Nuclear Weapons Operations, Nuclear Materials Processing and Stabilization, Nuclear Facilities Design and Infrastructure, and Nuclear Safety Programs and Analysis.

Nuclear Weapons Operations

The Board's strategic performance goal for this area is to ensure that DOE operations directly supporting the nuclear stockpile and defense nuclear research are conducted in a manner that provides adequate protection of the health and safety of the workers and the public. The Board's safety oversight activities in this area focus on assembly and disassembly of weapons; processing and storage of uranium, plutonium, and tritium; and research, development, manufacturing, and testing.

As a result of the Board's efforts during 2007, DOE has taken actions to upgrade the safety of these activities. These actions include improving safety systems and controls in aging facilities, safe packaging of nuclear weapons materials, improving the formality of nuclear explosive and nuclear processing operations, enhancing the quality of engineered safety systems, and correcting deficiencies in the safety bases for new and ongoing activities. Specific examples of safety improvements in weapons operations made by DOE in consequence of the Board's work are given below. (The "Sections" cited provide additional discussion of the subject matter.)

Pantex Plant (Sec. 2.1.1):

- NNSA gathered subject matter experts from Pantex and the nuclear weapons laboratories to evaluate and disposition potential lightning protection issues. (Board letter dated March 30, 2007)
- NNSA improved the quality of procedures for nuclear explosive operations. (Board letter dated April 24, 2007)
- NNSA completed two of five overdue Nuclear Explosive Safety Master Studies and developed a schedule for completing the other three. (staff-to-staff meetings)

- NNSA issued a letter clarifying its expectation that facility safety documentation for an activity being started or restarted be implemented and approved prior to beginning readiness assessments or reviews. (Board letter dated July 16, 2007)
- NNSA instituted changes in its process to ensure that potential inadequacies in documented safety analyses are identified and declared in a timely manner. (Board letter dated July 30, 2007)
- NNSA developed a process to ensure proper closure of post-start findings and a plan and schedule to close 45 open post-start findings from prior nuclear explosive safety evaluations. (staff-to-staff meetings)
- NNSA is developing new manuals governing nuclear explosive safety. (staff-to-staff meetings)
- NNSA required the nuclear weapon design agencies to develop expert elicitation processes¹ and committed to assess their adequacy in actual use. (Recommendation 98-2; Board letter dated May 10, 2007)

Y-12 National Security Complex (Sec. 2.1.2):

- NNSA formed an assessment team and formulated a plan for performing regular assessments of the safety of continued operations in the aging 9212 Complex. (Board letter dated March 13, 2007)
- NNSA assigned a project manager and deployed additional resources to evaluate process systems and equipment to support nuclear criticality safety needs. (staff-to-staff meetings)
- NNSA evaluated and is revising engineering protocols to require independent design reviews for all new nuclear process equipment and safety systems. (staff-to-staff meetings)
- NNSA improved conduct of operations through additional training on disciplined operations and conservative decision-making. (staff-to-staff meetings)
- NNSA developed protocols restricting opening legacy material containers in an air environment (a fire hazard) without first conducting a formal hazard analysis. (staff-to-staff meetings)
- NNSA took actions to reinforce formality of operations in wet chemistry operations, and to reduce the inventory of uranium-bearing solutions. (staff-to-staff meetings)

¹ "Expert elicitation" is a formal, highly structured, and well-documented process whereby expert judgments, usually of multiple experts, are obtained.

Savannah River Site (Sec. 2.1.3):

- NNSA instituted changes to invigorate the work of the site's Corrective Action Review Board for tritium facilities. (staff-to-staff meetings)

Los Alamos National Laboratory (Sec. 2.2.1):

- NNSA bolstered efforts to disposition transuranic waste in Area G, particularly containers with the highest radioactive inventories. (Board letter dated January 18, 2007)
- NNSA took actions to strengthen federal oversight, implement safety programs, and reduce inventories of plutonium-238 residues. (Board letter dated February 1, 2007; public hearing, December 5, 2007)
- NNSA began an analysis of the risk of continued operations in the 55-year-old Chemistry and Metallurgy Research facility beyond the previously accepted end-of-life date of 2010. (Board letter dated October 23, 2007)
- In response to criticality safety inadequacies, the contractor suspended fissile material operations throughout the Plutonium Facility and established a process to reassess all criticality limits. (Board letter dated September 10, 2007; staff-to-staff meetings)
- NNSA committed to reinvigorate integrated nuclear planning to ensure that infrastructure and services will be adequate for increased pit production. (staff-to-staff meetings)

Lawrence Livermore National Laboratory (Sec. 2.2.2):

- NNSA developed controls, implemented a process, and safely dispositioned a legacy item with unique hazards. (staff-to-staff meetings)
- NNSA is developing a configuration management system for vital safety systems. (Recommendation 2000-2; staff-to-staff meetings)
- NNSA directed increased management attention to operations involving special nuclear material and developed a formal process to evaluate safety-related events. (staff-to-staff meetings)

Nevada Test Site (Sec. 2.2.3):

- NNSA is carrying out corrective actions to assure the reliability of vital safety systems at the Device Assembly Facility. (Board letter dated November 28, 2005; staff-to-staff meetings)
- NNSA is evaluating the strength of the existing concrete structure for the Device Assembly Facility and is developing an *in situ* procedure to characterize the strength of

concrete in cracked portions of the facility. (Board letter dated March 18, 2005; staff-to-staff meetings)

Sandia National Laboratories (Sec. 2.2.4):

- NNSA completed implementation of a safety basis improvement project. (staff-to-staff meetings)
- NNSA completed near-term actions to correct deficiencies in integrated safety management. (staff-to-staff meetings)

Nuclear Materials Processing and Stabilization

The Board continued to review the substantial efforts of DOE to stabilize remnant materials from past nuclear facility operations, packaging and storage of those materials, and final disposition in approved waste repositories. The Board also monitored DOE's efforts to decontaminate and decommission retired nuclear facilities. DOE is attempting to stabilize liquid high-level radioactive wastes, spent nuclear fuel, inactive special nuclear materials (which include uranium and plutonium), low-level wastes, and transuranic wastes. The Board's reviews in this area focused on specific issues at individual facilities as well as safety topics with broad implications across DOE's defense nuclear complex. Specific examples of safety improvements made by DOE in response to the Board's actions are given below.

Complex-Wide Safety Issues:

- DOE issued a new standard, DOE-STD-5506-2007, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*, providing guidance for enhanced and consistent safety controls during transuranic waste retrieval, characterization, shipping, and disposal operations. (Board letter dated January 29, 2007; Sec. 3.3.2)
- DOE began consolidation of plutonium-239 materials by making shipments of these materials from Hanford and Lawrence Livermore to Savannah River. (staff-to-staff meetings; Sec. 3.1.1)
- DOE approved implementation plans for the consolidation and disposition of surplus plutonium-239 and disposition of uranium-233. (staff-to-staff meetings; Sec. 3.1.1)

Hanford Site (Sec. 3.2.1, 3.3.1, 3.3.2):

- DOE completed the transfer of all sludge out of K-East basin, allowing that facility to undergo deactivation and demolition. Sludge in K-West Basin has been containerized. (Recommendation 2000-1)
- DOE conducted several investigations of the radioactive waste spilled from Tank S-102 and began implementation of corrective actions to prevent and mitigate spills. (Site Representative Weekly Reports)

Savannah River Site (Sec. 3.1.3, 3.3.1):

- DOE completed construction, startup testing, and integration of the Actinide Removal Process and the Modular Caustic Side Solvent Extraction Unit, which taken together constitute a pilot facility for salt waste processing. (Recommendation 2001-1)
- DOE reversed the downward trend in conduct of operations and emergency preparedness at H-Canyon and strengthened training on a site-wide basis. (Site Representative Weekly Reports)
- DOE completed a major revision to the Life-Cycle Liquid Waste Disposition System Plan. (Recommendation 2001-1)

Oak Ridge National Laboratory (Sec. 3.1.3):

- DOE approved the preliminary design of the U-233 Downblending and Disposition Project and committed to address the Board's comments on the project's design and safety basis. (Board letter dated September 14, 2007)

Los Alamos National Laboratory (Sec. 3.1.2):

- DOE stabilized 50 percent of weapons grade plutonium, 90 percent of non-weapons grade plutonium, and 50 percent of material in the Recovery Evaluation Process. (Recommendation 2000-1)

Nuclear Facilities Design and Infrastructure

The Board's strategic performance goal for this area is to ensure that new defense nuclear facilities and major modifications to existing facilities are designed and constructed in a manner providing adequate protection of the health and safety of workers and the public. In the past few years, the number of design and construction projects under the Board's jurisdiction has substantially increased. DOE has undertaken design and construction projects with a projected total cost of about \$20 billion. The Board continues to devote extensive resources to ensure that safety is integrated early in the design process and that designs for defense nuclear facilities incorporate multiple layers of safety controls commensurate with the hazards. Specific examples of safety improvements in design and infrastructure accomplished as a result of the Board's work are given below.

Hanford Site (Sec. 4.3):

- Waste Treatment Plant: DOE completed its seismic borehole project and successfully validated seismic design ground motion criteria. (Board letter dated October 17, 2005)
- Waste Treatment Plant: DOE developed a sound technical basis to assess hydrogen hazards; this technical basis includes new design criteria and administrative controls. (Board letter dated October 17, 2005)

- Demonstration Bulk Vitrification Project: DOE improved the confinement strategy for this facility. (Board letter dated September 7, 2005)
- K-Basin Closure Project: DOE returned the Sludge Treatment Project to the conceptual design stage. (Board's Quarterly Report to Congress dated February 17, 2007)

Savannah River Site (Sec. 4.4):

- Salt Waste Processing Facility: structural design expertise and DOE oversight have now been brought to bear on the project. Geotechnical requirements have been finalized, and changes to the structural design and the analysis methodology have been made. Corrective actions were also taken to address deficiencies in the quality assurance program. (Board letter dated January 10, 2007)
- Salt Waste Processing Facility: DOE developed a sound technical basis for determining hydrogen generation rates and used this basis to construct controls for certain generation mechanisms. DOE also proposed to test the effects of thermolysis on hydrogen generation rates. (teleconference, December 12, 2007)
- Container Surveillance and Storage Capability project: nuclear incident monitors will be incorporated into the design of the project. (Board letter dated January 29, 2007)

Y-12 National Security Complex (Sec. 4.5):

- Uranium Processing Facility: DOE enhanced safety in design early in the project, allowing the Board to identify safety concerns with the conceptual design as the design matured. The Board issued a project letter highlighting its safety concerns; DOE committed to resolve each of these concerns. (Board letter dated August 9, 2007)
- Highly Enriched Uranium Materials Facility: NNSA identified near-term actions to increase the reliability of the water supply system for fire suppression, and is evaluating long-term improvements for the system. (Board's Quarterly Report to Congress dated October 17, 2007)

Idaho Cleanup Project (Sec. 4.7):

- Integrated Waste Treatment Unit: DOE increased waste sampling to ensure radionuclide inventories are conservative and completed investigation of an over-temperature event in the pilot plant's charcoal bed. (Board letter dated Jan. 24, 2007)
- Integrated Waste Treatment Unit: DOE developed technically sound geotechnical, soil-structure interaction, and structural analyses to ensure that the facility will meet imposed seismic demands. (staff-to-staff discussions)

Nuclear Safety Programs and Analysis

The Board's strategic performance goal for this area is to ensure that DOE develops, maintains, and implements regulations, contract requirements, guidance, and safety programs that ensure adequate protection of the health and safety of workers and the public. The Board's oversight activities in this area focus on generally applicable safety standards and on issues affecting a variety of defense nuclear facilities. As a result of the Board's efforts during 2007, DOE has taken actions to strengthen the technical competence of its federal employees, to establish and implement safety standards, and to improve the effectiveness of confinement ventilation systems. DOE has also taken measures to enhance the effectiveness of oversight and integrated safety management. Specific examples of improvements in nuclear safety programs and analysis made in consequence of the Board's work are given below.

- DOE fully implemented the Central Technical Authorities function, with associated technical support staff managed by the Chief of Defense Nuclear Safety for NNSA and the Chief of Nuclear Safety for the remainder of DOE. (Recommendation 2004-1; Sec. 5.1.2)
- DOE created an Integrated Safety Management Champions Council responsible for reinvigorating this program in the complex. (Recommendation 2004-1; Sec. 5.1.2)
- DOE evaluated more than two dozen nuclear facilities' ventilation systems and identified areas where physical modifications are necessary. (Recommendation 2004-2; Sec. 5.3.2)
- DOE has incorporated former facility representatives into its integrated project teams, with noticeable success for the Highly Enriched Uranium Materials Facility at Y-12 National Security Complex and the Waste Treatment and Immobilization Plant at Hanford. (Recommendation 2004-1; Sec. 5.4.3)
- DOE strengthened its directives for oversight of complex, high-hazard nuclear operations and made progress towards implementing new requirements in the complex. (Recommendation 2004-1; Sec. 5.1.2)
- DOE developed Integrated Safety Management System Descriptions for each of the program offices, defining the management system these offices will use to perform work safely. (Recommendation 2004-1; Sec. 5.1.2)
- DOE significantly increased the number of federal personnel who have completed or are in the process of completing their qualifications under an enhanced Technical Qualification Program. (Recommendation 2004-1; Sec. 5.4.1)
- DOE developed and issued supplemental guidance for DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports, Change Notice 1*, to address implementation issues identified by the Board. (Board letter dated June 26, 2006; Sec. 5.2.4)

Outstanding Safety Problems of Defense Nuclear Facilities

Integration of Safety into the Design of New Defense Nuclear Facilities

One of the Board's strategic performance goals is to ensure that new defense nuclear facilities are designed and constructed in a manner providing adequate protection of the health and safety of the workers and the public. For the past several years, the Board has made a concerted effort to ensure that its review of new design projects focuses on early recognition and resolution of safety issues.

Beginning in late 2005, the Board initiated a series of public hearings concerning integration of safety into the design process. The third public hearing, held on March 22, 2007, addressed early identification of safety issues, communication of issues to DOE, issue management, and timely resolution and closure. The Board also collected information regarding the implementation of DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, the development of DOE-STD-1189, *Integration of Safety into the Design Process*, and lessons learned from incorporating safety into the design of two major DOE projects: the Waste Treatment Plant at Hanford and the Chemistry and Metallurgy Research Replacement Project at Los Alamos.

Consistent with commitments made in a report to Congress prepared jointly by the Board and DOE (*Improving the Identification and Resolution of Safety Issues During the Design and Construction of DOE Defense Nuclear Facilities*, July 19, 2007), quarterly meetings are held between members of the Board's staff and their DOE counterparts. The Board also maintains a dialog with senior DOE and NNSA management on a monthly basis to ensure that issues receive the required senior DOE management attention. The Board has initiated the practice of sending to DOE a "project letter" identifying from the Board's point of view the safety issues that should be resolved at various stages of the design. These actions all have the same purpose: to ensure that DOE's senior decision makers have a clear understanding of the Board's concerns when projects are reviewed at authorization or critical decisions.

To ensure continued compliance in 2008 and beyond, DOE must implement the revised directives that were developed as part of the safety-in-design initiative.

Safety-Related Research and Development

In accordance with the implementation plan for Recommendation 2004-1, the Secretary of Energy directed the Assistant Secretary for Environment, Safety and Health to create an Office of Nuclear Safety Research and to implement an aggressive nuclear safety research program. By October 2005, the Office of Nuclear Safety Research had been created with a full time director and staff. Twenty-three proposals were initially solicited and evaluated by an expert panel. However, DOE was unable to reprogram funds; as a result, the Office of Nuclear Safety Research became temporarily inactive and these initial efforts to establish a nuclear-safety research program were lost. DOE subsequently revised the implementation plan and shifted responsibility for management of nuclear safety research to NNSA, effective October 1, 2006. Since that time, very little has been accomplished. NNSA has not provided documented evidence

of significant efforts to identify its nuclear-safety research needs or to create an office with specific staff consistent with requirements in its revised implementation plan.

The Board remains steadfast in its belief that research in nuclear safety is essential and should be carried out by DOE. Such research can be directed at many worthy safety objectives, among them reducing uncertainties in safety analyses, validating analytical models and methods, improving operating practices, and advancing the fundamental understanding of nuclear safety science and technology. DOE has already identified a variety of specific nuclear safety research projects, thirteen of which are listed below. The Board believes these projects need to be funded and executed.

1. Deflagration/Detonation of Hydrogen/Volatile Organic Compounds in Nuclear Waste Drums, Pipes, and Vessels Containing Nuclear Materials
2. Fire Hazard and Potential Nuclear Material Damage Ratios, Airborne Release Fractions, Respirable/Non-Respirable Fractions and Facilities Leak Path Factors in Fire Initiated Accident Scenarios
3. Characterizing Overpressurization Failures of 3013 Containers Holding Powder Plutonium
4. Standardized and Vetted Approach to Analysis of Common Accidents for Nuclear Safety Analyses
5. Measurement of Leak Path Factors and Comparison with Nuclear Safety Analysis Toolbox Code-Predicted Results
6. Leak Path Factors for Seismically Damaged Reinforced Concrete Structures of Nuclear Facilities
7. Long-term Storage of Nuclear Material in Type B Containers
8. Fire Integrity of Glove Box Vision Panels
9. Tritium Oxidation Fraction During Representative Accident Scenarios
10. Water Mist Fire Suppression Applications in Nuclear Facilities
11. Effectiveness of Automatic (Fire) Sprinklers in High Bay Areas in Nuclear Facilities
12. Liquid Nuclear Waste Releases from Tanks and Pipes
13. Incident Response Times for Fire Emergency Responders to Nuclear Facilities

Reinvigorating Integrated Safety Management

In 1995, the Board issued Recommendation 95-2, urging DOE to integrate work planning and safety planning more effectively. The methodology that evolved from this recommendation and from DOE's implementation plan is termed *integrated safety management*. Integrated safety management is a structured, comprehensive, common-sense approach to performing work safely. Through integrated safety management, the Board has encouraged DOE to identify and implement a comprehensive set of measures, e.g. engineered and administrative controls, to protect the public, workers, and the environment from nuclear, chemical, and physical hazards.

In 2001, DOE achieved a major goal in its commitment to integrated safety management by verifying through comprehensive assessments that the basic elements of integrated safety management had been implemented at defense nuclear facilities. This was a commendable achievement. Over the next three years, however, implementation faltered. In Recommendation 2004-1, the Board identified the need to reinvigorate integrated safety management through technical and operational excellence based on nuclear safety standards subjected to rigorous

oversight. DOE's implementation plan of June 2005 and its subsequent revision in October 2006 contained three major thrusts, one of which directly addresses integrated safety management.

In 2006, the Board closed Recommendation 95-2 after determining that the Recommendation 2004-1 implementation plan and the recently-issued *Integrated Safety Management System Manual* contain the actions necessary to reinvigorate the program. While progress was made in 2007, issues remain with various elements of implementation of integrated safety management, including activity level work planning and control, federal oversight of contractor work, and the establishment of a viable, safety-related research and development function. Overseeing DOE's implementation and reinvigoration of integrated safety management will continue to be a major focus of the Board's work in 2008.

Safe Retrieval, Handling, and Stabilization of Nuclear Materials

At both Hanford and Savannah River, DOE is responsible for the safe storage and handling of tens of millions of gallons of high-level waste in tanks that have exceeded their original design lives. While DOE has taken action to prolong the lives of the tanks, high liquid levels in the tanks continue to make transfers and treatment operations difficult. Waste spills, such as the spill at Hanford's Tank S-102 in July 2007, have threatened the safety of workers and the environment. The investigation of the S-102 spill identified several programmatic deficiencies. DOE is implementing corrective actions at Hanford and Savannah River to prevent or mitigate potential future waste leaks or mistransfers.

The Board continues to provide close oversight of DOE's efforts to safely retrieve, treat, and dispose of high-level wastes, spent fuel sludges, inactive actinides, and transuranic wastes. Many of these activities present significant programmatic and safety challenges to DOE. For example, the project to retrieve radioactive sludges from the K-Basins at the Hanford Site has experienced many delays and cost overruns during the past decade. DOE has isolated the sludge in containers in K-West Basin to prevent release to the environment but faces new challenges in safely treating the sludge in a timely fashion.

Until recently, investments in the H-Canyon and HB-Line facilities and supporting infrastructure were minimized because these facilities were expected to be shut down and deactivated following the stabilization of hazardous materials detailed in Recommendation 94-1. The Board believes an extended mission for these facilities through 2019 is acceptable from the safety standpoint, provided certain upgrades are made. The Board has encouraged DOE to expand the focus of facility system health reports from near-term operations to the full anticipated life cycle. DOE must ensure that adequate funding is provided to cover the cost of necessary H-Canyon and HB-Line upgrades.

Report to Congress

1. Introduction

This Annual Report summarizes the Board's work during calendar year 2007. Section 1 summarizes the Board's mission, oversight strategy, and strategic plan. Sections 2, 3, 4, and 5 describe progress in the four major areas of the Board's operations: Nuclear Weapons Operations, Nuclear Materials Processing and Stabilization, Nuclear Facilities Design and Infrastructure, and Nuclear Safety Programs and Analysis. Section 6 explains the Board's interactions with the public and reports on administrative matters. Appendix A reprints the Board's Recommendation 2007-1, Appendix B lists all recommendations cited in this report, Appendix C lists all reporting requirements imposed on DOE in 2007, and Appendix D contains a full list of the Board's 2007 correspondence.

1.1 Mission

The Defense Nuclear Facilities Safety Board is an independent federal agency established by Congress in 1989. The Board's mandate under the Atomic Energy Act is safety oversight of nuclear weapons facilities managed by the Department of Energy. The nuclear weapons program remains a complex and hazardous operation. DOE must maintain in readiness a nuclear arsenal, dismantle surplus weapons, dispose of excess radioactive materials, maintain aging facilities, clean up surplus facilities, and construct new, complex, one-of-a-kind, high-hazard facilities for many purposes. All of these functions must be carried out in a manner that protects the public, workers, and environment.

Congress established the Board as an independent agency to provide sound technical safety oversight of DOE's defense nuclear weapons facilities and operations. For that reason, the Board is composed of respected experts in the field of nuclear safety. The Board has, in turn, assembled a permanent staff with broad experience and competence in all major aspects of safety.

The Board has established site offices at six high-priority defense nuclear sites: Pantex Plant in Texas, Los Alamos National Laboratory in New Mexico, Y-12 National Security Complex in Tennessee, Savannah River Site in South Carolina, Hanford Site in the State of Washington, and Lawrence Livermore National Laboratory in California (temporarily vacant). The site offices provide the Board with a continuous presence and oversight at these locations. At other locations, the Board maintains safety oversight by means of regular onsite reviews by members of its technical staff.

During the Board's 18 years of operation, its priorities have evolved with changes in the nuclear weapons program. The Board uses its Strategic Plan, required by the Government Performance and Results Act, to ensure that its limited resources remain focused on the most significant health and safety challenges and keep pace with shifts in those challenges from year to year. The Board's health and safety oversight activities are closely tied to goals and objectives embodied in this plan.

1.2 Oversight Strategy

Maintaining an effective safety oversight program that fulfills the broad mandates of the Board's enabling legislation requires continuing reassessment of health and safety conditions throughout DOE's defense nuclear complex. The Board concentrates its resources on the most hazardous operations and complex safety issues, guided by its Strategic Plan and the following principles:

Oversight Role - As an oversight but not a regulatory agency, the Board uses a variety of statutory powers to ensure adequate protection of the public and worker health and safety. While the Board is empowered to identify current and potential safety problems and to recommend solutions, DOE remains responsible for taking actions based on the Board's insights.

Risk-Based Oversight - The Board's safety oversight activities are prioritized predominantly on the basis of risk to the public and workers, types and quantities of nuclear and hazardous material at hand, and hazards of the operations involved.

Technical Expertise - The Board has endeavored since its inception to ensure that DOE obtains and maintains the high level of technical expertise essential to the management of nuclear activities.

Line Management - Primary responsibility for safety resides in DOE and contractor management. Safety oversight can reinforce but not substitute for the commitment of line management and workers to safe work planning and performance.

Clear Expectations - Effective safety management demands that safety expectations be clearly defined and tailored to hazards existing in the workplace. Work instructions that are clear, succinct, and relevant to the work are more likely to be embraced by workers.

Effective Transition Planning - The Board's safety oversight of defense nuclear facilities is coordinated with other federal agencies and with state governments to ensure a smooth transition from facility construction and startup to deactivation and decommissioning to environmental regulation.

The Board is provided by statute with a number of tools to carry out its mission. Among these are recommendations (typically broad and comprehensive in nature), reporting requirements (focused on specific safety issues), and public hearings (used to obtain information from DOE, other expert sources, and the public at large). Since 1989 when the Board began operations, it has issued 50 formal recommendations, comprising 225 individual sub-recommendations. In that same period of time, the Board has issued 196 reporting requirement letters and held 96 public hearings.

1.3 Strategic Plan

The Board organizes its safety work by merging the broad health and safety mandate of its statute with the requirements of the Government Performance and Results Act. The Board's

Strategic Plan identifies the serious hazards of handling nuclear weapons and weapons materials, and disposing of aging and surplus facilities. These hazards include:

- Tons of radioactive and toxic materials throughout the defense nuclear complex, some stored in an unstable state.
- Aging facilities that require ever-increasing maintenance and surveillance to assure safety.
- Accidental releases caused by inadequate safety controls, human errors, equipment malfunctions, chemical reactions, building fires, detonations, and criticality events.
- Natural phenomena such as wildfires, earthquakes, extreme winds, floods, and lightning.

Given these hazards, safety can be assured by the adoption of a conservative engineering philosophy that hinges on reliable systems and multiple layers of protection. This concept is called “defense in depth,” and it has been a precept of nuclear safety in the United States for many decades. Defense in depth is especially important with respect to the handling of high explosives in proximity to radioactive material.

The Board’s Strategic Plan sets forth four general goals:

- *Nuclear Weapons Operations*: Operations that directly support the nuclear stockpile and defense nuclear research are conducted by DOE in a manner that ensures adequate protection of the health and safety of workers and the public.
- *Nuclear Materials Processing and Stabilization*: Processing, stabilizing, and disposing of hazardous nuclear materials are performed by DOE in a manner that ensures adequate protection of the health and safety of workers and the public.
- *Nuclear Facilities Design and Infrastructure*: New defense nuclear facilities and major modifications to existing facilities are designed and constructed by DOE in a manner that ensures adequate protection of the health and safety of workers and the public.
- *Nuclear Safety Programs and Analysis*: Regulations, requirements, guidance, and safety management programs adequate to protect public health and safety, including workers, are developed and implemented by DOE.

2. Nuclear Weapons Operations

2.1 Safe Conduct of Stockpile Management

Stockpile management refers to the industrial aspects of maintaining the nation's nuclear weapons stockpile. Examples of the Board's activities to improve health and safety in stockpile management are discussed in the following subsections.

2.1.1 Pantex Plant

The Pantex Plant, located near Amarillo, Texas, serves a central role in stockpile management. Operations at the site include assembly, disassembly, dismantlement, and surveillance of weapons, as well as interim storage of special nuclear material removed from retired weapons. In 2007, the Board sought health and safety improvements in areas such as weapons operations and procedures, the Pantex safety basis, readiness for nuclear explosive operations, lightning protection, and requirements for the evaluation of weapon response to external stimuli.

Conduct of Operations. The Board issued a letter in May 2005 identifying deficiencies in the conduct of nuclear explosive operations at Pantex. In a March 2006 letter, the Board re-emphasized the importance of a consistently high degree of formality in the conduct of nuclear explosive operations. After a followup review in 2007, the Board noted in a letter dated April 23, 2007, that slow but continued improvement had been made to correct deficiencies identified in the May 2005 letter. However, the Board observed that staffing levels for safety oversight of nuclear explosive operations have dropped dramatically. The Board also observed a lack of consistency in the formality of operations among work crews. Since the review, NNSA has increased the number of safety oversight personnel and will continue to search for personnel until staffing reaches an acceptable level.

Procedures. In a letter dated April 23, 2007, the Board provided examples of inadequacies in technical procedures for nuclear explosive operations at Pantex and noted that improvements are needed in the process for procedure development, review, validation, and configuration management. In its letter, the Board requested that NNSA identify specific measures to improve the quality of technical procedures at Pantex. In response to the Board's letter, NNSA is taking measures to improve flowdown of safety-related requirements into procedures, the procedure validation process, and the level of detail in technical procedures.

Safety Basis. In a letter dated July 30, 2007, the Board identified several faults in Pantex safety basis actions and documentation, including inadequate treatment of beyond-design-basis accidents, inadequate level of detail in some technical safety requirements, and systematic lack of timeliness in declaring potential inadequacies and taking corrective actions when new information is identified. The Board also noted in its letter that NNSA had lost configuration control of the safety basis. NNSA is addressing the first two issues in the annual updates to the safety basis. In response to the third issue, NNSA is changing its process for handling emerging information to ensure that a potential inadequacy in the documented safety analysis will be declared in a timely manner when appropriate. NNSA admits the loss of configuration control of the Pantex safety basis and has developed a project plan to remedy the problem.

W76-1 Startup Activities. In a letter dated July 16, 2007, the Board expressed its concern regarding NNSA's willingness to deviate from its requirements and typical good practices in response to growing production demands. Specifically, the readiness activities for W76-1 operations could not be performed with the expected level of rigor in the time frame specified by NNSA. The Board pointed out in its letter that both the Nuclear Explosive Safety Study and the contractor readiness assessment for W76-1 assembly operations were conducted without an approved safety basis in place. In the case of the Nuclear Explosive Safety Study, the safety basis is a primary source of information for study participants. For a contractor readiness assessment, the maturity of the safety basis is an indicator of the level of readiness of the operation in question. Without an approved safety basis in place, the contractor readiness assessment for W76-1 assembly operations was used to achieve readiness rather than verify it. NNSA thereafter issued guidance stating that facility safety documentation for an activity being started or restarted should be implemented and approved prior to beginning the contractor readiness review for that activity (Memorandum, Ostendorff to Schoenbauer, "Startup and Restart of Nuclear Facilities," September 27, 2007).

W80 Nuclear Explosive Safety Study. The Board evaluated the Nuclear Explosive Safety Study for W80 disassembly and inspection operations to determine whether effective corrective actions were taken in response to the Board's July 16, 2007, letter on the W76-1 startup preparations. For the W80, NNSA delayed the commencement of the Nuclear Explosive Safety Study until all safety documentation was complete and approved, thereby addressing the central concern in the Board's letter. The Board observed that the W80 disassembly and inspection operations were well engineered, and the Nuclear Explosive Safety Study report did not contain any adverse findings. The Board noted, however, that several safety-related concerns identified by the Nuclear Explosive Safety Study were captured as "deliberation topics" rather than as findings, resulting in no assurance that corrective actions will be fully implemented.

Lightning Protection. The Board has worked with NNSA for the last several years to minimize the potential lightning threat to nuclear explosive operations. During this time, NNSA applied resources to understand and mitigate the potential threat from *direct* lightning effects. The Board issued a letter on March 30, 2007, identifying work needed to mitigate the *indirect* effects of a lightning strike. NNSA responded by forming the Nuclear Weapons Complex Lightning Committee to analyze these hazards. The committee's efforts currently are directed towards establishing appropriate input parameters for a gross analysis of the indirect lightning threat. Future efforts are expected to refine this analysis by adding more detailed facility configurations. The committee also plans to analyze the hazard of lightning-induced concrete spalling and induced voltages on wires used to electrically bond metallic penetrations to facility rebar.

Quality of Safety-Related Information. Commitment 4.2.2 in the implementation plan for Recommendation 98-2 mandates that NNSA issue further guidance on how weapon response is to be analyzed and documented. NNSA intended to meet this commitment with the issuance of DOE-NA-STD-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*. This standard offers expert elicitation, expert judgment, and peer review processes as means of improving the quality and consistency of safety-related information provided to Pantex by the design agencies. The Board issued letters on December 15, 2006, and May 10, 2007, requesting NNSA's expectations for the implementation of these processes because follow-up reviews by

the Board found no clear plan. The Board also requested NNSA's plan and criteria for review and approval of the processes once they have been implemented. In response to the Board's letters, NNSA held a workshop on July 16, 2007, to clarify its expectation that the design agencies develop processes for expert elicitation, expert judgment, and peer review by the end of fiscal year 2007. NNSA has developed criteria for review and approval of these processes and is currently performing a review of design agencies' procedures.

Nuclear Explosive Safety. In response to a commitment made to the Board in 2005, NNSA conducted a comprehensive top-down review of its nuclear explosive safety directives to determine if existing requirements are being implemented effectively, and to propose improvements to the requirements for ensuring the safety of nuclear explosive operations. During 2007, NNSA completed, or nearly completed, implementation of most of the open recommendations from the top-down review, including the following accomplishments:

- Consolidated Master Study guidance and other requirements from sources such as DOE-STD-3015, *Nuclear Explosive Safety Evaluation Process*, Supplemental Directives, Technical Business Practices, and Engineering Procedures into draft Manuals 452.2-1, *Nuclear Explosive Safety Manual*, and 452.2-2, *Nuclear Explosive Safety Evaluation Processes*.
- Accepted the need for expiration dates in Nuclear Explosive Safety Studies.
- Completed a Nuclear Explosive Safety Master Study schedule and finished two of the five overdue Master Studies in 2007.
- Developed a process for validation of nuclear explosive safety evaluations and incorporated it into draft Manual 452.2-2.
- Developed a process to ensure proper closure of post-start findings, incorporated it into draft Manual 452.2-2, and developed a plan and schedule to close the 45 currently open post-start findings.
- Revised the nuclear explosive safety change control process for contractor-approved changes and incorporated it into draft Manual 452.2-2.
- Clarified the process for final approval of Nuclear Explosive Safety Study reports and captured the specific process steps, such as management briefings and concurrence into draft Manual 452.2-2.

Draft Manual 452.2-2 is currently in the directives comment resolution process. The Board provided numerous comments on this new directive late in 2007. Many of the comments are substantial and resulted from an independent review of the nuclear explosive safety process begun by the Board in 2007.

2.1.2 Y-12 National Security Complex

The Y-12 National Security Complex is a manufacturing facility located in Oak Ridge, Tennessee. Stockpile management activities at Y-12 include production, maintenance, refurbishment, dismantlement, evaluation, and storage of certain components of nuclear weapons. The Board's most recent efforts to improve safety at Y-12 include the following operations and projects.

Enriched Uranium Operations. The 9212 Complex at Y-12 is a collection of superannuated structures built between 1947 and 1958 for processing highly enriched uranium. NNSA has identified numerous structural deficiencies that prevent the 9212 Complex from meeting current requirements for Hazard Category 2 nuclear facilities. In addition, other aging facility components continue to deteriorate and increase operational safety risk. In response to the Board's letters issued April 20 and November 28, 2005, NNSA attempted to identify facility improvements necessary to ensure safe operations. These improvements were mainly aimed at improving operational reliability to achieve reduction in material at risk.

By May 2007, NNSA made some progress by completing structural upgrades to 9818, a small portion of the 9212 Complex. However, NNSA has not made significant progress in reducing material inventories or making other needed upgrades.

In a letter dated March 13, 2007, the Board noted that it is likely that the 9212 Complex will continue to operate for 15 or more years because its replacement is currently in the early stages of design. However, the current list of necessary facility improvements does not provide upgrades needed to operate the complex for an extended period. The Board advocated a regimen of increased vigilance and close observation to regularly assess the physical condition of the 9212 Complex as a means of ensuring reliable and safe operation while the proposed replacement facility, the Uranium Processing Facility, is being designed and constructed. To this end, the Board requested an annual report and briefing on the safety of operations at the 9212 Complex. NNSA has formed an assessment team and briefed the Board in October 2007 on its plans for carrying out these annual assessments.

Conduct of Operations. In late 2006, the Board urged NNSA to consider special action to achieve consistent, disciplined operations in Y-12's nuclear facilities. In several operational events, the Board noted a lack of proper adherence to procedures or non-conservative decision making by operations personnel upon encountering unanticipated conditions. In 2007, NNSA implemented an improvement initiative that included reinforcement training given by senior management on disciplined operations and conservative decision making. While overall improvement was evident in 2007, certain events at Y-12 indicated the need for additional action. NNSA determined that training on conduct of operations is needed on a periodic basis. At year's end, NNSA was developing protocols for periodic training.

Operational Configuration Tracking. The Board found that, although facility operations management at Y-12 maintains status information for general nuclear facility and safety systems, other system information (e.g., tank levels, valve alignments, pending surveillances) was not tracked and readily available for use by production crew management. In response, NNSA initiated protocols to track information in certain major systems for chemical

processing of enriched uranium. Deliberate tracking and use of this information by production crews has proven beneficial to the planning and execution of day-to-day operations.

Processing of Legacy Materials. In September 2006, a small fire occurred during an operation at Y-12 to open and inspect in air a container of uranium metal items that had not been opened in more than 30 years. In 2007, the Board found that corrective actions resulting from the fire did not provide adequate control of operations to open such legacy containers in a non-inert atmosphere. In response, NNSA committed to performing a hazard analysis before opening such legacy containers in an air environment.

Administrative Controls. In a letter dated July 30, 2007, the Board questioned the lack of safety classification of monitoring and alarm equipment supporting an administrative control to maintain glovebox oxygen concentration to less than two percent. In response, NNSA issued a safety evaluation report that called for upgrading the equipment to safety-significant and completing a design adequacy review. The design adequacy review, completed in November of 2007, contains a recommendation to install a backup power system to improve system reliability. NNSA has established a compensatory measure (daily functional response test) to ensure system reliability while plans for a system upgrade are evaluated.

Conduct of Engineering. In 2005, NNSA discovered that the design of a new vessel for blending enriched uranium would not prevent a criticality in a water intrusion scenario. A design change was necessary. In 2006, the Board found that NNSA's corrective actions were inadequate. NNSA evaluated its engineering protocols in 2007, and at year's end was revising the protocols to require independent design reviews for all new nuclear process equipment and safety systems.

Uranium Holdup. In 2006, NNSA discovered problems with detecting and controlling uranium accumulations in process systems and equipment. To correct these problems, NNSA undertook a program involving application of appropriate design changes, routine monitoring, and periodic cleanout. The initial activity under the new program was to review fissile material activities that rely on holdup surveys; by late 2007, NNSA had made little progress towards completing these initial reviews. Following an inquiry from the Board, NNSA designated a project manager and deployed additional resources to complete these reviews by early 2008.

New Glovebox Project. The Board reviewed the design and safety basis for the new glovebox project prior to Critical Decision 3B approval. When complete, this glovebox will increase worker safety. The Board has found no safety problems in the design or with the initial operations planned in the glovebox. The Board will continue oversight of construction, startup, and operation.

2.1.3 Savannah River Site - Tritium Operations

In 2007 the Board focused primarily on conduct of operations and equipment issues at the Savannah River's tritium facilities. The Board offered and DOE accepted suggestions for making the tritium Corrective Action Review Board process more proactive and rigorous. Slow improvements in conduct of operations were observed during the year.

2.1.4 Nuclear Material Packaging

Recommendation 2005-1. The Board issued Recommendation 2005-1 to increase protection for workers involved in the storage and handling of nuclear materials. In 2007, the Board worked to ensure that DOE developed a manual as part of the recommendation's implementation. In March of 2007, DOE issued for complex-wide comment a draft of DOE Manual 441.1-1, *Nuclear Material Packaging Manual*; DOE also issued direction to field offices to develop schedules and funding plans for implementing the requirements in the draft manual. The Board provided comments on the manual; as of December 2007, DOE has not issued the final document.

2.2 Safe Conduct of Stockpile Stewardship

Stockpile stewardship refers to activities carried out in the absence of underground nuclear weapons testing to ensure confidence in the safety, security, and reliability of nuclear weapons in the nation's stockpile. Stockpile stewardship includes using past nuclear test data in combination with future non-weapons test data and aggressive application of computer modeling, experimental facilities, and simulations. Safety aspects of activities at the major sites engaged in stockpile stewardship are discussed in the following subsections.

2.2.1 Los Alamos National Laboratory

Los Alamos National Laboratory, located in New Mexico, is the NNSA weapons laboratory with the largest number of unique defense nuclear facilities and weapons-related activities. Work performed at Los Alamos includes stockpile stewardship activities and increasingly also involves stockpile management activities, such as pit manufacturing. In 2007, the Board focused its oversight on institutional safety program improvements, the Chemistry and Metallurgy Research facility, disposition of transuranic waste, nuclear criticality safety, pit manufacturing, safety systems, and confinement ventilation.

Safety Improvements. The Board visited Los Alamos in November 2006, and in a February 1, 2007, letter highlighted key areas requiring action to substantially improve the laboratory's safety posture. The Board held a public hearing in Los Alamos, New Mexico, on December 5, 2007, to assess the progress made in these areas. Testimony from NNSA and from the Board's staff revealed that progress had been made in some areas:

Strengthening federal safety oversight. NNSA was able to fill several critical oversight positions at the Los Alamos Site Office and is working to reestablish traditional safety oversight processes in this office. NNSA recognizes that significant challenges remain to strengthen federal oversight of nuclear safety.

Developing effective institutional safety programs. Manuals and plans to strengthen key safety programs have been issued; however, progress toward implementation is slow.

Improving safety bases and ensuring the efficacy of safety systems. While a few nuclear facilities' safety bases were updated this year, many others are still operating with dated safety bases ranging up to 12 years old. For safety systems, the laboratory continues to struggle to put

in place the configuration management and other engineering, maintenance, and operations elements necessary to assure these systems will perform their credited safety functions.

Eliminating known hazards. NNSA has made some progress in dispositioning high-activity transuranic waste drums as well as plutonium-238 and other actinide residues. However, more work is needed to complete chemical stabilization of the actinide residues and support timely disposition of the remaining transuranic waste inventory.

Increasing federal management of new projects. NNSA has enhanced federal oversight of the Chemistry and Metallurgy Research Building Replacement project. This project and several others are essential to the expanded mission that NNSA envisions for Los Alamos. More needs to be done to strengthen the federal oversight for the projects necessary to this expanded mission.

Continued Operation of the Chemistry and Metallurgy Research Facility. In a letter dated October 23, 2007, the Board questioned NNSA's decision to operate the 55-year-old Chemistry and Metallurgy Research facility an additional six years past the previously-planned shutdown date of 2010. Continued operation of this facility in its current condition poses risks to workers and the public that have not been comprehensively evaluated since 1998. Given the age, material condition, nuclear material inventory, and seismic capacity of the facility, the Board has encouraged NNSA to assess these risks promptly, and NNSA has agreed to do so.

Pit Manufacturing. NNSA intends to manufacture a greater number of pits at Los Alamos's Plutonium Facility than has been past practice. The Board's review of this project concluded that NNSA has narrowly focused its evaluations on pit manufacturing equipment, to the exclusion of associated infrastructure required to safely support expanded pit production, e.g., waste management. In response, NNSA is taking a harder look at the safety implications of expanded pit production.

Transuranic Waste Operations. In a letter dated January 18, 2007, the Board urged NNSA to promptly develop a viable pathway for shipping high-activity transuranic waste drums in Area G off-site for disposal at the Waste Isolation Pilot Plant. A small fraction of high-activity waste drums (about two percent of the total waste volume) contains about one-third of the above-ground radioactive inventory. Postulated accident scenarios involving these drums predict high consequences because of their loading, the proximity of the storage area to the site boundary, and the lack of robust engineered controls. In response, NNSA has bolstered waste disposition work at Los Alamos by facility infrastructure upgrades, new safety basis documents, and training and qualification of operators. By September, NNSA had begun its high-activity drum processing campaign, although safety and compliance issues have slowed progress through the end of the year.

Nuclear Criticality Safety. The Board has provided safety oversight of the laboratory's attempt to develop a standards-based nuclear criticality safety program. During 2007, the Board assessed operations in the Plutonium Facility's vault for special nuclear materials. This assessment led to a letter to NNSA dated September 10, 2007, expressing concern over the laboratory's Materials Accountability and Safeguards System software and the criticality safety documentation for the vault.

Confinement Ventilation, Plutonium Facility. The decade-old safety basis for the Plutonium Facility credits a passive confinement strategy instead of active confinement ventilation as a safety-class control to protect the public from postulated accidents. As part of DOE's implementation plan for Recommendation 2004-2, an evaluation of the facility's confinement strategy was completed in parallel with a separate effort to develop a new safety basis for the facility. Unfortunately, the proposed safety basis upgrade continues to rely on a passive confinement strategy. NNSA is currently developing a list of upgrades that would bring portions of the ventilation system up to safety-class status.

2.2.2 Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory, located 45 miles southeast of San Francisco, California, is a nuclear weapons research and development laboratory. It provides technical expertise to support stockpile stewardship and management, including consulting on the surveillance and dismantlement of nuclear weapons. Most defense nuclear activities are conducted in the Superblock complex, which includes the Plutonium Facility and the Tritium Facility. During 2007, the Board conducted reviews of material packaging, work permits, conduct of operations, disposition of legacy material, development of a critique process, and configuration management of vital safety systems at the Superblock facilities.

Radiography Facility. The Board evaluated operations in this facility and found weaknesses in material packaging, development of work permits, posting of radiological controls, and training. NNSA has, as a result, increased management attention to these operations.

Legacy Item Disposition Project. The Board evaluated efforts to address the unique hazards of a classified legacy component (referred to as Object 77) at Lawrence Livermore and the unusual challenges to the facility and personnel associated with its safe disposition. The Board identified deficient safety controls, a problem corrected by NNSA. Preparations to disposition the item included dry runs during readiness assessments. In May 2007, the key phases of the project were safely completed.

Critique Process. The Board evaluated informal methods used at Lawrence Livermore to gather information on safety-related events and identify follow up actions. The Board strongly urged the development of a more rigorous and formal process for critiquing such events. In March 2007, the laboratory introduced a new process called Nuclear Material Technology Program Event Critique; it proved to have weaknesses. NNSA is working to make improvements.

Configuration Management. In a November 2004 letter, the Board identified the apparent lack of configuration management of vital safety systems at Lawrence Livermore facilities. In 2006, NNSA established procedures and processes to maintain an interim configuration management system and developed a resource-loaded schedule integrated with the documented safety analysis implementation schedule. During a review in 2007, the Board identified a lack of quality in the interim system drawings. NNSA has drafted a corrective action plan.

2.2.3 Nevada Test Site

The Nevada Test Site is located in southern Nevada, about 75 miles northwest of Las Vegas. Stockpile activities at the Test Site include test readiness preparations, planning for the disposition of damaged nuclear weapons, and subcritical experiments. Underground testing of nuclear weapons is no longer being conducted; however, the site is maintained in a state of readiness should national security requirements demand the resumption of underground testing. The Board seeks to ensure that testing, if resumed, will be done safely. During 2007, the Board focused its attention on the Device Assembly Facility and subcritical experiments.

Device Assembly Facility. NNSA plans to use the Device Assembly Facility to house nuclear explosive operations and criticality experiments. In 2004, the Board requested that NNSA assess the facility's safety systems and management programs. NNSA attempted to respond by using the site office's assessment program, but this was ineffective in delivering a comprehensive assessment. The Board wrote to NNSA again on November 28, 2005, requesting that more aggressive action be taken with respect to the assessment of the safety systems and management programs needed to ensure that DAF would be ready for planned increases in the scope of work. In response, NNSA developed assessment plans for each vital safety system and safety management program and conducted assessments in 2006 and 2007. Nearly 200 significant findings were identified, and corrective actions are ongoing.

Subcritical Experiments. The Board's review of preparations for subcritical experiments disclosed inadequate nuclear safety management practices. In 2006, NNSA made improvements for the UNICORN experiment in areas such as safety basis reviews, implementation of controls, and readiness reviews. As a result, UNICORN had a more complete documented safety analysis and thorough verification of readiness. The Board stressed to NNSA that it is essential to apply the improved practices and formality to future subcritical experiments. Activities in 2007 indicated that improvements are being applied to other projects.

2.2.4 Sandia National Laboratories

Sandia National Laboratories are located in Albuquerque, New Mexico, and Livermore, California. Major defense nuclear facilities at Sandia, most of which are located in Technical Area V at the New Mexico site, include the Annular Core Research Reactor, Auxiliary Hot Cell Facility, Gamma Irradiation Facility, and Sandia Pulsed Reactor Facility (no longer in operation). The Board focused its attention during 2007 on safety bases and the implementation of integrated safety management. In regard to the former, the Board previously identified fundamental weaknesses in the implementation of nuclear safety requirements and controls at a defense nuclear facility located at Sandia, leading to extensive immediate and long-term corrective actions. In 2007, the laboratory completed implementation of a safety basis improvement project to resolve the underlying safety-related deficiencies and implemented a safety basis operations schedule. The Board noted continued improvement during its reviews. With respect to integrated safety management, the Board identified multiple failures of the hazard analysis and work control process. In response, NNSA developed a corrective action plan. Near-term corrective actions for defense nuclear facilities are now complete. Corporate-level systems must be implemented to fully achieve integrated safety management across the laboratory.

3. Nuclear Materials Processing and Stabilization

3.1 Stabilization and Storage of Remnant Materials

3.1.1 Complex-Wide Program

Nuclear Material Stabilization. The Board continued its oversight of DOE efforts to improve the safety posture of remnant nuclear materials stored throughout the DOE complex. In particular, the Board monitored the safety of unstabilized materials still in storage at Hanford and Los Alamos. During 2007, DOE completed certain commitments in the implementation plan for Recommendation 2000-1: at Hanford, sludge removal from the K-East Basin and bulk sludge containerization at K-West Basin, and at Los Alamos, milestones for the stabilization of weapons grade and non-weapons grade plutonium.

Nuclear Materials Consolidation, Storage, and Disposition. DOE's Nuclear Materials Disposition and Consolidation Coordination Committee has identified eight implementation plans needed to guide the disposition of surplus nuclear materials. Thus far, DOE has approved plans for consolidation and disposition of surplus plutonium-239, for disposition of surplus uranium-233, and for removal of category I/II special nuclear materials from Sandia National Laboratories. The committee forwarded to DOE for approval a plan for consolidation and removal of nuclear materials from Y-12.

DOE has started to implement the first two plans. In 2007, DOE began to ship plutonium-239 materials from Hanford and Lawrence Livermore to Savannah River. DOE continued design work on the uranium-233 disposition project at Oak Ridge, and has nearly finished the removal of category I and II quantities of special nuclear materials from Sandia. In a related development, DOE is revising its order and manual, both entitled *Management of Nuclear Materials*. The Board reviewed initial drafts of these documents and provided informal comments; the Board will offer further comments at a later time.

3.1.2 Plutonium

Plutonium Stabilization, Los Alamos. Operators at Los Alamos are stabilizing or repackaging excess nuclear materials stored in thousands of containers on site. The laboratory continues to make progress in risk reduction by repackaging materials into more robust containers and intends to chemically stabilize these materials at a later date when aqueous chemistry capability is fully restored. Many of these items are stored in containers not suitable for long-term storage and therefore warrant stabilization or repackaging on a priority basis. DOE stabilized 50 percent of weapons grade plutonium, 90 percent of non-weapons grade plutonium, and 50 percent of material in the Recovery Evaluation Process. The Board continues to closely monitor the storage conditions and stabilization efforts at Los Alamos.

Plutonium Consolidation and Disposition, Savannah River. To disposition surplus plutonium, DOE initially proposed a "three-prong" strategy, employing Savannah River's H-Canyon, the Mixed-Oxide Fuel Fabrication Facility, and a plutonium vitrification process. However, based upon plans to extend the life of H-Canyon and a broadening of acceptable feed stock for the Mixed-Oxide Fuel Fabrication Facility, DOE has more recently indicated that a

plutonium vitrification facility may be unnecessary. DOE plans to reach a final decision concerning the fate of the plutonium vitrification facility by mid-2008. Since all plutonium disposition facilities are proposed to operate at Savannah River, DOE recommended that all surplus plutonium be consolidated there as well. In August 2007, DOE began construction of the Mixed-Oxide Fuel Fabrication Facility. Given this progress, and the continued operation of H-Canyon, both viable disposition paths for plutonium, DOE began consolidation of surplus plutonium in 2007 by starting shipments of plutonium from Hanford to Savannah River.

K-Area Material Storage. In Section 3183 of the National Defense Authorization Act for Fiscal Year 2003, Congress directed the Board to conduct a study of the adequacy of plutonium storage at Savannah River and thereafter to file annual reports on DOE's progress in implementing the study's recommendations. On June 26, 2007, the Board issued its fourth annual report. DOE has now completed action on all proposals made in the 2003 study. The K-Area Material Storage facility will provide adequate extended storage of plutonium at Savannah River.

3.1.3 Uranium

Savannah River. In August 2006, the Deputy Secretary of Energy approved the mission need for the Enriched Uranium Disposition Project and designated Savannah River's H-Canyon as the preferred facility for executing the project. In order to process surplus uranium and the approximately 19,000 spent nuclear fuel and target assemblies that are within the scope of the Enriched Uranium Disposition Project, H-Canyon will have to remain operational until at least 2019.

Until recently, DOE minimized its investments in the H-Canyon and HB-Line facilities and supporting infrastructure because these facilities were expected to be shut down and deactivated. In light of current plans to extend the mission through 2019, the Board reviewed the viability of extending the lives of these facilities. The Board does not believe there are any fundamental flaws that would preclude an extended mission if some upgrades are implemented. The Board did encourage DOE to begin planning and preparations for extended operation, including conducting systematic life extension evaluations, and taking advantage of lessons learned from the commercial nuclear sector. The Board has also encouraged DOE to expand the scope of system health reports from near-term operations to the full anticipated life cycle.

The Board also focused its oversight on conduct of operations and emergency preparedness at H-Canyon. Although conduct of operations began a noticeable downward trend midway through 2007, significant attention by management was able to stop and ultimately reverse this trend. The annual emergency preparedness exercise revealed weaknesses in H-Area emergency response, particularly with command and control, mitigation, and radiological monitoring and control. The Board expressed concern with the effectiveness of corrective actions from past emergency preparedness exercises and pointed out that similar weaknesses were also identified during the 2005 and 2006 annual exercises. These concerns go beyond H-Area and encompass the entire site's emergency management program. The Board identified several problems with the realism of drill scenarios and the adequacy of the demonstrated response. The Board has observed additional training and drills performed to improve site-level emergency preparedness performance.

Oak Ridge National Laboratory. The Board continued its design review of the Uranium-233 Downblending and Disposition Project in Building 3019 at Oak Ridge National Laboratory. In 2007, DOE approved the project's preliminary design, which the Board found to be faulty in respect to the safety analysis, fire hazards analysis, ventilation analysis, and the need to determine a mitigation strategy for the fall hazard of an adjacent exhaust stack. DOE has committed to upgrade its safety documentation and to remove the exhaust stack.

3.2 Stabilization of Spent Nuclear Fuel

3.2.1 Hanford Site

Tens of cubic meters of radioactive sludge, including corrosion products of spent nuclear fuel, still remain in the K-West Basin at Hanford. This sludge is the only material at Hanford that remains to be stabilized under Recommendation 2000-1. The project warrants some urgency because the K-Basins are degrading and the K-East Basin is known to have leaked to the underlying soil. This year, DOE completed transfer of K-East Basin sludge to engineered containers in the K-West Basin. This allows deactivation and demolition of K-East Basin to proceed in order to identify the extent of radiological contamination under the basin from past leaks. DOE also completed bulk sludge containerization in K-West Basin. These activities represent the closure of all Recommendation 2000-1 milestones for this project with the exception of the final removal and processing of the sludge from K-West Basin.

3.2.2 National Spent Nuclear Fuel Program

The Board monitored DOE's efforts to ship aluminum-clad fuel from the Idaho Cleanup Project to Savannah River for reprocessing in H-Canyon beginning in 2010. The Board reviewed the safety of spent fuel storage at Savannah River and found the facilities and systems adequate to protect worker and public safety. DOE also proposes to ship its stainless steel-clad and zircaloy-clad fuel from Savannah River to the Idaho Cleanup Project for packaging and storage pending shipment to the geological repository for disposal. These proposed actions will require a Supplemental Analysis and an Amended Record of Decision removing melt-and-dilute as the preferred method of handling aluminum-clad fuel.

3.3 Waste Management

3.3.1 High-Level Waste

Hanford Tank Farms

Tank Integrity. The high-level waste storage tanks at Hanford contain millions of gallons of radioactive waste that DOE plans to vitrify for eventual disposal. DOE plans to use these tanks until at least 2046. Radioactive waste is currently being transferred from 149 older, single-shell tanks to 28 newer, double-shell tanks to reduce the potential environmental risk. DOE conducts ongoing tank integrity programs for both types of tanks, although the program for double-shell tanks is considerably more extensive. DOE is considering an enhanced program for the single-shell tanks. Corrosion controls are in place to extend the lives of the double-shell tanks, and in general, these controls are working reasonably well. However, some anomalous

corrosion occurrences led the Board to suggest further studies. In response, DOE performed tests, and based on the results, changed the pH limit in one tank and may do so for other tanks. DOE also began a study on vapor space corrosion to identify chemical species that inhibit or promote corrosion in the space above the liquid waste. DOE continued ultrasonic testing of the double-shell tank walls to measure general corrosion, potential pitting, and cracks.

To support greater filling levels, DOE conducted a structural analysis of a double-shell tank; the Board questioned the methods used in this analysis. In response, DOE engaged outside experts to review structural calculations and discovered potential new safety concerns. DOE plans to resolve the structural integrity issues prior to increasing the fill height of the next tank.

Tank S-102 Spill Investigation. On July 27, 2007, radioactive waste spilled on the soil and equipment above single-shell tank S-102 during a waste transfer to double-shell tank SY-102 at Hanford. Immediately upon learning of the spill, both of the Board's Hanford site representatives responded to the Incident Command Post at the tank farm to monitor the situation. Based on subsequent investigations, the most likely pathway of the spill was via the dilution water system. DOE began an independent Type A investigation of the spill event on August 20, 2007. The tank farm contractor commissioned several investigation teams to review different aspects of the spill, and the DOE field office performed several self assessments. Other government agencies and Hanford contractors also reviewed specific aspects of the spill event. The Board was able to provide technical advice and expertise in several areas including health physics and emergency planning. Comments and questions regarding DOE's efforts have been communicated to DOE via the Board's site representatives. The Board is reviewing the implementation of corrective action plans to prevent and mitigate future spills.

Savannah River Site

High-Level Waste Management. Recommendation 2001-1 sought to make changes in Savannah River's strategy for managing high level waste. In 2007, DOE completed a major revision of the Life-Cycle Liquid Waste Disposition System Plan, which satisfied an implementation plan milestone to issue a program evaluation for the integration of processing facilities. The Board believes that the latest system plan is reasonable, given the many constraints of the system. The Board has also emphasized the need for a viable Risk Management Plan and was encouraged by the establishment of a joint DOE and contractor Risk Management Board to instill rigor in the implementation of risk management strategies.

Another milestone required demonstration that the deliquification, dissolution, and adjustment process was viable. Although legal challenges delayed the completion of this demonstration, the Saltstone Production Facility resumed operations in 2007. Modifications are ongoing to support the processing of higher curie² salt waste in early 2008. The implementation plan also included commitments to begin operations of the actinide removal process and Modular Caustic Solvent Side Extraction Unit in late 2007. Salt processing operations are expected to commence in the spring of 2008, following successful completion of readiness

² "Curie" is a standard unit for measuring the activity of a given radioactive sample. It is equivalent to the activity of 1 gram of radium, or 3.7×10^{10} disintegrations/second.

reviews. The Board has followed the startup testing of systems and equipment for these processes and the conduct of readiness activities.

In order to reduce the volume of waste requiring vitrification and to accelerate the closure of the high-level waste tanks, DOE proposed removing aluminum from future batches of high-level waste to be vitrified at the Defense Waste Processing Facility. The removal of aluminum from the first batch of waste will take place in Tank 51. The low-curie, aluminum-rich supernate will be sent to Tank 11 for storage and may later be sent to the Salt Waste Processing Facility for treatment and eventual disposal as low level waste. Tank 11 is an old-style, single-shell tank with known leak sites. The Board reviewed the safety aspects of using Tank 11 to store the aluminum-rich supernate and had no objections to DOE's proposed plans. In a letter to DOE dated August 29, 2007, the Board stated its belief that this operation can be conducted safely provided that actions are taken to prevent, detect, and respond to leaks.

Idaho Cleanup Project

High-Level Waste Tank Closure. The Board continued to review DOE's efforts to clean and close high-level waste tanks at Idaho. Historically, DOE stored high-level wastes in eleven large (300,000 gallon) and four small (30,000 gallon) underground tanks. By the end of 2007, DOE had grouted seven of the large tanks and all four small tanks. Three of the remaining four large tanks contain 900,000 gallons of sodium-bearing waste which will be treated by a steam reforming process in the Integrated Waste Treatment Unit now under construction. The fourth large tank is a spare unused tank. DOE estimates that treatment of remaining waste may be completed by 2012, and the Board is closely monitoring this effort.

3.3.2 Low Level and Transuranic Waste

National Transuranic Waste Program. DOE stores large quantities of transuranic wastes on concrete pads and in soil-covered trenches at many sites and is retrieving these wastes for shipment to the Waste Isolation Pilot Plant for disposal. On January 29, 2007, the Board sent a letter to DOE noting that significant differences exist in the safety requirements governing retrieval work at the various transuranic waste sites. In response, DOE issued a new standard DOE-STD-5506-2007, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*. Efforts are underway by the various sites to implement the standard. The Board will continue to provide oversight until the standard is fully implemented.

Savannah River Transuranic Waste. The Board's oversight of transuranic waste operations at the Solid Waste Management Facility and F-Canyon focused on ensuring that proper safety controls were in place for both planned operations and anomalous events. In one event, a forklift truck accidentally damaged a transuranic waste drum. The Board reviewed the causes of the accident. The Board also studied DOE's plan to vent bulging drums that may contain flammable gases. The Board found that the plan did not provide adequate shrapnel protection for nearby workers if venting caused a deflagration.³ DOE has moved bulging drums

³ A "deflagration" is rapid burning of a material; in a deflagration, flame propagation proceeds through thermal conductivity at subsonic speed.

into concrete culverts until additional analysis can be performed and a better venting plan formulated.

The Board reviewed plans for transporting transuranic waste drums containing large quantities of dispersible plutonium between the Solid Waste Management Facility and F-Canyon. DOE's initial proposal would have authorized the transportation activity under an inappropriate safety basis. When the safety basis was re-evaluated, the Board challenged the authorization process itself because it bypassed DOE review and approval, even though a transportation activity involved quantities of nuclear material greater than the inventory of many facilities. As a result, DOE revised its processes to require approval of all new or revised onsite transportation safety assessments and non-routine transfers. The Board also provided feedback to ensure that workers involved with these transfers were adequately trained with realistic emergency preparedness drills.

Advanced Mixed Waste Treatment Project. DOE's largest effort to retrieve transuranic waste at the Idaho Cleanup Project takes place at the Advanced Mixed Waste Treatment Project, and the Board continues to provide close oversight of the activities there. As of December 2007, DOE successfully shipped more than 20,000 cubic meters of transuranic waste from the Advanced Mixed Waste Treatment Project to the Waste Isolation Pilot Plant. However, many thousands of cubic meters of waste remain to be packaged and shipped. The Board continues to monitor the safety of this activity and DOE's actions to implement the new standard (DOE-STD-5506-2007, noted above).

Accelerated Retrieval Project. DOE operates a second facility to retrieve transuranic wastes buried at the Idaho Cleanup Project. This smaller operation, run by a different site contractor, is called the Accelerated Retrieval Project. The Board monitored DOE's operations at the Accelerated Retrieval Project several times during 2007. In the summer of 2007, DOE discovered the accumulation of liquid in the bottom of drums of packaged sludge waste, preventing acceptance of the drums for disposal at the Waste Isolation Pilot Plant. DOE changed the design of the drums to prevent future accumulation of water and developed a method to safely repackage the estimated 1700 affected drums.

Shielded Transfer Tanks. At the Oak Ridge National Laboratory, DOE has been storing high activity wastes in five shielded transfer tanks since the late 1960s and early 1970s. Four of the tanks contain highly-contaminated resins that had been used to capture isotopes (primarily cesium-137) from fuel reprocessing wastes at Hanford. The fifth tank contains waste from Savannah River reactor operations. Venting, sampling, and characterization of tank contents will be required prior to future disposal of the tanks because of the potential for hydrogen buildup during storage. The Board reviewed the safety basis for these tanks and concurred with the conclusion that the tanks can remain safely in storage for an extended period of time.

Waste Isolation Pilot Plant. The Waste Isolation Pilot Plant in New Mexico is a geologic repository utilized for the disposal of defense transuranic wastes. During 2007, the plant received and disposed of nearly 900 shipments of contact-handled transuranic waste, with a total volume in excess of 7,800 cubic meters. Remote-handled (high activity) transuranic waste operations began with receipt of an initial shipment from the Idaho National Laboratory on January 24, 2007. This was the first of 99 shipments of such waste, totaling approximately 35

cubic meters. Previously, the Board had reviewed preparations for the start of remote-handled transuranic waste operations including observing a DOE operational readiness review. A February 2007 review confirmed that remote-handled transuranic operations were being conducted safely. Throughout 2007, the Board verified that both contact-handled and remote-handled transuranic waste operations were conducted safely.

3.4 Facility Deactivation and Decommissioning

3.4.1 Overview

DOE continues to pursue accelerated decommissioning at some defense nuclear facilities, while work at other facilities is delayed due to higher priority work or funding reductions. The Board performs oversight of decommissioning work at DOE's sites.

3.4.2 Hanford - Plutonium Finishing Plant

Due to budgetary constraints, decommissioning of the Plutonium Finishing Plant has been delayed from 2009 to 2016. The Board reviewed the results of life extension evaluations to determine if upgrades or replacements of vital safety systems are required during this extended period. The Board also reviewed and found improvements in the nuclear criticality safety program at this facility; the number of nuclear criticality safety nonconformances has decreased, DOE developed a set of generic controls for cleanout of gloveboxes, and steps have been taken to retain personnel and equipment to perform non-destructive assay of material holdup in the facility.

3.4.3 Idaho Cleanup Project

The Board conducted reviews of the decontamination and decommissioning of several facilities contaminated with radioactive and hazardous materials in the Reactor Technology Complex, Test Area North, Radioactive Waste Management Complex, and the Idaho Nuclear Technology and Engineering Center. The Board made several visits to the site and continued to oversee the decontamination and decommissioning activities. During 2007, DOE demolished all major facilities to be removed in the Test Area North. In the Reactor Technology Area, DOE grouted the Engineering Test Reactor vessel and removed it to the Idaho solid waste disposal facility.

4. Nuclear Facilities Design and Infrastructure

4.1 Introduction

The Board's strategic performance goal for this area is to ensure that new defense nuclear facilities and major modifications to existing facilities are designed and constructed in a manner providing adequate protection of the health and safety of the workers and the public. The Board is required by statute to review the design and construction of defense nuclear facilities, which must be designed and constructed in a manner that supports safe and efficient operations. During the past two years, the Board has made a concerted effort to ensure that its review of new design projects focuses on early recognition and resolution of safety issues and that new DOE facilities will be constructed to acceptable industry codes and standards.

4.2 Safety in Design

Beginning in late 2005, the Board initiated a series of public hearings concerning integration of safety into the design process. The most recent of these public hearings, held on March 22, 2007, addressed early identification of issues, communication of Board issues to DOE, issue management, and early resolution and closure of design-related safety issues. In this public hearing the Board also collected information regarding the implementation of DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and the development of DOE-STD-1189, *Integration of Safety into the Design Process*, and lessons learned from incorporating safety into the design of two major DOE projects—Hanford's Waste Treatment Plant and Los Alamos's Chemistry and Metallurgy Research Replacement project. These public hearings have aided the Board in measuring the success of DOE's actions regarding their safety-in-design initiative and allowed examination of how DOE develops safety-related design requirements for its new projects. The Board plans to observe DOE's implementation of its safety-in-design initiative and revised directives.

The Board has initiated the practice of sending "project letters" to DOE, containing a summary of the Board's safety concerns at each stage of a project's design and construction. The first of these letters covered the Integrated Waste Treatment Unit at Idaho; the next two addressed the Container Surveillance and Storage Capability Project at Savannah River and the Uranium Processing Facility at Y-12. The Board's aim is to ensure its safety concerns are known to DOE when projects are reviewed for further authorization.

Consistent with commitments made in the report prepared jointly by the Board and DOE, quarterly meetings began in 2007. At these sessions, staff from the Board and DOE discussed resolution of pending issues and explored new issues. These meetings have generally been successful in communicating Board concerns and have helped ensure that the resolution of design issues progresses in a timely fashion. The Board is briefed by senior DOE and NNSA management on a monthly basis to ensure that issues receive adequate attention. The reports provided to Congress on a quarterly basis also provide DOE with a clear understanding of the Board's outstanding concerns.

Overall, the policies instituted by the Board and the safety-in-design initiative have helped DOE focus more on new facility design projects and successfully address long-standing

Board issues. The following discussion summarizes actions taken over the past year on specific design and construction projects currently being reviewed by the Board. The *Joint Report to Congress* on this topic, issued July 19, 2007, provides additional detail on these efforts.

4.3 Hanford Site

Waste Treatment Plant. The Waste Treatment Plant is a multi-facility complex designed to treat Hanford's high-level radioactive liquid wastes. It consists of three primary nuclear facilities known as Pretreatment, Low Activity Waste, and High Level Waste, supported by an analytical laboratory. The Pretreatment facility receives high-level waste from Hanford's tank farms and separates it into high and low activity streams. The low-activity portion is transferred to the Low Activity Waste facility, where it is mixed with glass-forming materials and converted to a stable borosilicate glass, or "vitrified." Glass canisters from the Low Activity Waste facility are subsequently placed in an onsite, near-surface disposal facility. The high-activity waste stream is transferred from the Pretreatment facility to the High Level Waste facility, where it is also vitrified. After vitrification, high-level waste glass logs are temporarily stored at the Hanford site in the Canister Storage Building pending shipment to DOE's high-level waste repository.

Construction progress varies among the facilities. Currently, construction of the Low-Activity Waste facility is furthest along. Late in 2007, work on the Pretreatment and High Level Waste facilities was re-initiated following resolution of ground motion issues and a review of construction readiness. The Board is continuing its review of design and construction of important-to-safety structures, systems, and components. During 2007, the Board's activities focused on the resolution of previously-identified issues.

Structural Design. In response to a finding by the Board that seismic requirements were not sufficiently conservative, DOE found that these requirements had been underestimated by about 40 percent. DOE initiated an evaluation in 2006 of the effect of this increase on the design of the structure and equipment. This review necessitated drilling new bore-holes to allow measurement of geotechnical properties beneath the facilities. DOE completed the seismic borehole project in early 2007 and was able to validate the seismic design ground motion. The Board considers this issue resolved.

The Board has also noted inadequate modeling, no clear seismic load transfer capability in the structure, and an inadequate finite element analysis. In 2006, DOE developed new structural design criteria that addressed the issues raised by the Board and late in 2007 completed a draft summary structural report for the High Level Waste and Pretreatment Facilities. The Board's staff is currently reviewing these documents and providing comments to DOE. The Board anticipates that following favorable resolution of staff comments, DOE will have provided sufficient technical justification to consider the issue closed.

Fire Protection. The Board objected to DOE's decision not to apply fire resistant coatings to structural steel. DOE changed course and is now committed to a fireproofing strategy complying with the building code and other DOE requirements. DOE has prepared structural design criteria for implementing this strategy across the project and will complete calculations to determine which steel members must be coated. In November 2007, DOE informed the Board

that calculations supporting the resolution of this issue were being developed and will be submitted from December 2007 to early 2009. The Board is currently reviewing the first of these documents.

Hydrogen Gas Hazards. DOE significantly underestimated the impact of hydrogen hazards on pipes and small process vessels and components. In 2007, DOE completed final actions needed to resolve this issue. These actions followed DOE's development of a comprehensive control strategy to prevent the most serious hydrogen-related accidents and limit the likelihood of hydrogen explosions. DOE's remaining action was to complete the development and implementation of design criteria for piping systems. DOE also completed new design criteria for construction of piping supports to address the impacts from hydrogen explosions. In mid-2007, DOE briefed the Board on these developments. The Board has reviewed the actions taken by DOE and believes that the design criteria and administrative controls, when properly applied, will be sufficient to resolve the Board's concerns. The Board considers this issue closed.

Demonstration Bulk Vitrification Project. The Demonstration Bulk Vitrification Project is a research and development project intended to demonstrate the suitability of bulk vitrification for disposing of low-activity waste from the Hanford Tank Farms. Previously, the Board pointed out weaknesses in the design for confinement of materials. DOE developed a confinement strategy that led to improvements in the design. The Board is now satisfied that the project's design for confinement of radioactive materials is adequate.

K-Basin Closure Project Sludge Treatment. The Sludge Treatment Project is a sub-project in the overall K-Basin Closure Project. A major modification to operating facilities, it will provide capability to treat waste sludge from corroded spent fuel and package it for disposal. The Board identified continuing problems with the integration of safety in design as the project approached completion of design work. In response, DOE required that the project fully implement requirements and guidance for project management, technology maturity evaluation, and integration of safety in design. While implementing these requirements and guidance, DOE discovered that the design was not sufficiently developed to support procurement and the technology was not at a development level suitable to fully support a conceptual design. DOE returned the project to a conceptual design stage.

4.4 Savannah River Site

Plutonium Storage. The 3013 Container Surveillance and Storage Capability project is a major modification to a Hazard Category 2 facility within the K-Area Complex. This project will provide examination, stabilization, and packaging capabilities for plutonium-bearing materials stored in 3013 containers. It will also provide rack storage for approximately 1900 containers. The Board continued to review the preliminary design of the Container Surveillance and Storage Capability project, focusing on hazards analysis, criticality safety, fire protection, and an evaluation of existing and new structures to meet seismic performance requirements. The Board issued a project letter in January 2007 communicating several concerns to DOE, including deficiencies in the hazards analysis and an inadequate basis for excluding nuclear incident monitors from the facility. As a result, DOE revised the hazards analysis to address the Board's concerns and directed that nuclear incident monitors be incorporated into the facility's design.

Salt Waste Processing Facility. The Salt Waste Processing Facility is a new facility intended to treat salt waste in high-level waste tanks by removing highly radioactive cesium, strontium and actinides from the bulk salt solution feed. Approximately 37 million gallons of the waste is currently being stored in 49 underground waste storage tanks. During 2007, the Board continued its review of this facility's design and processes and identified concerns with structural design and hydrogen generation.

Structural design. This facility was of particular concern to the Board because of technical shortcomings in the design process—a lack of geotechnical requirements, structural issues, and issues related to structural modeling. These shortcomings also raised questions regarding the quality assurance program implemented by the contractor. The Board pointed out these deficiencies to DOE in a letter dated January 10, 2007. The Board was concerned about an adverse schedule and cost impact on the project if these deficiencies were not resolved early in the design process. Since that letter, DOE, its contractor, and the Board have been working together to minimize potential impacts on the high-level waste program at the site. Appropriate structural design expertise and DOE oversight have been brought to bear on the project. Geotechnical requirements have been finalized, and changes to the structural design and analysis methodology have been made. Corrective actions were also taken to fix the quality assurance program. In a letter to the Board dated May 11, 2007, DOE acknowledged that as a result of these constructive efforts, a mutually agreeable and technically sound path forward for the design had been developed.

Hydrogen generation. Deflagration or detonation of hydrogen produced during processing is the main process safety concern for this facility. The Board was not convinced that DOE had accurately calculated the hydrogen generation rate. Without an accurate generation rate, the margin of safety provided by process safety controls is indeterminate. The Board suggested that DOE review and compare the more current, first-principle based, hydrogen generation rate formulation used at the Waste Treatment Plant. This review was completed to support some of the assumptions. However, the Board was still concerned that hydrogen generation that can occur when organic solvent material is heated in the presence of radiation—thermolysis—had not been adequately considered. The Board concluded that the technical basis for estimating hydrogen generation due to thermolysis would best be determined by experimentation. The Board informed DOE that suitable irradiation tests had already been performed at the Idaho National Laboratory on solvents very similar to those used at the Salt Waste Processing Facility. A simple modification of these tests can provide the data needed to estimate thermolysis. In December 2007, DOE proposed to test the effects of thermolysis at Idaho National Laboratory.

Pit Disassembly and Conversion Facility. In 2007, work on the Pit Disassembly and Conversion Facility slowed significantly. The Board reviewed the status of combustible loadings for seismically induced fires. The Board previously agreed with the project team's approach for evaluation of seismically induced facility fires as a design basis accident contingent on finalization of the assumed combustible loading. NNSA conducted fire tests of a glovebox with prototypical materials, including water-encapsulated polyester, gloves, and a window assembly consisting of safety glass, leaded glass, and shielding using polymethylmethacrylate. These tests revealed higher-than-expected fire loadings. NNSA is analyzing the results and exploring options to account for the increased fire loadings.

4.5 Y-12 National Security Complex

Highly Enriched Uranium Materials Facility. The Highly Enriched Uranium Materials Facility will replace several aging storage facilities. The new facility will reduce the site footprint of uranium storage, thus simplifying safeguards and security measures. The design of this facility is essentially complete. NNSA began construction in early 2005, with completion now projected for late 2009. The preliminary documented safety analysis identifies the fire suppression system as safety-significant to control incipient fires. A water supply for the sprinklers is needed for the fire suppression system to perform its safety function. The Board noted that the system planned to supply the needed water was not classified as safety-significant, consistent with the project's design requirements and guidance associated with DOE Order 420.1B, *Facility Safety*. The Board identified this inconsistency in its quarterly report to Congress dated October 17, 2007: *Status of Significant Unresolved Issues Concerning the Design and Construction of New DOE Defense Nuclear Facilities*.

In response, NNSA identified near-term actions aimed at increasing the operational reliability of the water supply system including a new safety-significant water supply pressure monitor that provides an alarm upon loss of supply pressure and an evaluation of scenarios that would adversely impact required flow. The Board is pursuing whether safety-related configuration controls ought to be implemented to provide positive assurance of a reliable flow path from the supply tanks to the fire suppression system. For the long term, NNSA is evaluating the use of fire water tanks for the planned Uranium Processing Facility.

Uranium Processing Facility. The Uranium Processing Facility is a new project intended to replace a number of aging facilities that process enriched uranium. The Board reviewed the conceptual design and safety documentation developed to support NNSA's review and approval of Critical Decision 1 authorizing preliminary design. NNSA agreed to retroactively implement the revised requirements of DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and the guidance in draft DOE-STD-1189, *Integration of Safety into the Design Process*, into the conceptual design and safety basis development for the project. Additional design detail for cost dominant safety systems was developed, and improved analyses of the safety functions and controls for the facility were performed. When NNSA approved Critical Decision 1 for the project, all Board concerns with the conceptual design, safety analyses and supporting documentation were either corrected or captured in the project risk management plan with contingency costs allocated. A clearly identified path forward for resolution of these concerns was also developed.

4.6 Los Alamos National Laboratory

Chemistry and Metallurgy Research Facility. The Board continued its review of the design for the Chemistry and Metallurgy Research Replacement project. Early in this project, the Board noted its concern regarding the acquisition strategy being employed. (Letter to NNSA dated February 24, 2005.) On March 28, 2007, NNSA directed that the acquisition strategy for the project be changed to a more traditional design-bid-build⁴ approach. Preliminary design

⁴ "Design-bid-build" refers to a traditional contracting method in which the design and the construction phases of a construction project are performed by two independent contractors under two distinct contracts.

continued throughout 2007 with the expectation that the project will enter into final design in 2008. NNSA has committed to completing an independent technical project review of the completed preliminary design. Critical Decision 2, establishing the project baseline, will occur no earlier than fiscal year 2009.

The Board's review of preliminary design documentation uncovered weaknesses in the safety strategy and the method for selecting safety-related systems and conservative design criteria. The early identification of structures, systems, and components that prevent and mitigate potential accidents is vital to the successful design of the project. At the end of preliminary design, the Board will undertake a detailed review of the overall safety strategy, the adequacy of design criteria, and the design of safety-related systems. NNSA's Chief of Defense Nuclear Safety has committed to review the safety strategy prior to proceeding into final design. The Board has stressed that for this project to be successful, aggressive oversight will be required by federal and contractor personnel experienced in the management and oversight of large, complex projects.

4.7 Idaho Cleanup Project

Integrated Waste Treatment Unit. The Integrated Waste Treatment Unit will convert approximately 900,000 gallons of acidic sodium-bearing tank waste at the Idaho National Laboratory to a dry carbonate product for disposal at the Waste Isolation Pilot Plant. The Board reviewed the final design for this facility, focusing its attention on process safety, seismic and structural, fire protection, mechanical equipment, confinement ventilation, and instrumentation and control. The Board also reviewed a draft of the preliminary documented safety analysis, as well as software quality assurance for both engineering design and safety analysis codes, and software supporting the control of the waste treatment process.

The Board identified a number of deficiencies in geotechnical data, analysis of soil-structure interactions, and seismic design of the main process and packaging cells. DOE worked diligently to address each issue, as documented in a series of communications to the Board, the last of which was received on December 21, 2007. Based on DOE's analysis, the Board's concerns have been resolved, and the structure's design is considered adequate.

The Board objected to the removal of a key design code from the design requirements for the safety-significant⁵ distributed control system. In response, DOE decided to re-incorporate the standard into the design requirements and is currently evaluating the system against the standard.

The Board issued a project letter at the beginning of 2007 documenting several items that needed to be addressed during final design to ensure safety. In response, DOE conducted additional waste sampling to ensure radionuclide inventories supporting the safety analysis are conservative. DOE also completed the investigation of an over-temperature event in the pilot plant's charcoal bed.

⁵ A "safety-significant" system is relied on to protect the workers from the effects of accidents.

4.8 Nevada Test Site

Device Assembly Facility. The Board continued its review of the seismic hazard and structural analysis for the Device Assembly Facility. Geotechnical investigations measuring soil dynamic properties were completed in March 2007; the final report was completed in October 2007. This report incorporates the results from the geotechnical investigations, assessing the impact of local soil conditions on earthquake ground motions. These reports indicate that estimates of earthquake ground motion have increased. The Board is reviewing these reports. The updated design basis earthquake ground motions are being used to perform an updated seismic analysis of the structure.

The Board has continued its focus on understanding the impact of numerous cracks that exist within the Device Assembly Facility structure. This issue has been under discussion for several years, and the Board has stressed to NNSA that progress to address this issue has been inadequate. The Board's basic concern is that poor construction practices may have adversely affected the concrete's *in situ* strength and contributed to the unprecedented level of cracking. Degraded concrete strength will need to be properly considered as part of understanding the capability of the structure to resist updated estimates of design earthquake ground motions. On December 7, 2007, NNSA committed to undertake nondestructive testing of concrete strength to ensure that low-strength concrete did not contribute to the cracking.

4.9 Seismic Hazard Analysis

The Board continued its review of DOE studies and reports on seismic ground motion across the complex. The Board and its outside experts have been proactive as DOE develops seismic ground motions to be used in the design of new facilities as well as updating the probabilistic hazards assessments for some sites.

Probabilistic hazard assessment. The Board continued its review of probabilistic seismic hazard updates at Savannah River, Los Alamos, and Nevada Test Site. The Board has stressed the importance of having an adequate review, including independent peer review, of both the site specific acquisition of data and the subsequent analysis to ensure that design basis earthquake ground motions are based on accurate scientific knowledge. Los Alamos completed its update of the probabilistic seismic hazard analysis and development of seismic design ground motions. The Board reviewed this update and considered it adequate. Predicted seismic design ground motions have increased and efforts are underway to assess impacts on existing nuclear facilities.

Seismic design of new facilities. Geologic field work was completed at the Hanford Waste Treatment Plant; the data were used to develop final seismic ground motion criteria. DOE satisfactorily briefed the Board on July 24, 2007, and the Secretary of Energy certified the final seismic ground motion criteria on August 10, 2007. At the Idaho National Laboratory Integrated Waste Treatment Unit project, DOE completed studies to assess the impact of local site soil conditions and subsequently revised the seismic design ground motion to reflect these conditions. Seismic ground motion criteria for the Chemistry and Metallurgy Research Replacement project at Los Alamos were increased in expectation of an increase in the probabilistic seismic hazard. The design of the project will be based on these higher seismic design motions.

5. Nuclear Safety Programs and Analysis

5.1 Federal Oversight

5.1.1 Overview

To meet its statutory health and safety mandate, the Board must continuously assess DOE's ability to carry out adequate oversight of contractor work. Oversight, in this context, includes federal line management assessment of contractors, contractor self-assessment, and independent assessment of both federal and contractor work. For much of the work conducted in the defense nuclear complex, DOE relies upon contractors to perform inherently risky activities in government-owned facilities. These activities are nevertheless governed by nuclear safety requirements promulgated by the government. Thus, DOE fills three simultaneous roles: owner, customer, and regulator. Preventing conflict among these roles requires a complex oversight system strained by competing demands that must be reconciled to ensure that the overall mission is achieved safely.

5.1.2 Recommendation 2004-1

The Board continued driving DOE to improve its oversight of complex, high-hazard nuclear operations. One important aspect of that oversight is integrated safety management, a concept that evolved from Recommendation 95-2 and continued to be developed in response to Recommendation 2004-1. The basic tenets of this approach provide the framework for safely performing all of the diverse hazardous activities in the defense nuclear complex. Integrated safety management provides for a single safety management program rather than multiple, unintegrated programs (e.g., quality assurance and environmental management). Nuclear safety is an important but not exclusive target, because nonradioactive hazardous materials and operations can also present significant risk. Integrated safety management builds upon standards of safe practice for nuclear, chemical, and other hazardous operations to ensure protection of the public, workers, and the environment.

In response to Recommendation 2004-1, DOE completed the following actions in 2007:

- fully implemented the Central Technical Authorities function, with associated technical support staff managed by the Chief of Defense Nuclear Safety for NNSA and the Chief of Nuclear Safety for the remainder of DOE;
- created an integrated safety management Champions Council, reporting to the Deputy Secretary and responsible for reinvigorating integrated safety management;
- performed program office self-assessments of safety function assignments at the program office level and defined criteria for the delegation of authority to the field offices; and
- issued an integrated safety management system description for each of the program offices defining the management system they will use to perform work safely.

Several areas continue to receive significant Board attention. In 2006, DOE revised the Recommendation 2004-1 implementation plan and moved responsibility for the Office of Nuclear Safety Research from the Office of Environment, Safety and Health to NNSA. Establishing a nuclear safety research function has been elusive and will continue to be an area of focus for the Board in 2008. In addition, NNSA continues to work on a modified line oversight contractor assurance system, which is intended to focus more NNSA oversight on the facilities where a low-probability, high-hazard accident is credible, while increasing reliance on the contractor to oversee the remainder of the facilities. The Board will expend significant effort in the oversight of this transformation to ensure that safety of defense nuclear facilities is not jeopardized and that the level and effectiveness of federal oversight is not allowed to deteriorate.

Commitment 5 of the implementation plan for Recommendation 2004-1 called for development and issuance of a safety oversight guide for effectively implementing the federal oversight order. In 2007, DOE revised and re-issued both its policy and order on federal oversight, further strengthening the requirements for federal oversight of its operations. However, this revision delayed the development of the oversight guide. DOE expects to issue the guide no later than February 1, 2008.

5.1.3 Recommendation 2000-2

Based on complex-wide progress toward implementation of this recommendation on configuration management of vital safety systems, the Board decided to close it on August 8, 2007, and address remaining implementation problems on a site-by-site basis. During 2007, the Board pressed NNSA to complete implementation at Los Alamos and Lawrence Livermore. The Board's July 2007 review of vital safety systems at Los Alamos uncovered deficiencies that were communicated to NNSA by letter dated October, 16, 2007. On December 21, 2007, NNSA requested an additional 60 days to respond to the Board's adverse findings.

5.1.4 Activity-Level Work Planning

The Board continuously emphasizes the importance of ensuring that hazards are identified and controlled, work is performed in a careful manner in accordance with the safety controls, and that DOE uses appropriate feedback mechanisms to ensure continuous improvement at the activity level. In its implementation plan for Recommendation 2004-1, DOE acknowledged the need to strengthen this area and committed to enhanced focus on work planning and work control at the field office level. During 2007 the Board reviewed work planning processes at three DOE sites: Los Alamos, Hanford, and Savannah River. The results of these reviews indicate that corrective actions that were to be taken may not have been fully institutionalized. This area will require significant effort during 2008 in order to improve performance.

5.2 Health and Safety Directives

5.2.1 Improvement of Directives

In 2007, as part of its ongoing review of new and revised DOE directives, the Board and its staff evaluated and provided constructive critiques of 28 directives associated with, but not

limited to nuclear design criteria, maintenance management, worker protection, emergency management, and project management. At year's end, the Board was in the process of working to resolve issues on 24 pending directives to improve the content, clarity, and consistency in safety requirements and guidance. Work was completed on eleven directives listed below.

DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*

DOE Order 410.1, *Central Technical Authority Responsibilities Regarding Nuclear Safety Requirements*

DOE Order 470.4A, *Safeguards and Security Program*

DOE Manual 460.2-1A, *Radioactive Material Transportation Practices Manual*

DOE Handbook 1129-2007, *Tritium Handling and Safe Storage*

DOE Handbook 1130-2007, *Radiological Worker Training*

DOE Standard 1183-2007, *Nuclear Safety Specialist Functional Area Qualification Standard*

DOE Standard 1185-2007, *Nuclear Explosives Safety Study Functional Area Qualification Standard*

DOE-STD-1170-2007, *Electrical Systems and Safety Oversight Functional Area Qualification Standard*

DOE-STD-1138-2007, *Industrial Hygiene Functional Area Qualification Standard*

DOE-STD-1137-2007, *Fire Protection Engineering Functional Area Qualification Standard*

5.2.2 Scope of the Directives System

The Board maintains a significant level of involvement in reviewing updates to existing DOE directives and proposed new directives. On September 10, 2007, the Secretary of Energy issued a memorandum entitled "Principles Governing Departmental Directives." The memorandum directs DOE personnel to "review existing and proposed directives to ensure that they are written and managed in accordance with the principles outlined in this memorandum." The stated intent of this review is to ensure that directives' objectives are "accomplished without being unclear, overly prescriptive, duplicative, or contradictory." In late December 2007, DOE released to the Board a plan for the review of 26 safety-related directives in accordance with the Secretary's memorandum. Based on past experience, the Board is concerned that DOE may lower safety expectations as a consequence of this review. The Board will maintain a high level of oversight to ensure that the current margin of safety embodied in DOE directives is maintained or increased.

5.2.3 Integrating Safety into Design

In an August 27, 2004, letter to DOE, the Board requested improved technical criteria for systems, structures, and components relied upon to confine radioactive materials threatened by natural phenomena. In 2005, DOE provided a revision to DOE Guide 420.1-2, *Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Nonnuclear Facilities*. The Board provided comments on this revision, suggesting that DOE consider adopting the national consensus standard American National Standards Institute/American Nuclear Society Standard 2.26-2004, *Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design*, rather than revising the guide. DOE has elected to adopt this national consensus standard by providing guidance for its implementation in a new standard,

DOE-STD-1189, *Integration of Safety into the Design Process*. In March 2007, DOE issued DOE-STD-1189 for review in its Revcom process. As of late 2007, DOE was still resolving outstanding comments. Foremost among these were issues raised by DOE's Chief of Nuclear Safety and NNSA's Chief of Defense Nuclear Safety regarding problems with federal and contractor roles and responsibilities and deficiencies in other orders resulting from the content developed in DOE-STD-1189. DOE has undertaken an effort to address these issues and plans to delay issuance of the standard until the internal issues are resolved.

5.2.4 Hazard Categorization

In a letter dated June 26, 2006, the Board requested that DOE review and address issues associated with the implementation of DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports, Change Notice 1*. The letter described specific problems observed throughout the complex, including inappropriate exclusion of sealed sources from facility inventories. Improper application of the standard can result in non-conservative facility hazard categorization and a reduced set of safety requirements and controls. DOE formed a working group to perform a thorough evaluation of the standard and identify weaknesses that required additional guidance. On May 7, 2007, DOE issued a supplemental guidance document to further clarify issues identified by the Board and the working group. This supplemental guidance is already being used by the sites to reevaluate their facilities' hazard categorization and to identify the potential need for revising their present hazard category. DOE will revise DOE-STD-1027-92 to incorporate the supplemental guidance.

5.3 Safety Programs

5.3.1 Administrative Controls

On January 4, 2007, DOE informed the Board that all commitments in the implementation plan for Recommendation 2002-3 had been completed and proposed that the recommendation be closed. The Board conducted a number of independent verification reviews to assess the effectiveness of DOE's implementation. These reviews identified a number of implementation weaknesses and deficiencies, and as a result, the Board determined that additional efforts were warranted on the part of DOE prior to closure of the recommendation. In response, DOE committed to conduct additional field verification reviews to fully identify and correct the implementation deficiencies.

5.3.2 Active Confinement Systems

The Board issued Recommendation 2004-2 to ensure reliable and effective confinement of potential accidents at defense nuclear facilities. In accordance with the implementation plan, DOE issued the *Ventilation System Evaluation Guidance* document in February 2006. All Hazard Category 2 and 3 defense nuclear facilities that had not been excluded or screened per the implementation plan were to have their ventilation systems evaluated against the criteria provided in the guidance document to identify any gaps. DOE has completed this evaluation for some 25 facilities and has identified areas where physical modifications are necessary to improve the effectiveness of active confinement ventilation systems. These modifications

include: providing an online stack monitoring system to provide an accurate account of the facility release to the environment during an accident; installing a deluge system upstream of the High Efficiency Particulate Air filters to protect them from the potential severe conditions during a fire; and upgrading a portion of the existing ventilation system to safety-class⁶ to ensure that the public is adequately protected in case of a fire inside the facility. These modifications will significantly improve the safety posture of defense nuclear facilities in the event of an accident.

In addition, the Board has reviewed major DOE design and construction projects to ensure that their designs do not solely rely on passive confinement for protection of the public and that they meet the criteria identified in the guidance document for their active confinement ventilation systems. The remaining hazard category 2 and 3 defense nuclear facilities (most operated by NNSA) are scheduled to complete their evaluation in 2008, followed by a DOE commitment to implement the identified modifications to meet the criteria identified in the *Ventilation System Evaluation Guidance* document.

5.3.3 Software Quality Assurance

The safe design and operation of many defense nuclear facilities is assured, in part, by analysis and operational support provided by computer software. In January 2002, the Board issued Recommendation 2002-1 to make changes to DOE's policies and practices regarding software design, implementation, testing, configuration management, and training of personnel in order to address longstanding safety deficiencies in these areas. The implementation plan for this recommendation is complete except for one action on software tools that were to be upgraded and maintained in a new Safety Software Central Registry. During 2007, DOE made limited progress addressing software quality assurance gaps identified in the original six toolbox codes in the registry. In late 2007, DOE developed a plan of action to address the gaps.

In 2008, DOE will provide the Board with a plan and schedule for completion and closure of this recommendation. The plan will include refining requirements, assessing the implementation of requirements, revamping DOE's corporate communication infrastructure, reviewing digital instrumentation and control practices and implementation strategies, establishing a support group, and setting up a forum to collect lessons learned. Late in 2007, as the first initiative from this effort, a Digital Instrumentation and Control Working Group was formed to develop requirements and guidance for digital instrumentation and control applications.

5.3.4 Risk Assessment Methodologies

Previously, the Board conducted a comprehensive assessment of DOE's policies, programs, processes, and procedures on the use of quantitative risk assessment and related methodologies. This review found that DOE widely employed quantitative risk assessment, but without adequate controls over quality and applicability. This in turn causes the quality and relevance of risk management plans, risk mitigative actions, and residual risk identification to be

⁶ A "safety-class" system is relied on to protect the public from the effects of accidents. Such systems have the highest safety pedigree in terms of design, procurement, installation, testing and maintenance.

highly variable. DOE responded by offering to develop a policy governing the use of risk assessment methodologies at defense nuclear facilities.

In a letter to DOE dated November 23, 2005, the Board found deficiencies in the policy as written and objected to the slow pace of its development. As a result of the Board's observations and concerns, DOE chartered a working group comprised of representatives from the major program offices, field elements, national laboratories, and major contractors to guide the efforts in this area. This group developed a draft policy, along with draft implementation guidance, which was scheduled to be released for general comment in early 2007. At this point all progress came to a halt. The Board will work to re-invigorate this area in 2008.

5.3.5 Criticality Safety

The Board continued to monitor DOE's progress in improving nuclear criticality safety programs. DOE's nuclear criticality safety program continues to provide a source of stable funding for many essential activities related to criticality safety. A total of thirteen training courses, sponsored by the program, have been conducted since mid-2006, and eight are planned for FY 2008. In addition, plans for startup of the Critical Experiments Facility at Nevada Test Site progressed with validation of the mission need statement. Three criticality experiments are scheduled following facility startup, currently projected to occur in 2010. In 2007, DOE completed the limited-scope, baseline reviews proposed in October 2005. Future criticality safety reviews are planned as a component of reviews conducted by the Chief of Nuclear Safety or Chief of Defense Nuclear Safety. The Board conducted a detailed review at Los Alamos in 2007, which is discussed in section 2.2.1 of this report.

5.3.6 Readiness Reviews

In 2005 the Board expressed concerns regarding the proper implementation of DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*. As a result, in 2006 DOE conducted a comprehensive review of startup and restart procedures, as well as their implementation at defense nuclear facilities. In 2007, DOE formed a readiness review working group to ensure more rigorous and conservative implementation of this order. The Board closely followed the meetings and progress of this group.

DOE's readiness review working group determined it necessary to revise and reinvigorate readiness review training for specific audiences. DOE developed detailed training for readiness review team members and tailored training sessions for readiness review team leaders and contractors. The Board continues to provide input and evaluate these training sessions. The readiness review working group also worked to further refine the definitions used in DOE Order 425.1C to reduce any ambiguity in the Order. Finally, the working group developed a streamlined process that contractors will use to notify DOE about upcoming readiness reviews. Improving the notification step of the readiness review process will help ensure a more rigorous implementation of DOE Order 425.1C.

5.3.7 Justifications for Continuing Operations

The Board reviewed DOE's use of justifications for continuing operations⁷ at defense nuclear facilities and found a number of weaknesses. The Board documented these weaknesses in a letter to DOE dated April 19, 2007. In response, DOE established a working group which collected data during 2007. A preliminary assessment of the data indicates that DOE may need to issue additional guidance.

5.3.8 Recommendation 2007-1

As a result of several recent events across the DOE complex, the Board issued Recommendation 2007-1, *Safety-Related In Situ Nondestructive Assay of Radioactive Material*, on April 25, 2007. The recommendation advises that DOE should (1) identify and review all current *in situ* measurements used to comply with nuclear safety limits to validate that the results are sufficiently conservative, and (2) issue new requirements and guidance. DOE accepted the recommendation on June 28, 2007, and issued its implementation plan on October 24, 2007. The Board is currently evaluating the adequacy of the implementation plan.

5.4 Technical Competence

5.4.1 Federal

In accordance with the implementation plan for Recommendation 2004-1, DOE updated a corrective action plan to respond to federal technical competency issues. The action plan focused on several major areas, including: (1) conducting a functional workforce analysis as a basis for meeting the needs of DOE's missions for the next five years, (2) establishing a voluntary corporate accreditation process for the Technical Qualification Program based on the Institute of Nuclear Power Operation model, (3) reestablishing the corporate Technical Leadership Development Program to hire and develop new engineers, and (4) strengthening the qualification program for Senior Technical Safety Managers. DOE is currently revising its Federal Technical Capability Manual to incorporate changes in federal technical capability expectations developed as part of the implementation plan. The revised Manual is expected to be issued later in 2008. DOE will also conduct a follow-on line management review of the effectiveness of the corrective action plan in 2008.

DOE achieved several successes in this area in 2007. DOE significantly increased the number of federal personnel (1183 to 1346) who have completed or are in the process of completing their qualifications under an enhanced Technical Qualification Program. NNSA and DOE have instituted similar two-year career intern programs for training and providing rotational assignments for recent college graduates, the majority of whom are engineering majors. NNSA's Future Leaders Program successfully graduated its first class of 29 personnel and has two other classes of 30 and 24 college graduates in its training cycle. DOE's Office of Environmental Management just started its first Professional Development Corps program with

⁷ A "justification for continued operation" is an analysis supporting a decision to allow operation of a facility or process to continue in the face of known safety deficiencies or noncompliances with safety requirements.

21 college graduates participating in June 2007. One year of graduate study will be offered as part of the program.

5.4.2 Criticality Safety Engineers

The Board followed progress made by DOE in the areas of nuclear criticality training and staffing at several DOE site offices. Criticality safety personnel were added at sites that were previously unstaffed or understaffed, including the Savannah River Operations Office and the Nevada Site Office. Some of the engineers added by DOE have little or no direct criticality safety experience and must complete the training necessary to obtain qualification under the appropriate DOE qualification standard. DOE does not have a defined methodology for determining the number of personnel needed at each site to provide effective oversight for criticality safety, similar to the methodology used for determining the required staffing level for Facility Representatives. Thus, a site may fill the allocated oversight positions, but, in reality, may not have sufficient resources to perform effective criticality safety oversight. The Board continues to require annual reporting by DOE on the status of nuclear criticality-related topics.

5.4.3 Federal Facility Representatives

Overall, the DOE Facility Representative program is relatively healthy, continuously monitored, and fairly well staffed with competent technical personnel. However, the Board observed that the effectiveness of the Facility Representative programs at several NNSA sites (Los Alamos, Lawrence Livermore, Nevada Test Site, and Sandia) and one DOE site (Savannah River) are in need of improvement. At the NNSA sites, the effectiveness was diminished by the lack of progress in qualifying Facility Representatives, which limited their ability to execute oversight responsibilities. NNSA senior management is now focusing more attention on the staffing and qualification of Facility Representatives, and some progress is being observed.

For three consecutive years, the Board has called for DOE to include seasoned Facility Representatives on Federal Integrated Project Teams in order to gain the benefit of their operational experience. DOE has complied, with noticeable benefits for the Highly Enriched Uranium Materials Facility at Y-12 and the Waste Treatment and Immobilization Plant at Hanford. DOE is now reviewing its procedures for incorporating staffing criteria and special training needs for this vital capability.

6. Public Outreach and Agency Administration

6.1 Public Hearings

The Board convened two public hearings in 2007, pursuant to its authority under 42 U.S.C. § 2286b. The first, on March 22, 2007, was convened at the Board's headquarters in Washington, D.C. This hearing was the third in a series concerning safety in the design, construction, and modification of defense nuclear facilities. During the first hearing on this subject, held on December 7, 2005, the Board focused on the adequacy of DOE's existing directives affecting the design of new facilities. In the second hearing, held on July 19, 2006, the Board further explored integration of safety into design and the progress being made in implementing DOE's safety-in-design initiatives. The foci of this third hearing were early issue identification, communication of Board issues to DOE, issue management, and early resolution and closure of design-related safety issues. The hearing also addressed the implementation status of DOE Order 413.3A and DOE Standard 1189; the revision of DOE Manual 413.3A-1; and lessons learned at two major federal projects, the Waste Treatment Plant at Hanford and the Chemistry and Metallurgy Research Replacement project at Los Alamos.

The Board convened its next public hearing on December 5, 2007, in Los Alamos, New Mexico. In this hearing, the Board assessed the safety posture of the Los Alamos National Laboratory, with particular interest focused on NNSA's response to the Board's letter of February 1, 2007. In that letter, the Board suggested strengthening federal safety oversight, improving safety bases, ensuring the reliability of safety systems, developing institutional safety programs, eliminating known hazards, and increasing federal management of new projects. At the hearing, the Board further examined how effectively NNSA and its contractor were carrying out the Atomic Energy Act mandate to protect the health and safety of the public and workers. The Board received testimony from senior management officials of NNSA, the Los Alamos Site Office, and the laboratory's operating contractor. Members of the public also testified.

6.2 Responding to Public Requests

The Board answered numerous informal public requests for documents and information and responded to eight formal requests filed under the Freedom of Information Act. The average response time for Freedom of Information Act requests was 5.6 working days, as compared with the statutory requirement of 20 working days. The Board's website (www.dnfsb.gov) contains a complete list of Freedom of Information Act requests processed since 2003.

6.3 Electronic Access

The Board posts essential, publicly-releasable documents on its website in a timely manner in a format suitable for downloading. The Board also mails paper copies of certain documents (annual reports, technical reports, public hearing notices, and others) to a list of nearly four hundred addressees.

6.4 Inquiries into Health and Safety Issues

The Board often receives information regarding potential health and safety hazards from private citizens or from employees at defense nuclear facilities. The Board treats these matters with the utmost seriousness by assigning members of its legal and technical staffs to investigate or inquire further. These inquiries, which may involve interviews, reviews of documents, and site visits, are continued until the Board is able to reach a technical judgment on the issues raised. The Board informs DOE of any health and safety hazards and then closely monitors DOE's corrective actions. When the Board receives information on matters outside its jurisdiction, such as alleged criminal activities or unlawful personnel practices, it refers the information to the appropriate federal agency for action. During 2007, the Board directed inquiries into health and safety issues at Hanford, Savannah River, and Los Alamos. These inquiries led to safety improvements in the conduct of work at the respective sites.

6.5 Site Representative Activities

The Board enhances its onsite health and safety oversight of defense nuclear facilities by assigning experienced technical staff members to full-time duty in the field. As of December 31, 2007, there were two site representatives at the Pantex Plant near Amarillo, Texas; two at the Hanford Site near Richland, Washington; two at the Savannah River Site near Aiken, South Carolina; two at the Y-12 National Security Complex in Oak Ridge, Tennessee; and two at Los Alamos National Laboratory in New Mexico. The Board's site representative position at Lawrence Livermore National Laboratory in Livermore, California is temporarily vacant. Site representatives conduct first-hand assessments of nuclear safety management to identify health and safety concerns promptly. They meet regularly with the public, union members, Congressional staff members, and public officials from federal, state, and local agencies. The Board receives weekly reports and regular briefings from its site representatives in person and maintains continuous contact with them using all available communication media.

6.6 Human Resources

During FY 2007, the Board succeeded in increasing its staff from 86 to 92 government personnel. Ten engineers were hired. However, the Board lost four personnel to retirement or attrition. All five Board Member positions are filled. The Board is making hiring a priority in order to reach full strength of 100 personnel in 2008.

The Board has assembled a professional staff of exceptional technical capability. Staff members' expertise cover all major aspects of nuclear safety: nuclear, mechanical, electrical, chemical, fire protection, and structural engineering, as well as physics and metallurgy. Most mid- to senior-level technical staff members possess practical nuclear experience gained from duty in the United States Navy nuclear propulsion program, the nuclear weapons field, or the civilian nuclear reactor industry. The Board expects its engineers and scientists to maintain the highest level of technical knowledge, encouraging them to improve their skills continually through academic study. Ninety-three percent of the Board's technical staff hold advanced science and engineering degrees, with 18 percent at the doctoral level.

Junior technical staff members continue to be recruited through the Board's professional development program. Entry-level employees recruited into this 3-year program receive graduate education and intensive on-the-job training guided by experienced technical mentors. Currently, there are three entry-level employees in this program, with one more expected to enter the program in June 2008. The Board will continue its vigorous recruitment program to attract the brightest engineering students from colleges and universities across the country.

6.7 Information Technology and Security

In 2007 the Board continued to strengthen internal controls and ensure that it is in compliance with the requirements of the Federal Information Security Management Act as well as other security guidance. The Board continues to implement processes called for by Homeland Security Presidential Directive 12 and expects to issue in 2008 new personal identity verification cards for physical and logical access.

The Board has made preparations for a complete refresh of its desktop infrastructure in 2008 to take advantage of new technologies. The equipment will also incorporate the new Federal Desktop Core Configuration settings as required by the Office of Management and Budget to standardize operating system security settings across the Executive Branch. Implementing these security settings on desktop and laptop computers will help the Board to improve system performance, decrease operating costs, and ensure public confidence in the confidentiality, integrity, and availability of government information.

6.8 Dispute Resolution Programs

The Board, like other federal agencies, is required by the Administrative Dispute Resolution Act of 1996 to provide an alternative dispute resolution program for use in resolving appropriate disputes. The Board maintains such a program, making use of cooperative agreements with other agencies to resolve workplace and contracts disputes economically.

6.9 Financial Management

The Board received a second consecutive "unqualified audit" opinion on its financial statements from an independent auditor. The auditor found that the Board complied with all applicable federal laws and regulations and had no financial internal control material weaknesses.

effort to reduce paperwork and respondent burden, conducts a pre-clearance consultation program to provide the general public and federal agencies with an opportunity to comment on proposed and/or continuing collections of information in accordance with the Paperwork Reduction Act of 1995 (PRA95) (44 U.S.C. 3506(c)(2)(A)). This program helps to ensure that requested data can be provided in the desired format, reporting burden (time and financial resources) is minimized, collection instruments are clearly understood, and the impact of collection requirement on respondents can be properly assessed.

Currently, the Corporation is soliciting comments concerning its proposed renewal of its Learn and Serve America Program and Performance Measurement Reports. These reports are used by current grantees, subgrantees and sub-subgrantees to report on Learn and Serve-funded service-learning programs. Data collected through the reports are utilized by the Corporation for Congressional reporting and program management. Completion of the Program and Performance Measurement Reports is a requirement of the Learn and Serve grant provisions.

Copies of the information collection requests can be obtained by contacting the office listed in the addresses section of this notice.

DATES: Written comments must be submitted to the individual and office listed in the **ADDRESSES** section by July 2, 2007.

ADDRESSES: You may submit comments, identified by the title of the information collection activity, by any of the following methods:

(1) By mail sent to: Corporation for National and Community Service, Research and Policy Development; Attention Kimberly Spring, Policy Analyst, 10th Floor; 1201 New York Avenue, NW., Washington, DC 20525.

(2) By hand delivery or by courier to the Corporation's mailroom at Room 8100 at the mail address given in paragraph (1) above, between 9 a.m. and 4 p.m. Monday through Friday, except Federal holidays.

(3) By fax to: (202) 606-3464, Attention Kimberly Spring, Policy Analyst.

(4) Electronically through the Corporation's e-mail address system: kspring@cns.gov.

FOR FURTHER INFORMATION CONTACT: Kimberly Spring, (202) 606-6629, or by e-mail at kspring@cns.gov.

SUPPLEMENTARY INFORMATION: The Corporation is particularly interested in comments that:

- Evaluate whether the proposed collection of information is necessary for the proper performance of the functions of the Corporation, including whether the information will have practical utility;

- Evaluate the accuracy of the agency's estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;

- Enhance the quality, utility, and clarity of the information to be collected; and

- Minimize the burden of the collection of information on those who are expected to respond, including the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology (e.g., permitting electronic submissions of responses).

Background

The Learn and Serve America Program was established by the National and Community Service Act of 1990, as amended, (42 U.S.C. 12501, *et seq.*) (Pub. L. 103-82) to support efforts in schools, higher education institutions, and community-based organizations to involve young people in meaningful service to their communities while improving academic, civic, social, and career-related skills. The Learn and Serve program is administered by the Corporation for National and Community Service and is funded through grants to states, national organizations, and institutions of higher education, and through them to individual schools and school districts, community-based organizations, and colleges or universities. Approximately 100 grantees and 2,000 subgrantees and sub-subgrantees receive Learn and Serve funds each year.

The Learn and Serve America Program and Performance Measurement Reports provide an annual program reporting process for Learn and Serve: Collecting program characteristics, output measurements, and institutional-level service-learning policies and practices. The system is Web-based and allows for the electronic submission of reporting information and grantee and public-use access of data collected through the system.

Current Action

The Corporation seeks to renew the current reporting instruments, which are designed to collect information on (a) the characteristics of grantee and subgrantee organizations; (b) the scope and structure of service-learning activities in the funded organizations;

(c) number of participants in service-learning and the hours of service provided; and (d) institutional supports for service-learning. The Corporation maintains three versions of the reporting instrument to correspond to the three major funding streams under Learn and Serve America: K-12 School-Based, Higher Education, and Community-Based. The Corporation also seeks to continue using the reporting instruments until the renewal of the instruments is approved by OMB. The current application is due to expire on September 30, 2007.

Type of Review: Renewal.

Agency: Corporation for National and Community Service.

Title: Learn and Serve America Program and Performance Measurement Reports.

OMB Number: 3045-0095.

Agency Number: None.

Affected Public: Learn and Serve America Grantees and Subgrantees.

Total Respondents: 2,100.

Frequency: Annually.

Average Time Per Response: ¼ hour for grantees and one hour for subgrantees.

Estimated Total Burden Hours: 2,025 hours.

Total Burden Cost (capital/startup): None.

Total Burden Cost (operating/maintenance): None.

Comments submitted in response to this notice will be summarized and/or included in the request for Office of Management and Budget approval of the information collection request; they will also become a matter of public record.

Dated: April 24, 2007.

Robert Grimm, Jr.,

Director, Office of Research and Policy Development.

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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

[Recommendation 2007-1]

Safety-Related In Situ Nondestructive Assay of Radioactive Materials

AGENCY: Defense Nuclear Facilities Safety Board.

ACTION: Notice, recommendation.

SUMMARY: The Defense Nuclear Facilities Safety Board has made a recommendation to the Secretary of Energy pursuant to 42 U.S.C. 2286a(a)(5) which addresses the measuring of radioactive material holdup at defense nuclear facilities in the Department of Energy complex.

DATES: Comments, data, views, or arguments concerning the recommendation are due on or before June 1, 2007.

ADDRESSES: Send comments, data, views, or arguments concerning this recommendation to: Defense Nuclear Facilities Safety Board, 625 Indiana Avenue., NW, Suite 700, Washington, DC 20004–2001.

FOR FURTHER INFORMATION CONTACT: Brian Grosner or Andrew L. Thibadeau at the address above or telephone (202) 694–7000.

Dated: April 27, 2006.

A.J. Eggenberger,
Chairman.

Recommendation 2007–1 to the Secretary of Energy

Safety-Related In Situ Nondestructive Assay of Radioactive Materials

Pursuant to 42 U.S.C. 2286(a)(5); Atomic Energy Act of 1954, As Amended

Dated: April 25, 2007.

Overview

There are many situations in which the quantity and composition of radioactive material must be determined. In some instances, access to the material is impossible or undesirable, and consequently, weighing, laboratory analysis, and calorimetry are not viable options. In these cases, *in situ* nondestructive assay (NDA), based on the measurement of signature emissions from a specific isotope of interest, is used to provide an estimate of the type and quantity of radioactive material present. However, large uncertainties and inaccuracies have occurred in estimating the type and quantity of radioactive material using *in situ* NDA. These uncertainties and inaccuracies include incorrect assumptions about shielding and the spatial distribution of radioactive material, as well as poor measurement techniques. Measurement errors, in turn, lead to potential criticality accident conditions, unexpected radiation exposure to workers, and underestimation of radioactive material available for release in accident scenarios.

In most nuclear safety areas, the Department of Energy (DOE) has captured required elements for robust site programs through its Directives system. These elements include requirements necessary for proper functioning of the program, training and qualification standards for personnel, assessment criteria to ensure proper implementation of requirements, and feedback mechanisms for lessons learned and continuous improvement. However, DOE has not established programmatic requirements for NDA, even though this method is heavily relied upon for nuclear safety throughout the complex and is key to many DOE activities. The capability to perform accurate measurements and use the results to determine compliance with nuclear safety limits is absolutely essential.

Research and development efforts for NDA have historically focused on the areas of material control and accountability and

nuclear material safeguards; advances in these areas have peripherally benefitted *in situ* NDA measurement capabilities. Current research and development efforts appear to hold little promise for addressing needed improvements for *in situ* NDA measurement. For example, development of instrumentation and measurement techniques is needed to reduce overall measurement uncertainties.

Examples

Three notable instances of recent errors associated with *in situ* NDA measurement of radioactive material holdup are discussed below. These errors resulted from the use of inaccurate correction factors regarding material geometry assumptions or failure to perform measurements at locations where the material was accumulating. In each of these cases, the amount of radioactive material was initially underestimated, resulting in a smaller-than-expected safety margin and violations of criticality safety limits.

Material holdup in 6-inch diameter vacuum system pipe at the Hanford Site's Plutonium Finishing Plant was assumed to be in the form of a 0.25 inch layer at the bottom of the pipe. Using a correction factor for this geometry, the initial estimate of material was about 1 kg. When workers then proceeded to remove the piping, it was found to be filled with a solid plug of material, and the actual amount of material present was nearly twice as high as the initial estimate.

Measurement of an exhaust filter at the Y–12 National Security Complex assumed that fissionable material was loaded only on the face of the filter. An estimate of a few hundred grams of material was obtained using correction factors for this geometry. Subsequent investigation showed that material was loaded throughout the filter, and not just on the face. The actual amount of fissionable material present was several times the initial estimate.

A second exhaust filter at the Y–12 National Security Complex was measured periodically using NDA, but the measurement point was not where the fissionable material was accumulating. Once this error was discovered, follow-up measurements showed significant material accumulation.

In each of these instances, site-specific corrective actions were taken based on the specific problem encountered. Lessons learned from these events do not appear to have been shared within the DOE complex. Complex-wide corrective actions have not been identified to minimize the occurrence of similar events at other sites. The Board is concerned that undiscovered problems currently exist at other facilities within the DOE complex. It is incumbent upon DOE and its contractors to review current *in situ* NDA measurements to determine whether the assumptions used to derive results are sufficiently conservative to ensure compliance with nuclear safety limits.

Issues

Three main issues dominate the current technical and regulatory landscape regarding

in situ NDA measurements: (1) Lack of standardized requirements for performing measurements, (2) lack of design requirements for new facilities that would facilitate accurate holdup measurement, and (3) lack of research and development activities for new instrumentation and/or measurement techniques. Each of these issues is discussed below.

Lack of Standardization—DOE has not established requirements or guidance for performing *in situ* measurements in its Directives system. While the Board recognizes that measurement techniques can be highly location specific, a requirement to follow methods outlined in national consensus standards when performing *in situ* NDA measurements would reduce the errors and uncertainty of results. Commercial guidance for NDA is available in a series of standards published by the American Society for Testing and Materials (ASTM). This series addresses good practices for performing NDA measurements, methods for performing specific types of NDA measurements (for example, ASTM C–1133–03, *NDA of Low-Density Scrap and Waste by Segmented Passive Gamma Ray Scanning*), and training and qualification of NDA personnel. While this guidance has been used informally at some sites, DOE has not required its use for NDA measurements.

Lack of Design Requirements for New Facilities—Many of the problems that require *in situ* NDA to determine radioactive material holdup arose because facilities were designed and built before the need for NDA technology was evident. As a result, no consistent attempt was made to design facility systems to minimize holdup or facilitate its measurement. This historical trend should not be repeated in new facilities. The necessity of monitoring radioactive material holdup must be considered in the design of new facilities. For example, locations for monitoring can be selected during the design phase on the basis of the most likely locations for holdup to occur. Calibrations can then be performed at these locations before the facility begins operations to provide a baseline for future NDA measurements. Facilities can also be designed to minimize holdup in areas where it may be of concern.

Lack of Research and Development Activities—Los Alamos National Laboratory (LANL) conducted NDA research for more than 20 years. LANL developed most of the NDA techniques in current use, and conducts associated training programs. However, it is not clear that any significant research and development for *in situ* NDA measurements is currently being conducted within DOE to address serious concerns with material holdup. Research and development activities are focused in other areas, such as nuclear material safeguards and homeland security, but these efforts have different objectives and may not yield results that are beneficial for measurements using *in situ* NDA.

Recommendation

The Board, therefore, recommends that DOE:

1. Evaluate the extent of condition regarding inaccurate *in situ* NDA programs

within DOE. This effort should involve at least two actions:

A. Identifying all cases within the defense nuclear complex in which *in situ* NDA results are used to ensure compliance with nuclear safety limits.

B. Reviewing the cases identified in step 1.A to validate that the protocols, methodologies, calculations, and assumptions used to obtain NDA results are sufficiently conservative. This review should take into consideration lessons learned from recent events.

2. Establish requirements and guidance in a DOE directive or directives. The requirements and guidance should focus on *in situ* NDA programs that are used to demonstrate compliance with nuclear safety limits. Particular issues to be addressed should include:

A. Training and qualification standards for personnel involved in performing NDA measurements, interpreting and reviewing results, and managing site programs.

B. Application of standard protocols and methodologies, such as those given in the national consensus series issued by ASTM, for performing NDA measurements.

C. Standardization of correction factors for common situations (geometry and self-attenuation factors) and consistent application of uncertainty values.

D. Reinforcement of the use of formal lessons-learned mechanisms in the application of NDA programs so that information can be shared easily among affected DOE sites.

E. Incorporation of features in the design of new facilities to minimize radioactive material holdup and facilitate accurate NDA holdup measurements.

F. Periodic assessments of the need for new NDA technology and the status of ongoing NDA-related research and development programs.

G. Periodic assessments to ensure that NDA programs are using the best available technology.

H. Incorporation of appropriate quality assurance elements into *in situ* NDA measurements when used for compliance with nuclear safety limits as required by 10 Code of Federal Regulations Part 830.

A.J. Eggenberger,

Chairman.

[FR Doc. E7-8374 Filed 5-1-07; 8:45 am]

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DEPARTMENT OF EDUCATION

Notice of Proposed Information Collection Requests

AGENCY: Department of Education.

ACTION: Notice of proposed information collection requests.

SUMMARY: The IC Clearance Official, Regulatory Information Management Services, Office of Management, invites comments on the proposed information collection requests as required by the Paperwork Reduction Act of 1995.

DATES: An emergency review has been requested in accordance with the Act (44 U.S.C. Chapter 3507(j)), since public harm is reasonably likely to result if normal clearance procedures are followed. Approval by the Office of Management and Budget (OMB) has been requested by December 7, 2007.

ADDRESSES: Written comments regarding the emergency review should be addressed to the Office of Information and Regulatory Affairs, Attention: Rachael Potter, Desk Officer, Department of Education, Office of Management and Budget; 725 17th Street, NW., Room 10222, New Executive Office Building, Washington, DC 20503 or faxed to (202) 395-6974.

SUPPLEMENTARY INFORMATION: Section 3506 of the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35) requires that the Director of OMB provide interested Federal agencies and the public an early opportunity to comment on information collection requests. The Office of Management and Budget (OMB) may amend or waive the requirement for public consultation to the extent that public participation in the approval process would defeat the purpose of the information collection, violate State or Federal law, or substantially interfere with any agency's ability to perform its statutory obligations. The IC Clearance Official, Regulatory Information Management Services, Office of Management, publishes this notice containing proposed information collection requests at the beginning of the Departmental review of the information collection. Each proposed information collection, grouped by office, contains the following: (1) Type of review requested, e.g., new, revision, extension, existing or reinstatement; (2) Title; (3) Summary of the collection; (4) Description of the need for, and proposed use of, the information; (5) Respondents and frequency of collection; and (6) Reporting and/or Recordkeeping burden. ED invites public comment. The Department of Education is especially interested in public comment addressing the following issues: (1) Is this collection necessary to the proper functions of the Department; (2) will this information be processed and used in a timely manner; (3) is the estimate of burden accurate; (4) how might the Department enhance the quality, utility, and clarity of the information to be collected; and (5) how might the Department minimize the burden of this collection on respondents, including through the use of information technology.

Dated: April 26, 2007.

Angela C. Arrington,

IC Clearance Official, Regulatory Information Management Services, Office of Management.

Office of Postsecondary Education

Type of Review: New.

Title: U.S.-Russian Program:

Improving Research and Educational Activities in Higher Education.

Abstract: This is a new Special Focus Competition, administered by the Fund for the Improvement of Postsecondary Education (FIPSE). FIPSE's U.S.-Russia Program will award grants to U.S. institutions participating in bilateral institutional cooperation to support innovative projects that will improve research and education activities in higher education in the U.S. and Russia. The rationale for the U.S.-Russia Program is based upon the need for increased interconnectedness between the U.S. and Russia in order to operate effectively in a global economy. Institutions will be funded by their respective government agencies in areas that advance the study of English and Russian and demonstrate innovative and/or best practices in a variety of academic disciplines, such as mathematics, science, and economics.

Additional Information: This important unique program is facing a tight deadline in order for both nations to have adequate time to apply, and hence we are asking for this emergency clearance to provide possible applicants a decent amount of time to complete the necessary application.

Frequency: Annually.

Affected Public: Not-for-profit institutions.

Reporting and Recordkeeping Hour Burden:

Responses: 12.

Burden Hours: 360.

Requests for copies of the proposed information collection request may be accessed from <http://edicsweb.ed.gov>, by selecting the "Browse Pending Collections" link and by clicking on link number 3323. When you access the information collection, click on "Download Attachments" to view. Written requests for information should be addressed to U.S. Department of Education, 400 Maryland Avenue, SW., Potomac Center, 9th Floor, Washington, DC 20202-4700. Requests may also be electronically mailed to the Internet address ICDocketMgr@ed.gov or faxed to 202-245-6623. Please specify the complete title of the information collection when making your request.

Comments regarding burden and/or the collection activity requirements should be electronically mailed to ICDocketMgr@ed.gov. Individuals who

Appendix B: Recommendations Cited

| Number | Date | Title |
|--------|--------------------|--|
| 94-1 | May 26, 1994 | Improved Schedule for Remediation in the Defense Nuclear Facilities Complex |
| 95-2 | October 11, 1995 | Safety Management |
| 97-2 | May 19, 1997 | Continuation of Criticality Safety at Defense Nuclear Facilities in the Department of Energy |
| 98-2 | September 30, 1998 | Safety Management at the Pantex Plant |
| 2000-1 | January 14, 2000 | Prioritization for Stabilizing Nuclear Materials |
| 2000-2 | March 8, 2000 | Configuration Management, Vital Safety Systems |
| 2001-1 | March 23, 2001 | High-Level Waste Management at the Savannah River Site |
| 2002-1 | September 23, 2002 | Quality Assurance for Safety-Related Software |
| 2002-3 | December 11, 2002 | Requirements for the Design, Implementation, and Maintenance of Administrative Controls |
| 2004-1 | May 21, 2004 | Oversight of Complex, High-Hazard Nuclear Operations |
| 2004-2 | December 7, 2004 | Active Confinement Systems |
| 2005-1 | March 10, 2005 | Nuclear Material Packaging |
| 2007-1 | April 25, 2007 | Safety-Related In Situ Nondestructive Assay of Radioactive Materials |

Appendix C: Reporting Requirements

| Date | Addressee | Site or Topic |
|--------------|--------------------------------|--|
| January 10 | Ass't Secy. Environmental Mgt. | Salt Waste Processing Facility, Savannah River |
| January 18 | Secretary of Energy | Transuranic waste operations, Los Alamos |
| March 13 | Acting Administrator, NNSA | 9212 Complex at Y-12 |
| March 30 | Acting Administrator, NNSA | Lightning protection, Pantex |
| April 24 | Acting Administrator, NNSA | Procedural deficiencies, Pantex |
| May 10 | Acting Administrator, NNSA | Expert elicitation process, NNSA complex |
| May 16 | Deputy Secretary of Energy | Risk assessment policy and guidance |
| July 16 | Acting Administrator, NNSA | Startup of weapons activities, Pantex |
| July 30 | Secretary of Energy | Implementation of Rec. 2002-3 |
| September 10 | Administrator, NNSA | Materials Accountability, Los Alamos |
| October 16 | Administrator, NNSA | Safety systems, Los Alamos |
| October 23 | Administrator, NNSA | Chemistry & Metallurgy Research, Los Alamos |

Appendix D: Correspondence

Idaho National Engineering Laboratory

January 24 letter to the Assistant Secretary for Environmental Management regarding design and construction of the Integrated Waste Treatment Unit.

Los Alamos National Laboratory

January 18 letter to the Secretary of Energy imposing a 45-day reporting requirement regarding specific action plans for transuranic waste operations.

February 1 letter to the Acting Administrator, NNSA, offering observations and suggested actions for improving safety at Los Alamos National Laboratory.

September 10 letter to the Administrator, NNSA, imposing a 90-day reporting requirement on strategy and milestones for the upgrade of the Materials Accountability and Safeguards System.

October 16 letter to the Administrator, NNSA, imposing a 60-day reporting requirement regarding efforts to improve safety systems.

October 23 letter to the Administrator, NNSA, imposing a 60-day reporting requirement regarding the continued safe operation of the Chemistry and Metallurgy Research Facility.

Oak Ridge National Laboratory

September 14 letter to the Assistant Secretary for Environmental Management regarding the uranium downblending and disposition program in Building 3019.

Pantex Plant

March 30 letter to the Acting Administrator, NNSA, imposing a 30-day reporting requirement regarding the potential threat posed by direct and indirect lightning effects.

April 24 letter to the Acting Administrator, NNSA, imposing a 30-day reporting requirement for a briefing on the quality of technical procedures used to conduct nuclear explosive operations.

July 16 letter to the Acting Administrator, NNSA, imposing a 30-day reporting requirement for safe startup of weapons program activities.

July 30 letter to the Manager, Pantex Site Office, regarding control of the authorization basis.

Nevada Test Site

October 15 letter to the Principal Deputy Administrator, NNSA, regarding the management and operating contractor assuming full responsibility for all nuclear and radiological facilities.

Savannah River Site

January 10 letter to the Assistant Secretary for Environmental Management imposing a 30-day reporting requirement on geotechnical and structural engineering issues for the Salt Waste Processing Facility.

January 29 letter to the Assistant Secretary for Environmental Management regarding the Container Surveillance and Storage Capability project.

February 1 letter to the Chief Operating Officer for Environmental Management regarding high-level waste management.

June 1 letter to the Assistant Secretary for Environmental Management expressing satisfaction with DOE's path forward for the Salt Waste Processing Facility design.

June 26 letter to the Congress forwarding a copy of the Fourth Annual Report, *Plutonium Storage at the Department of Energy's Savannah River Site*.

August 29 letter to the Assistant Secretary for Environmental Management regarding the plans for Tank 11.

Y-12 National Security Complex

March 13 letter to the Acting Administrator, NNSA, imposing a 6-month reporting requirement regarding assessments of the 9212 complex.

August 9 letter to the Administrator, NNSA, regarding the conceptual design activities and associated safety basis development for the Uranium Processing Facility.

Other Correspondence

January 4 letter to the Deputy Administrator of Naval Reactors, NNSA, acknowledging receipt of reports and noting the first successful cruise of *USS Virginia*.

January 18 letter to the Secretary of Energy accepting the revised schedule of deliverables for Recommendation 2005-1.

January 22 letter to the Secretary of Energy acknowledging receipt of letter requesting formal closure of Recommendation 2002-3.

January 29 letter to the Assistant Secretary for Environmental Management regarding worker protection during transuranic waste activities.

January 30 letter to the Deputy Secretary of Energy regarding improvements in the operational readiness review process.

February 15 letter to the Secretary of Energy forwarding the Board's *First Quarterly Report to Congress on the Status of Significant Unresolved Issues with Department of Energy's Design and Construction Projects*.

February 28 letter to the Secretary of Energy forwarding a copy of the Board's 17th Annual Report to Congress.

March 13 letter to the Secretary of Energy accepting the revised Implementation Plan for Recommendation 2004-2.

April 19 letter to the Deputy Secretary of Energy regarding justifications for continuing operations at defense nuclear facilities.

April 25 letter to the Secretary of Energy transmitting Recommendation 2007-1, *Safety-Related In Situ Nondestructive Assay of Radioactive Materials*.

May 10 letter to the Acting Administrator, NNSA, imposing a 30-day reporting requirement regarding expert elicitation, expert judgment, and peer review processes.

May 16 letter to the Deputy Secretary of Energy imposing a 45-day reporting requirement on DOE's risk assessment policy.

June 6 letter to the Secretary of Energy recognizing Robert C. Seal as 2006 DOE Facility Representative of the Year and Elizabeth D. Sellers for being named DOE's Facility Representative of the Year for three consecutive years.

June 20 letter to the Secretary of Energy forwarding a copy of the Board's *Second Quarterly Report to Congress on the Status of Significant Unresolved Issues with Department of Energy's Design and Construction Projects*.

June 26 letter to the Deputy Administrator of Naval Reactors, NNSA, acknowledging receipt of reports and commending the program's outstanding performance.

July 19 letter to Congress enclosing the joint Board-DOE report *Improving the Identification and Resolution of Safety Issues During the Design and Construction of DOE Defense Nuclear Facilities*

July 30 letter to the Secretary of Energy imposing a 45-day reporting requirement regarding implementation of Recommendation 2002-3.

August 8 letter to the Secretary of Energy closing Recommendation 2000-2.

October 17 letter to the Departmental Representative to the Board forwarding a copy of the Board's *Third Quarterly Report to Congress on the Status of Significant Unresolved Issues with Department of Energy's Design and Construction Projects*.

