
NINETEENTH ANNUAL REPORT TO CONGRESS

DEFENSE NUCLEAR FACILITIES SAFETY BOARD



MARCH 2009

A.J. Eggenberger, Chairman
John E. Mansfield, Vice Chairman
Joseph F. Bader
Larry W. Brown
Peter S. Winokur

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700 Washington, D.C. 20004-2901
(202) 694-7000



March 24, 2009

To the Congress of the United States:

The Defense Nuclear Facilities Safety Board is pleased to submit to Congress its Nineteenth 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 2008, 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

A handwritten signature in black ink, appearing to read "John E. Mansfield".

John E. Mansfield
Vice Chairman

A handwritten signature in black ink, appearing to read "Larry W. Brown".

Larry W. Brown
Member

A handwritten signature in black ink, appearing to read "Joseph F. Bader".

Joseph F. Bader
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.

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 are resolved early in the design phase.

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Responses to Congressional Direction

Certification of Design

The Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417, enacted a limitation on funding for the Chemistry and Metallurgy Research Replacement Project at Los Alamos National Laboratory until the Board and the National Nuclear Security Administration (NNSA) each certify that certain design issues reported by the Board have been resolved. The pertinent language reads as follows:

Sec. 3112. Limitation On Funding For Project 04-D-125 Chemistry And Metallurgy Research Replacement Facility Project, Los Alamos National Laboratory, Los Alamos, New Mexico.

Of the amounts appropriated pursuant to an authorization of appropriations in this Act or otherwise made available for fiscal year 2009 for Project 04-D-125 Chemistry and Metallurgy Research Replacement (in this section referred to as “CMRR”) facility project, Los Alamos National Laboratory, Los Alamos, New Mexico, not more than \$50,200,000 may be made available until (1) the Administrator for Nuclear Security and the Defense Nuclear Facilities Safety Board have each submitted a certification to the congressional defense committees stating that the concerns raised by the Defense Nuclear Facilities Safety Board regarding the design of CMRR safety class systems (including ventilation systems) and seismic issues have been resolved; and (2) a period of 15 days has elapsed after both certifications under paragraph (1) have been submitted.

The Board is applying significant effort toward accomplishing this certification. The Board has initiated review of design documentation, including the Preliminary Documented Safety Analysis supplied by NNSA, and has established a process that will allow NNSA and the Board to reach mutual agreement on issues identified by the Board. The Board’s goal is to reach a decision on certification as soon as possible following receipt from NNSA of full and complete information on the design.

Quarterly Reports

As requested, the Board has been providing Congress quarterly reports on the status of significant unresolved technical differences between the Board and DOE on the design and construction of DOE’s defense nuclear facilities. Though Congress requested that the Board provide quarterly reports only through fiscal year 2008, the Board has continued issuing these reports because they serve a useful purpose, namely, to keep all parties apprised of the Board’s concerns with new designs for DOE’s defense nuclear facilities. The Board has also been encouraged by the feedback received from the Congressional committees (see, for example, Senate Armed Services Committee Report 110-77, June 5, 2007). For these reasons, the Board intends to continue issuing quarterly reports to DOE and Congress. The Board issued three quarterly reports covering calendar year 2008; a fourth quarterly report discussing activities through the end of November 2008 was issued February 9, 2009.

Summary of the Board's Accomplishments in 2008

The nuclear weapons program operated by DOE and 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 Board's constant vigilance 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 the 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 2008, 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. (Sections cited below provide additional discussion of the subject matter.)

Pantex Plant (Sec. 2.1.1):

- The Board found deficiencies in the quality and consistency of procedures for nuclear explosive operations. NNSA improved the procedures to reduce the likelihood an error could lead to an accident. (Board letter dated April 23, 2007; staff-to-staff meetings)
- The Board found deficiencies in the configuration control and level of detail in safety basis documents. During 2008, NNSA completed implementation of configuration control of the safety basis and clarified documentation of technical safety requirements and safety basis documents, improving assurance that safety controls are properly identified and implemented. (Board letter dated July 30, 2007)

- The Board identified the need to reduce uncertainties and resolve issues involving lightning hazards at Pantex. During 2008, NNSA utilized subject matter experts from Pantex and the nuclear weapons laboratories to evaluate and disposition potential lightning protection issues. (Board letter dated March 30, 2007)
- The Board has long been concerned with the impact of electrostatic discharges on nuclear weapons; this issue arose again in NNSA's effort to restart W76 nuclear explosive operations. NNSA is working to characterize the electrostatic discharge environment within nuclear facilities and implement safety controls to reduce the chance of accidental ignition of explosive charges. (Board letter dated August 8, 2008)
- The Board continued to press NNSA to improve the documentation and peer review of design agency evaluations of weapon response to potential accident environments and stimuli. In response, the design agencies developed improved processes for the evaluation and documentation of weapon response to potential accident environments and stimuli, and NNSA verified their adequacy. (Recommendation 98-2* ; Board letter dated December 16, 2008)
- The Board has urged NNSA to perform overdue Nuclear Explosive Safety Master Studies essential to verifying the continued adequacy of nuclear explosive facilities. During 2008, NNSA completed two of three overdue Master Studies and developed a schedule for completing the remaining study in 2009. (staff-to-staff meetings)
- The Board questioned planning by the Pantex contractor to perform operations involving uncased conventional high explosives in a nuclear explosive bay instead of a more blast-resistant cell. NNSA determined that use of a cell facility was practical and reaffirmed that practice for future operations involving conventional high explosives. (Board letter dated March 20, 2008)
- The Board found that the quality and fidelity (realism) of weapon trainer units had degraded over time. NNSA addressed the issue by incorporating weapon trainer units into the NNSA provisioning process to ensure that high fidelity training of weapon production personnel is sustained. (Board letter dated July 8, 2008)

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

- In response to the Board's concern that regular assessments of the safety of continued operations in the aging 9212 Complex were needed, NNSA provided the first annual report and briefings to the Board on results of assessments and specific actions taken to evaluate and improve the safety posture of the facility. (Board letter dated March 13, 2007; Board briefings March and December 2008)

* All Board recommendations referenced in this report are listed in Appendix B at page 77.

- The Board identified the need for improvements in programs to measure and control unintended accumulations of fissile materials posing criticality hazards in process systems and equipment. NNSA is implementing more than 100 improvements stemming from fissile material hold-up reviews completed in 2008. (Recommendation 2007-1; staff-to-staff meetings)
- The Board identified the need for a thorough evaluation of degradation of concrete in the 9204-2E facility resulting from chemical leaks. NNSA developed a test plan to be completed in early 2009 to assess the extent of degradation in the facility. (staff-to-staff meetings)
- The Board found that safety documentation for the Uranium Processing Facility did not use the bounding Airborne Release Fraction and Respirable Fraction values from the applicable DOE handbook to evaluate postulated accident consequences. In response, NNSA committed to use the appropriate bounding values in safety basis calculations for the Uranium Processing Facility and other Y-12 nuclear facilities, ensuring that a conservative set of safety controls will be developed. (Board letter dated January 17, 2008)
- The Board informed NNSA that the level of readiness review approved by the Y-12 Site Office for resuming operation of the Oxide Conversion Facility was insufficient and did not comply with the applicable DOE order. In response, NNSA Headquarters directed that Operational Readiness Reviews be performed by NNSA and the contractor prior to restarting the facility instead of a less rigorous level of review that only involved the contractor. (staff-to-staff meetings)
- A review by the Board found inconsistencies in procedure use that could lead to human error during hazardous operations. NNSA has started an effort to improve formal expectations for the use of procedures in order to reduce confusion and the potential for errors in execution. (staff-to-staff meetings)

Los Alamos National Laboratory (Sec. 2.2.1):

- The Board identified the need for NNSA to focus on rapidly improving deficiencies in safety systems. As part of its response, NNSA has bolstered management attention and added personnel to the Formality of Operations initiative, which aims to improve the conduct of engineering, operations, maintenance, and training. (Board letter dated October 16, 2007; staff-to-staff meetings)
- In response to the Board's concern that prompt action was needed to eliminate the hazard posed by legacy high-activity transuranic waste drums stored in Area G, NNSA completed efforts to disposition the high-activity transuranic waste drums that were above ground and available for processing. (Board letter dated January 18, 2007)

- The Board identified the need for improvements in fire and emergency response capabilities. In 2008, NNSA completed a cooperative agreement with the local government for fire and emergency response services and is working to better align these services with the unique needs of the laboratory. (Board letters dated February 1, 2007, and December 8, 2008)
- In response to the Board's concern that prolonging operations in the 55-year-old Chemistry and Metallurgy Research facility represents a serious safety risk, NNSA studied alternatives to continued use of the facility and now plans to reduce the material-at-risk by relocating some activities to a more robust facility. (Board letters dated October 23, 2007, and May 16, 2008)
- Following an evaluation by the Board that found deficiencies in criticality safety evaluations supporting fissile material operations in the Los Alamos Plutonium Facility, NNSA suspended fissile material operations throughout the facility and reassessed criticality safety limits before resuming operations. (Board letter dated September 10, 2007; staff-to-staff meetings)
- The Board observed that the interrelationships among defense nuclear facilities and projects at Los Alamos require a holistic approach to decisions regarding infrastructure investments, facility upgrades, and project planning to ensure that the safety impacts of decisions are adequately understood. NNSA subsequently instituted an integrated nuclear planning process to improve coordination among its projects as national security mission requirements evolve. (staff-to-staff meetings)
- The Board has consistently urged NNSA to develop and implement an improved safety basis for the Plutonium Facility at Los Alamos, and a recent review by the Board identified deficiencies in the proposed new documented safety analysis for the facility. In 2008, NNSA approved an acceptable documented safety analysis for the Plutonium Facility which should significantly streamline and improve the safety of operations. (Board letter dated May 30, 2008)

Lawrence Livermore National Laboratory (Sec. 2.2.2):

- NNSA transitioned management and operations of the laboratory to a new contractor; the Board's evaluation of the transition found that safety-related enhancements were made to contractual requirements and organizational structure. (staff-to-staff meetings)
- The Board evaluated readiness preparations for startup of the Tritium Science Station. After initial difficulties, NNSA improved training, documentation, and facility condition, resulting in the successful completion of startup activities. (staff-to-staff meetings)
- The Board found deficiencies in the laboratory's processes for the planning and control of hazardous work. NNSA is pursuing improvements. (staff-to-staff meetings)

Nevada Test Site (Sec. 2.2.3):

- The Board identified numerous deficiencies in the fire suppression system for the Device Assembly Facility. NNSA initiated an improvement project to assess the condition of the system, analyze and prioritize needed improvements, and formulate plans to improve the system. (Board letter dated January 18, 2008)
- The Board continued to stress the need to identify and accomplish safety upgrades for the facility at G-Tunnel that would be used in disposition of an improvised nuclear device. NNSA completed some facility improvements and a cost/benefit analysis of proposed controls and improvements; the agency is now developing a plan for implementation of safety controls and upgrades for the facility. (Board letter dated December 7, 2006; staff-to-staff meetings)

Sandia National Laboratories (Sec. 2.2.4):

- Completing its response to deficiencies previously identified by the Board, NNSA continued to strengthen safety bases for its defense nuclear facilities through annual updates and development of new bases for planned activities. (Board letter dated September 27, 2004; staff-to-staff meetings)
- The Board reviewed analyses performed by Sandia to characterize electrostatic discharge and lightning hazards for nuclear explosive operations at the Pantex Plant. Sandia's work has improved the understanding of the safety impacts of these phenomena. (Board letter dated March 30, 2007; 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, 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 (Sec. 3.1.1):

- The Board closed Recommendation 94-1, *Improved Schedule for Remediation in the Defense Nuclear Facilities Complex* and Recommendation 97-1, *Safe Storage of Uranium-233*. (Board letter dated April 29, 2008)

Hanford Site (Sec. 3.2.1, 3.3.1):

- The Board's review of the K Basin sludge project noted problems with DOE's planned implementation of project management requirements such as alternatives analysis and formal project reviews which are important to ensuring that safety is appropriately considered early in the design phase. In response, DOE committed to fully implement DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and the expectations of DOE Standard 1189, *Integration of Safety into the Design Process*, for the sludge project. (Quarterly Reports to Congress dated February 12 and May 21, 2008)
- Continuing implementation of the Board's Recommendation 2000-1 at the K West Basin, DOE packaged, dried, and placed into interim storage, small pieces of fuel remaining after bulk spent nuclear fuel removal and sludge consolidation, further reducing the hazards at the basin. (Recommendation 2000-1)
- Following a July 2007 spill of radioactive waste from single-shell tank S-102, the Board communicated to DOE its concerns and observations regarding corrective actions for emergency management. DOE took action to improve its planning and preparation for emergency response. (Board letter dated July 15, 2008).
- The Board found deficiencies in the maintenance management program for vital safety systems in the Tank Farms. In response, DOE began an assessment of the program that is expected to result in improvements in the reliability of safety systems. (Board letter dated September 17, 2008)

Savannah River Site (Sec. 3.3.1):

- DOE met a commitment in the implementation plan for Recommendation 2001-1 by starting up the Interim Salt Disposition Project to remove and process salt waste contained in high-level waste storage tanks. (Recommendation 2001-1)
- The Board identified gaps in the qualification of contractor systems engineers for vital safety systems in the high-level waste tank farms, as well as the lack of formal system performance monitoring at F-Tank Farm, and found that DOE was not adequately staffed to perform oversight of the high-level waste tank farms. In response, DOE improved the performance monitoring of vital safety systems at the Tank Farms, and improved the training and staffing for both DOE and contractor personnel. (Board letter dated June 25, 2008)

- The Board identified several issues related to the high-level waste tank integrity program, including problems with the assumptions used in the evaluation of pit growth rates and inspections for pits. DOE committed to inspecting a larger percentage of the walls of double-shell tanks and revising the tank inspection plan (Board letter dated September 4, 2008)

Los Alamos National Laboratory (Section 3.1.2):

- NNSA completed the stabilization of all non-weapons grade plutonium within the scope of Recommendation 2000-1, thus reducing the likelihood of packaging failures and associated exposures of personnel. (Recommendation 2000-1, January 14, 2000)

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 \$25 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):

- DOE completed a structural analysis to resolve issues associated with the lack of fire coating of structural steel for Waste Treatment Plant facilities. The Board conducted its own analysis of the data and was able to conclude that the facility’s design is now adequate in this regard. (Board letter dated January 8, 2009)
- The Board identified major technical deficiencies in a request by the Waste Treatment Plant contractor to deviate from DOE Standard 1066, *Fire Protection Design Criteria*, for protecting the final high-efficiency particulate air filters of the confinement ventilation systems from effects of a fire. DOE subsequently rejected the contractor’s request and is now evaluating alternative approaches to resolve this problem. (Board letter dated June 24, 2008)

Savannah River Site (Sec. 4.4):

- Salt Waste Processing Facility: The Board identified numerous deficiencies in the structural analysis of the basemat and walls to the 116-foot elevation. DOE resolved the deficiencies. (staff-to-staff meetings)

- Waste Solidification Building: The Board identified deficiencies in the structural analysis for the Waste Solidification Building. DOE corrected the deficiencies in subsequent analyses. (Board letters dated June 25, 2008 and January 12, 2009)
- Waste Solidification Building: The Board concluded that a more stringent criterion was needed to preserve the integrity of the primary confinement boundary during a potential hydrogen explosion scenario. The Board also noted that DOE Standard 1189 had not been applied to the project. DOE developed an appropriate path forward to resolve the identified deficiencies. (Board letters dated July 15, 2008 and January 12, 2009)

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

- Highly Enriched Uranium Materials Facility: In response to issues raised by the Board, NNSA enhanced the reliability of the water supply system for fire suppression. (Board letter dated February 6, 2008, and Quarterly Report to Congress dated September 25, 2008)

Los Alamos National Laboratory (Sec. 4.6):

- Chemistry and Metallurgy Research Replacement: The Board identified deficiencies with the preliminary design, the Preliminary Documented Safety Analysis, and the confinement ventilation system. DOE is taking corrective actions. As required by Congress, the Board has commenced activities to certify that concerns raised by the Board have been resolved. (Board letter dated May 30, 2008, and Quarterly Reports to Congress issued in 2008.)
- Radioactive Liquid Waste Treatment Facility Replacement: The Board determined that the weak integration of the safety and design processes and weak federal oversight resulted in problems with safety basis development, material selection, determination of seismic design requirements, and configuration management. DOE is taking corrective actions. (Board letter dated March 5, 2008, and Quarterly Report to Congress dated February 9, 2009)
- Transuranic Waste Facility: The Board found inadequate integration of safety into the conceptual design. In particular, concerns were noted with inconsistencies between controls identified in the conceptual design package and the preliminary safety basis, the ability of the design to meet required safety functions, the lack of engineered controls for worker protection, and the thoroughness of the required independent review of nuclear safety. (Quarterly Report to Congress dated February 9, 2009)

Idaho Cleanup Project (Sec. 4.7):

- Integrated Waste Treatment Unit: Based upon Board concerns resulting from an over-temperature event in the pilot plant's charcoal bed, DOE modified the design to prevent and mitigate the event. (staff-to-staff meetings; see Quarterly Report to Congress dated February 9, 2009)
- Integrated Waste Treatment Unit: The Board was concerned that there was insufficient data to support safety basis assumptions regarding the radionuclide content of the waste. DOE performed further analysis of the waste to verify the control strategy was adequate for the worst-case inventory. (staff-to-staff meetings; Quarterly Report to Congress dated February 9, 2009)
- Integrated Waste Treatment Unit: The Board questioned whether the safety-related instrumentation and control system could shut down the system as expected in an accident. DOE revised the design to separate the safety-related functions and power supply from non-safety functions in the rest of the network, and an appropriate design standard was adopted to ensure its reliability. (staff-to-staff meetings; Quarterly Report to Congress dated February 9, 2009)

Nevada Test Site (Sec. 4.8):

- Device Assembly Facility: The Board was concerned that poor construction practices may have adversely affected the concrete's strength and contributed to the unprecedented level of cracking evidenced in the facility. At the Board's urging, NNSA conducted nondestructive testing that confirmed that the cracking was not associated with low concrete strength. The Board now considers this concern resolved. (staff-to-staff meetings; Quarterly Report to Congress dated February 9, 2009)

Filter Test Facility (Sec. 4.9):

- The Board requested that DOE take action to (1) correct the root causes of increased rejection rates of high-efficiency particulate air filters tested at the Filter Test Facility for use in safety-related confinement ventilation systems in the DOE complex, and (2) evaluate any safety impacts for filter attributes not tested at the Filter Test Facility. DOE developed a corrective action plan and initiated its implementation. Filter failure rates improved this year. (Board letter dated March 17, 2008)

Recommendation 2008-1 (Sec. 4.11):

- On January 29, 2008, the Board issued Recommendation 2008-1, *Safety Classification of Fire Protection Systems*, identifying the need for standards applicable to the design and operation of fire protection systems relied upon as a primary means of protecting the public and workers from radiological hazards at DOE's defense nuclear facilities. DOE accepted this recommendation and provided an acceptable implementation plan.

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 2008, 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 created a complex-wide "Operating Experience Committee" chaired by DOE's Office of Health, Safety, and Security, with members representing each Headquarters office and site, to facilitate gathering, analyzing, and disseminating lessons learned throughout the DOE complex. (Recommendation 2004-1; Sec. 5.1.2)
- DOE created an Integrated Safety Management Council with a permanent co-chairman from the Office of Health, Safety, and Security and a rotating co-chairman from one of the line organizations. A key focus of this activity during 2008 was reinvigorating integrated safety management in the DOE nuclear weapons complex. (Recommendation 2004-1; Sec. 5.1.2)
- DOE revised the Integrated Safety Management Manual to include a requirement that each Headquarters program office and field office develop an integrated safety management system description and update the description on an annual basis. (Recommendation 2004-1; Sec. 5.1.2)
- The Board developed and communicated insights as to how to monitor the safety performance of an organization in a predictive manner. Several DOE sites are implementing leading indicator programs, and a joint DOE/contractor working group has developed and promulgated guidance for assessing and improving safety culture within the complex. (Recommendation 2004-1; Sec. 5.1.2)
- DOE provided adequate Functions, Requirements, and Authorities documentation for its Headquarters and field offices, thus completing implementation of Recommendation 98-1. The Board closed the recommendation. (Recommendation 98-1; Board letter dated March 28, 2008; Sec. 5.1.2)

- DOE issued DOE-STD-1189, *Integration of Safety into the Design Process*; Order 413.3A Change 1, *Program and Project Management for the Acquisition of Capital Assets*; and sixteen guides, implementation of which is driving incorporation of safety early in the design phase of new defense nuclear facilities. (Board letter dated February 22, 2008; Sec. 4.2, 5.2.4, 5.2.6)
- DOE promulgated additional guidance and expectations for implementation of specific administrative controls and added the review of such controls as a focus area for headquarters review efforts, providing the framework for more effective implementation of this category of safety controls. (Recommendation 2002-3; Sec. 5.3.1)
- DOE reviewed all candidate Environmental Management facilities and many NNSA facilities against the confinement ventilation system evaluation criteria developed under the implementation plan for Recommendation 2004-2. DOE and NNSA are to submit to the Board recommended actions for modifications or compensatory measures to address the review findings. (Recommendation 2004-2; Sec. 5.3.2)
- DOE issued a plan and schedule to upgrade and maintain the software tools used in analysis and operational support of defense nuclear facilities in the Safety Software Central Registry. (Recommendation 2002-1; Sec. 5.3.3)
- DOE developed a new draft policy and implementation guidance on the use of quantitative risk assessment and related methodologies to address the Board's concerns regarding the quality and applicability of such methodologies in use across the DOE complex. (Board letter dated November 23, 2005; Sec. 5.3.4)
- Responding to deficiencies found by the Board, DOE is developing revised guidance for use in the field in the development and implementation of justifications for continuing operations. (Board letter dated April 19, 2007; Sec. 5.3.7)
- DOE developed an acceptable plan for implementing Recommendation 2007-1, established a Technical Support Group with significant experience in nondestructive assay, and issued lines of inquiry to be used during site reviews of *in situ* nondestructive assay programs. (Recommendation 2007-1; Board letter dated April 4, 2008; Sec. 5.3.8)
- DOE established a voluntary corporate accreditation process for the Technical Qualification Program based on the Institute of Nuclear Power Operations model and implemented it at Sandia National Laboratories and the NNSA Service Center. (Recommendation 2004-1; Sec. 5.1.3)
- Each DOE site office now has at least one criticality safety engineer engaged in oversight of fissionable material activities, all of whom have either finished qualification requirements or will finish within the next few months. (staff-to-staff discussions; Sec. 5.1.4)

Outstanding Safety Problems of Defense Nuclear Facilities

Safe Retrieval, Handling, and Stabilization of Nuclear Materials

DOE is responsible for managing and disposing tens of millions of gallons of high-level waste held in underground storage tanks. Both the Hanford Site and the Savannah River Site face challenges in retrieving the waste and transferring it to treatment plants that immobilize the waste for disposal. The properties of high-level waste vary among the tanks and often vary within a single tank, requiring a variety of tools for successful retrieval. DOE is developing new waste retrieval technologies, especially for thick and very dense wastes that make pumping difficult. The Board encourages DOE to continue efforts such as the High-Level Waste Corporate Board to integrate and coordinate waste handling and treatment among the many DOE contractors.

Because of uncertainties in the characteristics of the high-level waste, in retrieval technologies, and in the eventual treatment approaches, DOE must plan to prolong the lives of aging tanks. A strong tank integrity program, which includes corrosion control, inspection and monitoring, and structural analysis is essential to increase confidence in continued safe operation of the waste tanks. To promote the success of these programs, the Board continues to emphasize the need for improved understanding of corrosion mechanisms, definition of optimum chemistry for corrosion control, improved understanding of in-tank conditions, and improved inspection techniques including non-destructive evaluation.

DOE has made considerable progress in the last fifteen years stabilizing nuclear materials left over from weapons production. DOE's large reprocessing facilities such as the F- and H-Canyons at the Savannah River Site processed very large quantities of spent nuclear fuel, targets, and other materials containing enriched uranium and plutonium. These important efforts were initiated and supported by carefully considered Congressional mandates, Environmental Impact Statements, Board recommendations, and DOE's own initiatives.

Although much progress has been made, much remains to be done. Of particular concern are the tasks facing DOE at the Savannah River Site, many of which are underway:

- Consolidation of plutonium (> 5,000 items)
- Disposition of plutonium (> 35 metric tons, > 5,000 items)
- Disposition of enriched uranium (> 25 metric tons)
- Disposition of spent nuclear fuel (~ 19,500 fuel assemblies)

To initiate this work, DOE established a regulatory framework, provided funding, carried out negotiations with affected states, and issued project approvals. All of this planning led DOE to conclude that the primary disposition pathways for these materials should be the Mixed Oxide Fuel Fabrication Facility and H-Canyon. However, DOE is now reconsidering alternatives that may not include H-Canyon. The Board will review DOE's plans as they develop to ensure that DOE avoids the serious mistake of choosing a course of action that will leave legacy materials without a disposition path.

Safety Initiatives Requiring Increased Management Focus and Staff Support

DOE accomplished a wide variety of safety improvements across the defense nuclear complex during 2008. This annual report focuses on those achievements. However, little progress was made toward carrying out several important safety initiatives responding to the Board's recommendations from prior years. All of these initiatives are straightforward and could be accomplished in a timely manner, given appropriate management focus and staff support. The most prominent of these initiatives are summarized below:

- *Safety-Related Research and Development*—Although it is an important component of Recommendation 2004-1 and was highlighted in the Board's Annual Report to Congress for 2007, DOE made essentially no progress toward instituting a nuclear safety research function during 2008. Recent briefings by DOE on this topic did not offer a positive path forward towards implementing the Board's recommendation in this area.
- *Confinement Ventilation System Evaluations*—DOE is behind schedule in implementing Recommendation 2004-2, particularly for NNSA facilities. The system evaluation report for the Plutonium Facility at Los Alamos National Laboratory is more than two years overdue, and site reports for 14 other NNSA facilities are more than a year overdue. Revised DOE directives regarding active confinement ventilation systems are more than two years overdue.
- *Nuclear Material Packaging*—DOE is behind schedule in developing a plan to implement the nuclear material packaging manual issued in response to Recommendation 2005-1, DOE has not developed a path forward to obtain satisfactory site-level plans and integrate them into an overall strategy.
- *Administrative Controls*—In January 2007, DOE informed the Board that all commitments in the implementation plan for Recommendation 2002-3 had been completed and proposed closing the recommendation. Reviews by the Board at several DOE sites in 2007 determined that the necessary improvements in administrative controls serving safety functions had not been satisfactorily accomplished. DOE informed the Board that it will correct the deficiencies, but it remains unclear when this will be done.

Each of these cross-cutting safety initiatives requires consistent and visible leadership from a central authority to drive implementation across the DOE complex. The Board's view is that these actions have lost momentum because of insufficient management focus and dedication of resources at the headquarters level. The Board believes that DOE possesses sufficient resources to apply the required level of attention to these actions, and that the problem is one of prioritization. During the coming year, the Board will reinforce to DOE that implementation plans for Board recommendations are Secretarial commitments and must receive commensurate management attention and staff support.

Protracted Reliance on Structurally Unsound Facilities

NNSA continues to rely on structurally unsound facilities to carry out hazardous production missions. Examples of this persistent problem include the 9212 Complex at Y-12 (portions of which are more than 60 years old) and the Chemistry and Metallurgy Research building at Los Alamos (55 years old). The 9212 Complex cannot meet existing requirements for Hazard Category 2 nuclear facilities, while the Chemistry and Metallurgy Research building remains seismically fragile and poses a continuing risk to the public and workers.

To its credit, NNSA has taken actions to reduce the radioactive material at risk in these facilities. These actions include reducing the inventory of bottled uranium solutions at the 9212 Complex and relocating some activities from the Chemistry and Metallurgy Research building to a more robust facility at Los Alamos. In addition, NNSA initiated a line-item project to upgrade certain facility systems in the 9212 Complex based on a facility risk review and is consolidating operations in the Chemistry and Metallurgy Research building into wings of the structure that do not lie directly above a seismic fault. However, these are stop-gap measures. The facilities are structurally unsound and are unsuitable for protracted use.

The Board is investing significant effort into reviewing the designs of the proposed replacement facilities—the Uranium Processing Facility at Y-12 and the Chemistry and Metallurgy Research Replacement facility at Los Alamos. Unfortunately, both of these facilities have been delayed from original projections and will face continued external scrutiny regarding cost, scope, and programmatic need. The Board continues to drive safety improvements at the existing facilities while at the same time pressing NNSA to build replacement facilities quickly or, in the case of the Chemistry and Metallurgy Research building, find alternative means of accomplishing mission-related work.

1. Introduction

This Annual Report summarizes the Board's work during calendar year 2008. 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 2008-1, Appendix B lists all recommendations cited in this report, Appendix C lists all reporting requirements imposed on DOE in 2008, and Appendix D contains a complete list of the Board's 2008 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 19 years of operation, its priorities have evolved with changes in the nuclear weapons program. The Board employs 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 51 formal recommendations, comprising 229 individual sub-recommendations. In that same period of time, the Board has issued 215 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 2008, 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.

Technical 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 response to the Board's letter, NNSA continues to take measures to improve flowdown of safety-related requirements into procedures, the procedure validation process, and the level of detail in technical procedures.

In 2008, the Board conducted a series of procedure reviews by observing operations on three weapon dismantlement programs. The Board provided feedback to engineering and production management personnel that resulted in immediate enhancements to procedures and conduct of operations. Examples include correcting instances where caution steps were placed after the steps where they needed to be implemented, adding critical step designators before all critical steps instead of the current practice of only placing the designator before the first in a series of critical steps, and clarifying when certain personal protective equipment is required. The Board is conducting further analysis of procedural weaknesses to determine additional areas of improvement in nuclear explosive operating procedures.

Safety Basis. In a letter dated July 30, 2007, the Board identified several faults in Pantex safety basis actions and documentation, including incomplete treatment of beyond-design-basis accidents and inadequate level of detail in the wording of some technical safety requirements. The Board also noted in its letter that NNSA had lost configuration control of the safety basis. Pantex has since developed and executed a plan to enhance configuration control of its safety basis and to implement the remaining technical safety requirements. In 2008, Pantex completed the plan and declared the safety basis fully implemented. Pantex is improving the level of detail in the wording of technical safety requirements and the treatment of beyond-design-basis accidents through annual updates to safety basis documents.

W76 Activities. In a letter dated July 16, 2007, the Board expressed its concern regarding NNSA's willingness to deviate from safety requirements and typical good practices in response to growing production demands. Specifically, the readiness activities for W76 operations could not be performed with the expected level of rigor in the time frame specified by NNSA.

After responding to the Board's concerns, NNSA started W76 operations in 2007. However, operations were suspended in May 2008 due to safety-related findings by a hazard analysis team. NNSA pursued an intense effort from May to August 2008 to develop and justify controls to address the identified hazards. On August 8, 2008, the Board issued a letter detailing concerns with the process DOE used to authorize restarting W76 nuclear explosive operations following the safety-related work suspension. The Board was concerned with the processes used to develop the technical basis for new controls and the use of administrative controls for new operations. DOE responded to the concerns raised in the Board's letter and issued a clear plan for controlling W76 operations as they were restarted. DOE committed to review all similar operations for the hazards that caused the work suspension on the W76.

Lightning and Electrostatic Discharge Protection. The Board has worked with NNSA for the last several years to characterize and control potential lightning threats to nuclear explosive operations. During this time, NNSA applied resources to understand and mitigate the potential threat from *direct* effects of a lightning strike. 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 Electromagnetic Committee to analyze both lightning and electrostatic discharge hazards.

The Committee has prepared a plan to address the Board's concerns systematically and to improve the safety of operations at Pantex relative to lightning hazards. In 2008, the committee completed an analysis of lightning-induced concrete spalling, concluding through modeling and tests that this phenomenon is not a concern in Pantex nuclear or nuclear explosive facilities. The Board has engaged experts in the field of lightning effects to verify the Committee's analyses. The Board also evaluated the characterization of electrostatic discharge environments at Pantex, as well as the development and implementation of effective controls to prevent and mitigate electrostatic discharge for nuclear explosive operations.

Quality of Safety-Related Information. The implementation plan for Recommendation 98-2 addresses the need for NNSA to issue further guidance on its expectations for the evaluation and documentation of weapon response to potential accident environments and stimuli. The Board and DOE agreed that the revised DOE-STD-NA-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*, would include the needed requirements for these analyses. In 2007, the Board issued a letter requesting that DOE provide a schedule for implementing these requirements at the weapon design laboratories and the criteria to be used to verify implementation.

In 2008, both Los Alamos and Lawrence Livermore National Laboratories issued implementation plans for this new standard. Based on progress in improving the quality of safety-related information, the Board issued a letter on December 16, 2008, closing Recommendation 98-2, but encouraging NNSA to continue diligent oversight of the development of technical data for use in the Pantex safety basis.

Nuclear Explosive Safety. In 2008, the Board evaluated ten Nuclear Explosive Safety studies, operational safety reviews, or change evaluations conducted at Pantex, including Master Studies of onsite transportation and staging and special purpose facilities. Completion of the two Master Studies leaves only one Master Study remaining overdue; NNSA has developed a schedule for completing it in 2009. The Board noted technical and administrative areas of concern regarding the process used in conducting Nuclear Explosive Safety activities.

In its letter closing Recommendation 98-2, the Board stated its concern that recent Nuclear Explosive Safety Studies for operations at Pantex suggest NNSA is struggling with maintaining a sound Nuclear Explosive Safety program, especially the interface between the technical Nuclear Explosive Safety Study groups and NNSA management. The Board's letter requested that NNSA summarize the outcomes of recent Nuclear Explosive Safety Studies, operational safety reviews, and change evaluations, and evaluate whether trends in the acceptance and resolution of findings provide insight into the present stature and effectiveness of the Nuclear Explosive Safety function within NNSA.

Revised Nuclear Explosive Safety Directives. In response to changes in operational and organizational realities, and to observations communicated by the Board, NNSA is revising key nuclear explosive safety directives, including DOE Order 452.1C, *Nuclear Explosive and Weapon Surety Program*, and DOE Order 452.2C, *Safety of Nuclear Explosive Operations*. The Board worked with NNSA to ensure the Board's concerns were addressed and improvements from the last four years of effort were adequately captured.

B53 Dismantlement Planning. On March 20, 2008, the Board issued a letter to NNSA raising issues associated with the type of facility at Pantex to be used in dismantlement of B53 weapon systems. The Pantex contractor was proposing to perform operations involving uncased conventional high explosives in a nuclear explosive bay without fully evaluating the feasibility of maintaining the established conservative practice of performing such operations in a nuclear explosive cell, which has greater capability of containing an explosion.

The Board's letter requested an evaluation of the relative safety risks of alternative processes that could be used for B53 dismantlement. Subsequently, the Pantex contractor evaluated the relative risks of several approaches to B53 dismantlement and determined that it was feasible to perform this work in a nuclear explosive cell. The contractor's planning now involves performing operations involving uncased conventional high explosives in a nuclear explosive cell.

Pantex Training and Qualification. The Board conducted a review of training and qualification procedures at Pantex. The Board issued a letter on July 8, 2008, noting concerns with the NNSA program for maintaining the fidelity of weapon trainer units and with the cessation of design agency training for Pantex employees on specific weapon critical skills. NNSA responded by incorporating weapon trainer units into the NNSA weapon provisioning process, which will ensure that parts needed to maintain weapon trainer units at the highest possible fidelity are identified and available when needed.

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 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 involve the following operations and projects.

Enriched Uranium Operations. The 9212 Complex is a collection of superannuated structures, some more than 60 years old, for processing highly enriched uranium. NNSA has identified numerous structural deficiencies and other non-compliances that prevent the 9212 Complex from meeting current requirements for Hazard Category 2 nuclear facilities. Over the last several years, the Board has expressed concerns over NNSA's ability to safely operate the 9212 Complex for an extended period.

In March 2007, the Board issued a letter to NNSA that advocated a regimen of increased vigilance and regular assessment of the physical condition of the 9212 Complex and requested NNSA to provide an annual report and briefing on the safety of operations. By March 2008, NNSA completed its first assessments of the safety of operations of the 9212 Complex and provided to the Board the first annual report and briefings on results of these assessments and specific actions taken to improve the safety posture of Building 9212. These actions include reducing the amount of nuclear material-at-risk and initiating a line-item project to fund facility improvements while the proposed replacement facility, the Uranium Processing Facility, is being designed and constructed.

Uranium Holdup. In 2006, NNSA discovered problems with detecting and controlling uranium accumulations in process systems and equipment. In 2007, the Board noted that NNSA had made little progress in implementing a new program to review fissile material processes that rely on holdup surveys for criticality safety. A project manager was assigned, additional resources were applied, and the fissile material process reviews were completed in 2008. More than 100 recommendations were developed for various equipment changes, new survey points, filter change-outs and other actions to control inadvertent holdup accumulations. NNSA is implementing those recommendations. The implementation of Recommendation 2007-1 will further improve the methods and processes for measuring uranium accumulations in Y-12 facilities.

Building 9204-2E Structure. NNSA identified concrete spalling on the underside of an elevated slab in Building 9204-2E in January 2008 when trying to install equipment anchor bolts. Similar concrete problems had been previously encountered and repaired on the top surface of this slab. The damage was attributed to chemical corrosion of the slab's rebar caused by equipment leaks. The Board expressed concern that the damaged concrete could impact the safe operation of the facility. NNSA developed an inspection plan to determine the full impact of the concrete degradation and provided the plan to the Board in August 2008. The inspection plan includes inspection for delamination within the concrete, chloride testing, and core sampling. These activities are to be completed by April 2009. The Board is following the progress of these tests and the assessment of results.

Dose Consequence Analysis. The Board reviewed the Preliminary Hazards Analysis for the planned Uranium Processing Facility. The Board found that NNSA based the calculated radiological dose consequences for fires involving bulk uranium metal on an airborne release fraction and respirable fraction that was not consistent with the bounding values in DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. The use of the bounding values for these parameters could have required additional safety controls not reflected in the hazard analysis. The Board communicated this issue to NNSA in a letter dated January 17, 2008. In response, NNSA committed to using the bounding airborne release fraction and respirable fraction values from DOE-HDBK-3010-94 for the Uranium Processing Facility and other Y-12 nuclear facilities.

Readiness Reviews. Operations performed in the Oxide Conversion Facility are essential to NNSA's capability to convert uranium oxide to uranium tetrafluoride in preparation for further processing to purified metal. The facility was shut down following an accidental hazardous gas release in October 2006. Corrective actions were taken by late 2007. Because the facility had been shut down for an extended period, DOE Order 425.1, *Startup and Restart of Nuclear Facilities*, requires that Operational Readiness Reviews be performed by the contractor and NNSA to confirm readiness for restart. However, NNSA's Y-12 Site Office had approved a less rigorous level of readiness review that would not include a review by NNSA. The Board pressed NNSA Headquarters on this matter. In response, NNSA Headquarters directed that Operational Readiness Reviews be performed prior to restarting the facility. The reviews were completed and operations were safely resumed.

Conduct of Operations. In late 2007, the Board urged NNSA to consider additional action to achieve consistent, disciplined operations in Y-12's nuclear facilities. In 2008, NNSA implemented tri-annual workforce training sessions to emphasize lessons learned from operational events and to reinforce disciplined operations. Separately, in August 2008, the Board observed that the methods for using procedures (reader-worker, reference as needed) implemented by the workforce are defined by first-line supervisors rather than being more formally defined. NNSA had recognized an increasing trend of personnel errors during nuclear operations and initiated a procedure review effort, but NNSA's effort was primarily intended to improve the usability of procedures. The Board urged NNSA to evaluate a more formal definition of procedure use expectations as part of this effort. At year's end, this evaluation was in progress.

2.1.3 Savannah River Site - Tritium Operations

In 2008, the Board focused primarily on conduct of operations and equipment issues at the Savannah River Site's tritium facilities. The Board offered and DOE accepted suggestions for making the 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 2008, the Board provided oversight of DOE's effort to develop a technically justified packaging manual as part of the recommendation's implementation. In March 2008, after making improvements suggested by the Board, DOE issued Manual 441.1-1, *Nuclear Material Packaging Manual*. DOE sites are currently developing repackaging schedules in support of sending the final complex-wide implementation schedule to the Board.

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 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 2008, the Board focused its oversight on formality of operations, fire and emergency response, the Chemistry and Metallurgy Research facility, disposition of transuranic waste, nuclear criticality safety, pit manufacturing, safety systems, and confinement ventilation for the Plutonium Facility.

Formality of Operations. The laboratory contractor is pursuing a Formality of Operations initiative intended to achieve compliance with DOE requirements and contractual obligations in the areas of the conduct of engineering, operations, maintenance, and training. Concerns raised by the Board have led to increased NNSA and laboratory management attention and improved performance metrics and criteria for assessing the implementation of these important safety programs. Personnel have also been added to strengthen the laboratory's cadre of cognizant system engineers, thereby enhancing the safety oversight program.

Fire and Emergency Response. After 11 years of operating without the benefit of a long-term contract for fire and emergency services, NNSA entered into a cooperative agreement for these services with Los Alamos County in October 2008. Given the poor record of fully implementing the results of baseline needs assessments at the laboratory and weaknesses identified in recent fire and emergency response exercises, the Board sent a letter to NNSA on December 8, 2008. In this letter, the Board requested that NNSA identify the actions being taken to immediately improve weaknesses in fire and emergency response and the strategy and schedule for ensuring that response capabilities meet the laboratory's needs.

Continued Operation of the Chemistry and Metallurgy Research Facility. In letters dated October 23, 2007, and May 16, 2008, the Board questioned NNSA's decision to operate the 55-year-old Chemistry and Metallurgy Research facility for a minimum of 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; these risks have not been comprehensively evaluated by NNSA since 1998. Given the age, material condition, nuclear material inventory, and seismic fragility of the facility, the Board encouraged NNSA to assess these risks promptly and evaluate alternative means of accomplishing programmatic requirements. In response, NNSA has developed a plan to support operations past 2010 which would include reducing the material-at-risk by relocating some activities to a stronger facility. NNSA is also evaluating options for ceasing operations in the facility as soon as practicable.

Integrated Nuclear Planning. The Board found that NNSA had not demonstrated formal mechanisms to ensure that design requirements and interfaces for pit manufacturing at the laboratory were appropriately managed and controlled across the suite of projects that contribute to the future plutonium processing infrastructure. In response, NNSA has developed an integrated nuclear planning process to improve coordination among its projects as national security mission requirements are refined. This process should improve integration of the projects and facilities that provide the required support infrastructure, with benefits for both safety and program success.

Transuranic Waste Operations. In a letter dated January 18, 2007, the Board urged NNSA to develop promptly a viable pathway for shipping high-activity transuranic waste drums from Los Alamos to the Waste Isolation Pilot Plant for disposal. Postulated accident scenarios involving these drums predict high consequences because of their radiological loading, the proximity of the storage area to the site boundary, and the lack of reliable engineered controls. In response, NNSA has bolstered waste disposition work at the laboratory by facility infrastructure upgrades, new safety basis documents, and training and qualification of operators. By November 2008, NNSA had remediated all high-activity drums available for processing. The remaining above ground high-activity drums have been placed in secure storage until appropriate processing capabilities are established.

Nuclear Criticality Safety. The Board has provided safety oversight of the laboratory's efforts to develop a standards-based nuclear criticality safety program. The Board assessed operations in the Plutonium Facility's vault for special nuclear materials and issued a letter on September 10, 2007, expressing concern over the laboratory's Materials Accountability and Safeguards System software and the criticality safety documentation for the vault. In response, the laboratory found the adequacy of some criticality safety evaluations to be doubtful. As a result, fissile material operations were paused until limits were reviewed and confirmed to be defensible. This effort, which extended into 2008, also resulted in the development of new criticality safety evaluations for parts of the vault.

Plutonium Facility Confinement Ventilation and Safety System Upgrades. As part of the laboratory's efforts to implement Recommendation 2004-2 and to develop a safety basis for the Plutonium Facility in compliance with 10 CFR Part 830 (DOE's nuclear safety rule), an independent review was performed of the facility's safety systems. This independent review generated a set of recommended actions described in a memorandum from the review group to the Los Alamos Site Office dated June 26, 2008. If implemented, the recommended actions will strengthen the Plutonium Facility's overall safety posture through the elimination of recognized safety system vulnerabilities (e.g., upgrading the fire suppression system, strengthening glovebox supports, and replacing water baths for plutonium-238 storage) and will improve the confinement strategy by transitioning to safety-class active confinement ventilation within the next three to five years. The Board is working to ensure that these corrective actions are accomplished.

Documented Safety Analysis for the Plutonium Facility. On May 30, 2008, the Board issued a letter identifying concerns regarding revised safety basis documentation for the Plutonium Facility submitted to NNSA by the laboratory. The Board's concerns were generally resolved, and in December 2008, NNSA conditionally approved the safety basis, replacing the previous decade-old, non-compliant document. Once implemented, the new safety basis should significantly streamline and improve the safety of operations at the Plutonium Facility.

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 2008, the Board conducted reviews of the contract transition, tritium science station startup, development of an updated safety basis for the Plutonium Facility, and activity-level work planning.

Transition of Contract Management. On October 1, 2007, Lawrence Livermore National Security, LLC, assumed management responsibility for operations at the laboratory. The Board evaluated the nuclear and radiological safety-related directives and standards contained in the new contract and the organizational restructuring of the nuclear facilities and found no issues. In particular, DOE-STD 1098, *Radiological Control Standard*, absent from the previous contract, is embedded in the current contract. The Board monitored implementation of the new contract as it continued throughout 2008.

Tritium Science Station. The Tritium Science Station provides a general purpose glovebox system for the storage, assay, purification, mixing, initial pressurization, and processing of tritium gas. The Board observed the readiness assessment activities associated with this new capability. The readiness assessment team determined that the laboratory had prematurely declared readiness and suspended its review. Following significant improvements to training, documentation, and facility condition, the readiness assessment was successfully completed in October 2008.

Updated Safety Analysis – Plutonium Facility. The Board reviewed the recently submitted first annual update to the documented safety analysis for the Plutonium Facility. The update had been delayed one year to complete implementation of the new documented safety analysis that had been approved in April 2006. The Board found that the update improved the analysis.

Work Planning and Control. As part of the implementation plan for Recommendation 2004-1, NNSA promulgated a document in 2006 that provided the attributes and best practices of a successful work planning and control process. In a recent review, the Board noted that the laboratory contractor and the Livermore Site Office had little knowledge of the NNSA document. The Board also noted deficiencies with the work planning and control process and ongoing efforts at the laboratory to improve and institutionalize the process across the site. The Board provided comments to NNSA and encouraged the efforts to improve and standardize the process for work planning and control.

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 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 2008, the Board focused its attention on the Device Assembly Facility and the capability to dispose of a damaged nuclear weapon.

Device Assembly Facility. NNSA plans to use the Device Assembly Facility to conduct nuclear explosive operations and criticality experiments. The Board previously identified the need for a comprehensive assessment of safety systems and safety management programs at the facility in light of the new missions. 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. In 2008 the Board evaluated corrective actions for safety management programs and vital safety systems, preparations for new operations in the facility, and the facility fire suppression system. NNSA progress on corrective actions was limited; further work will be required in 2009.

Criticality Experiments. NNSA has been preparing for Criticality Experiment Facility operations at the Device Assembly Facility. Previously, the Board reviewed and commented on the design for facility modifications and modifications to the critical assembly machines. In 2008 the Board reviewed construction activities and the rebuild and testing of the four critical assembly machines.

Readiness to Dispose of a Damaged Nuclear Weapon or Improvised Device. NNSA has identified G-Tunnel at the Nevada Test Site as a facility to be used in the evaluation and disposition of an improvised device. As a result of the Board's interactions and follow-up discussions in 2008, NNSA completed some facility improvements, completed a cost/benefit analysis of proposed controls and improvements, and is developing a plan to implement safety controls and upgrades appropriate for the scope of operations envisioned at G-Tunnel. The Board expects the new plan to be available in 2009.

2.2.4 Sandia National Laboratories

Sandia National Laboratories are located in Albuquerque, New Mexico, and Livermore, California. Major defense nuclear facilities at Sandia are located in Technical Area V at the New Mexico site, including the Annular Core Research Reactor, Auxiliary Hot Cell Facility, Gamma Irradiation Facility, and Sandia Pulsed Reactor Facility. The Sandia Pulsed Reactor is no longer in operation; however the facility is now used for smaller scale criticality experiments. The Board focused its attention during 2008 on safety bases and the support Sandia National Laboratories gives to nuclear explosive operations at the Pantex Plant.

In 2007, the laboratory completed implementation of a safety basis improvement project to resolve the underlying deficiencies and implemented a safety basis operations schedule. The Board noted continued improvement during its reviews in 2008. The Board also has been following Sandia's work on electrostatic discharge and lightning issues that affect the safety of nuclear explosive operations at the Pantex Plant. In 2009, the Board will review a revised documented safety analysis being prepared in support of planned materials disposition activities at the Auxiliary Hot Cell Facility.

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 closed Recommendation 94-1, as all commitments under this Recommendation had been met by DOE or encompassed by Recommendation 2000-1. Five milestones remain open under the implementation plan for Recommendation 2000-1: one at Hanford and four at Los Alamos National Laboratory. DOE originally intended to complete stabilization of all materials identified under Recommendation 2000-1 by December 2009, but this schedule will be delayed. The Board also closed Recommendation 97-1, following DOE's fulfillment of all commitments under the associated implementation plan.

Nuclear Materials Consolidation, Storage, and Disposition. DOE is responsible for consolidating and disposing of many metric tons of excess nuclear materials that have been declared surplus to national security needs. These materials, which include plutonium, uranium, neptunium, and spent nuclear fuel, can pose significant hazards if not stored, shipped, and disposed of properly. The Board monitors DOE's efforts to manage these materials and ensures that DOE meets commitments made pursuant to Recommendations 2000-1 and 2005-1. NNSA established the Office of Nuclear Materials Integration to support and integrate DOE's activities to consolidate or disposition nuclear materials. The new office will replace the Nuclear Materials Disposition and Consolidation Coordination Committee and is coordinating the update of DOE's order on management of nuclear materials. The Board reviewed and provided initial comments on this order. The Board is working with DOE to resolve these comments.

3.1.2 Plutonium

Plutonium Stabilization, Los Alamos. Operators at Los Alamos completed repackaging non-weapons grade plutonium materials per the associated milestone in the implementation plan for Recommendation 2000-1. Three other material types remain to be stabilized under this recommendation: weapons grade plutonium, materials in large vessels, and materials in the Recovery Evaluation Process. Site operators continue to make progress in risk reduction by repackaging some of these materials into sturdier containers. Site managers plan 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. The Board continues to provide close oversight of storage conditions and stabilization efforts.

Plutonium Consolidation and Disposition, Savannah River Site. Savannah River Site's K-Area continues to receive and store plutonium from across the defense nuclear complex, particularly from Hanford, Los Alamos, and Lawrence Livermore National Laboratory.

The current baseline includes two disposition paths for this plutonium; one is processing plutonium through Savannah River Site's H-Canyon, followed by vitrification in high-level waste glass at the Defense Waste Processing Facility, and the other, processing the material through the Mixed Oxide Fuel Fabrication Facility, currently under construction at Savannah River Site. In addition, a proposed Plutonium Preparation Project at K-Area would prepare some plutonium for disposition in the Mixed Oxide Fuel Fabrication Facility and H-Canyon.

Near the end of the year, DOE began reevaluating the viability of the H-Canyon disposition path because the expected fissile material concentration in the vitrified waste form was greater than the concentration stated in the license application for the Yucca Mountain high-level waste repository. Because H-Canyon's processing capability is unique in the DOE complex, the Board has begun evaluating the potential impacts of possible changes to H-Canyon's mission and the implications for future plutonium storage at the Savannah River Site.

3.1.3 Uranium

Savannah River Site. DOE approved the Enriched Uranium Disposition Project. The plan for this project contemplates that Savannah River's H-Canyon will process more than 20 metric tons of surplus uranium and approximately 19,500 spent nuclear fuel and target assemblies through 2019. A 2007 Board review concluded that H-Canyon and HB-Line could support this long-term mission if systematic life extension evaluations were conducted, the Documented Safety Analysis was updated, and planned upgrades were implemented.

The Board questioned the timeliness and usefulness of the initial proposals for conducting life extension evaluations. Eventually, DOE developed an Integrated Facility Aging Management Program that integrates programs such as system health reports, maintenance, equipment performance monitoring, and structural integrity. DOE began its review of the first H-Canyon system in late 2008. DOE intends to complete management reviews of aging phenomena for all significant safety and processing systems at H-Canyon in 2009 and begin similar reviews at HB-Line in summer 2009.

The contractor continues to develop a major upgrade to the H-Canyon Documented Safety Analysis to meet the requirements of the newest DOE Rules and directives. The Board is reviewing documents supporting this effort. The contractor plans to submit the new Documented Safety Analysis to DOE for approval in March 2009.

While the Board is encouraged by the progress made at H-Canyon, lack of funding has the potential to adversely impact future progress. For example, lack of funding has already significantly slowed the pace of planned upgrades to support a long-term processing mission. It is also not clear whether funding will be available to address any degradation of the structure, systems, or components identified by the aging management reviews or to implement more reliable engineered safety controls. Prioritization of these funds is complicated by the fact that DOE is reconsidering its plans to process spent nuclear fuel at H-Canyon.

The Board continued its focus on conduct of operations and emergency preparedness at H-Canyon. Although isolated events indicate that continued vigilance is still warranted, there was a noticeable improvement in overall conduct of operations and emergency preparedness at H-Canyon.

Oak Ridge National Laboratory. The Uranium-233 Downblending and Disposition Project in Building 3019 at Oak Ridge National Laboratory did not make significant progress in addressing the issues identified by the Board in the previous year because of major project delays resulting from rebaselining efforts. The Board expects to continue its review of the rebaselined project and verify closure of all open items.

3.2 Stabilization of Spent Nuclear Fuel

3.2.1 Hanford Site

DOE continues to store approximately 30 cubic meters of radioactive sludge, including corrosion products of spent nuclear fuel, in the K-West Basin at Hanford. This sludge and small pieces of fuel scrap are the only material at Hanford within the scope of Recommendation 2000-1 that remains unstabilized. The project warrants some urgency because the K-Basins are degrading and K-East Basin has leaked into the underlying soil. The Board reviewed the project management processes instituted following the return of the sludge project to the conceptual design phase after a false start. The Board noted problems with DOE's planned implementation of project management requirements such as alternatives analysis and formal project reviews.

DOE took corrective actions and committed to implement fully DOE Order 413.3A and DOE Standard 1189. During pre-conceptual design, DOE directed a two-phase approach to be considered. This approach would transfer the sludge to the Hanford Central Plateau for interim safe storage, followed eventually by stabilization and disposition. In early 2009, the contractor expects to select a process that will be developed further as the conceptual design. Contractor efforts to complete sludge sampling and technology development in support of the conceptual design will continue through 2009.

The Hanford Spent Nuclear Fuel Project completed bulk spent nuclear fuel removal from the K-Basins in 2004. During 2008, small fuel pieces and the fuel found during sludge consolidation, as well as fuel found in the burial grounds, were packaged, dried, and placed into interim storage at the Hanford's Canister Storage Building. DOE expects to conduct at least one more fuel processing campaign to stabilize fuel pieces left in old K-West Basin components and fuel found by other projects at the Hanford site.

3.2.2 National Spent Nuclear Fuel Program

The Board has been monitoring the safe transfer of spent nuclear fuel between facilities at the Idaho National Laboratory for many years. Fuel transfers from wet basin storage to dry storage were approximately 75 percent complete by December 2008. DOE plans to complete the remainder during 2009.

Transfers of spent nuclear fuel between the Idaho National Laboratory and the Savannah River Site are proposed by DOE to avoid building more than one packaging and handling facility at each site. DOE would ship its aluminum-clad fuel to Savannah River Site and ship stainless steel-clad and zircaloy-clad spent nuclear fuel to the Idaho National Laboratory. Transfers are scheduled to begin in 2011; however, no DOE funding has been provided. DOE would construct a packaging and handling facility at the Idaho National Laboratory for shipment of the steel- and zircaloy-clad fuel to the geological repository at Yucca Mountain. DOE had planned to process the aluminum-clad fuel at the H-Canyon facility at the Savannah River Site but is presently reevaluating this approach.

3.3 Waste Management

3.3.1 High-Level Waste

Hanford

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 2047. Radioactive waste is currently being transferred from 149 older, single-shell tanks to 28 newer, double-shell tanks to reduce the environmental risk. DOE conducts ongoing tank integrity programs for both types of tanks, although the program for double-shell tanks is considerably more mature. DOE has begun 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. The Board reviewed these programs in detail and encouraged DOE to continue laboratory and in situ testing of corrosion mechanisms related to the high level waste tanks. This effort is expected to lead to assurance that DOE's double-shell tanks can continue to perform as designed for 40 or more years. DOE continued ultrasonic testing of the double-shell tank walls to measure general corrosion, pitting, and cracks.

Safety Systems. In evaluating the infrastructure and life extension of the high-level waste tanks at Hanford, the Board conducted several reviews that focused on vital safety systems. The Board reviewed the maintenance management program, the electrical distribution system, and the digital instrumentation and controls for safety-related systems at the Tank Farms. In two letters dated September 17, 2008, the Board noted several deficiencies in these areas. The Board is working with DOE to resolve these issues.

Corrective Actions for the Tank S-102 Spill. In July 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. The Board monitored the spill clean-up efforts and other corrective actions. DOE and the tank farm contractor commissioned several investigation teams to review different aspects of the spill and issued corresponding corrective action plans. The Board conducted onsite reviews of the implementation of these corrective actions. The areas reviewed included conduct of operations, emergency management, oversight, and the issues management program.

The Board communicated its concerns and observations regarding the S-102 corrective actions for emergency management to DOE in a letter dated July 15, 2008. The Board found that DOE's corrective action plan did not include an update of the emergency planning hazards assessment; additional planning is required to improve emergency preparedness. The Board continues to follow the implementation of corrective actions.

Savannah River Site

Salt Waste Processing. In 2008, DOE met a commitment in the implementation plan for Board Recommendation 2001-1 by starting the Interim Salt Disposition Project. This project's mission is to process low-activity salt waste until the Salt Waste Processing Facility begins operation in approximately 2013. The Board performed oversight of the contractor and DOE operational readiness reviews and subsequent operations. After beginning operation, the waste processing rate was affected by repeated plugging of a coalescer in the facility. The Savannah River National Laboratory is developing modifications to fix the plugging problem, thereby reducing the frequency of process shutdowns.

Tank 48 Organic Waste Processing. After several years of reviews and studies of technologies to treat Tank 48 waste, DOE approved Critical Decision 1 in March and selected the fluidized bed steam reforming process as the preferred treatment technology. However, DOE managers plan to reconsider this decision in 2009. The Board reviewed DOE's Critical Decision 1 package and found that the safety strategy was reasonably conservative.

Vital Safety Systems. The Board performed a review of vital safety systems in the tank farms and identified gaps in the qualification of contractor systems engineers as well as the lack of formal system performance monitoring at F-Tank Farm. The Board also found DOE was not adequately staffed to perform oversight of the high-level waste tank farms. The Board communicated these concerns to DOE in a letter dated June 25, 2008. In response, the contractor formally qualified its systems engineers, resumed formal system performance monitoring at the F-Tank Farm, and initiated an aging management program for F- and H-Tank Farms. DOE also accelerated its efforts to fill safety oversight vacancies.

Integrity of High Level Waste Tanks. The Board performed a review of the ultrasonic testing used to monitor the integrity of double-shell waste tanks. The Board identified several issues related to the tank integrity program, including problems with the assumptions used in the evaluation of pit growth rates and inspections for pits. In response to a Board letter dated September 4, 2008, DOE committed to inspect a larger percentage of the walls of double-shell tanks and to revise the tank inspection plan.

Idaho Cleanup Project

High-Level Waste Tank Closure. The Board monitored DOE's continuing efforts to clean and close high-level waste tanks at Idaho. DOE previously 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 emptied and grouted seven of the large tanks and all four small tanks. In 2008, DOE completed grouting the interconnecting piping in the tank farm. Three of the four remaining large tanks contain 900,000 gallons of sodium-bearing waste that is to be treated by a steam reforming process at the Integrated Waste Treatment Unit, which is now under construction. The fourth large tank is a spare, unused tank. DOE estimates that treatment of remaining waste may be completed by 2012.

3.3.2 Low Level and Transuranic Waste

National Transuranic Waste Program. DOE manages large quantities of contact-handled, lower activity transuranic wastes at many sites and has been retrieving these wastes for shipment to the Waste Isolation Pilot Plant for disposal since 1999. DOE also holds significant quantities of remote-handled, higher activity transuranic waste in temporary storage at several sites. Shipment of remote-handled waste to the Waste Isolation Pilot Plant has been underway since early 2007. During 2008, the Board evaluated the progress of DOE's efforts to eliminate the long-term safety hazard inherent in transuranic waste storage at various sites across the complex. The Board also monitored the activities of the DOE Transuranic Waste Corporate Board.

Savannah River Site. The Board provided oversight of transuranic waste operations at the Savannah River Site's Solid Waste Management Facility and F-Canyon and confirmed that proper safety controls were in place for normal operations and during the recovery from anomalous events. The Board also observed the venting of bulged transuranic waste drums and suggested to site management ways for reducing risk to workers during these operations. Subsequently, site workers safely vented all of the legacy transuranic waste drums.

Oak Ridge National Laboratory. The Board verified that characterization and packaging of remote-handled transuranic waste at the Transuranic Waste Processing Center was performed safely. The verification included a review of the safety basis documents as well as observation of DOE's operational readiness review. Remote-handled transuranic waste shipments to the Waste Isolation Pilot Plant are expected to commence in early 2009.

Advanced Mixed Waste Treatment Project. DOE's largest effort to retrieve and repackage 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 2008, DOE had shipped more than 25,000 cubic meters of transuranic waste from the Advanced Mixed Waste Treatment Project to the Waste Isolation Pilot Plant. Many thousands of cubic meters of waste remain to be packaged and shipped. In October 2008, DOE issued a request for proposals to operate the Advanced Mixed Waste Treatment Project to treat and ship the remaining 37,000 cubic meters of transuranic waste in storage. The new contract is expected to take effect in October 2009.

Accelerated Retrieval Project. DOE operates a smaller facility to retrieve transuranic wastes buried at the Idaho Cleanup Project. This operation is run by a different contractor and is called the Accelerated Retrieval Project.

The Board reviewed DOE's operations at the Accelerated Retrieval Project several times during 2008. Following the discovery in 2007 of liquid in the bottom of drums of packaged sludge waste, DOE changed the design of the drum liner to prevent accumulation of water and developed a method to safely repackage the estimated 1,700 affected drums. In 2008, the Board observed successful operations to absorb the undesirable liquid that had accumulated in the drums.

Remediation Schedule. In 2008, the Board observed successful operations to absorb the undesirable liquid that had accumulated in the drums. DOE completed negotiations with the state of Idaho to resolve the longstanding question of how much transuranic waste and toxic chemicals are required to be retrieved from the burial grounds. This work will continue for the next 20 years depending upon the available funding.

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 2008, the Waste Isolation Pilot Plant received and disposed of more than 600 shipments of contact-handled transuranic waste, with a total volume in excess of 5,100 cubic meters. Remote-handled transuranic waste operations consisted of 96 shipments totaling nearly 48 cubic meters in 2008. Throughout 2008, the Board verified that both contact-handled and remote-handled transuranic waste operations were conducted safely. Particular emphasis was placed on addressing some negative trends in conduct-of-operations and problems with the radiation dosimetry program.

3.4 Facility Deactivation and Decommissioning

3.4.1 Overview

Deactivation and decommissioning work has slowed at some defense nuclear facilities because funding has been directed toward nuclear material stabilization and management programs. Where appropriate, the Board has provided oversight of DOE's deactivation and decommissioning activities.

3.4.2 Hanford

Plutonium Finishing Plant. Since the shutdown of the Plutonium Finishing Plant complex in 1996, various deactivation and decommissioning activities have been performed. Originally, the buildings in the complex were to be demolished to slab-on-grade by September 2009. However, funding constraints have delayed this end state, and there is a continued need for safety systems to operate. The Board reviewed the plant life extension program for electrical systems and assessed the condition of select safety-related electrical equipment and cables. Several deficiencies were noted, and the Board continued to work with DOE to resolve these issues. The contractor has made progress toward implementing a cable monitoring program, which would improve the service life and reliability of electrical equipment by making it possible to detect damaged and deteriorating cables.

3.4.3 Idaho Cleanup Project

The Board made several visits to the Idaho Cleanup Project to review deactivation and decommissioning activities. During 2008, the Idaho Cleanup Project decontaminated, decommissioned, and demolished 40 buildings or structures. Extensive worker training has resulted in highly skilled and efficient working teams that have safely executed work scope utilizing fewer resources than planned.

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 are being constructed to acceptable industry codes and standards.

4.2 Safety in Design

In a report issued jointly by DOE and the Board on July 19, 2007, the Board committed to several actions intended to enhance early identification and resolution of safety concerns in the design and construction of new defense nuclear facilities. These actions included:

- Issuing "project letters" to DOE, containing a summary of the Board's safety concerns at appropriate stages of a project's design and construction.
- Issuing a quarterly report to Congress and DOE summarizing unresolved safety issues on new defense nuclear facilities.
- Periodically meeting with DOE to discuss safety issues raised by the Board.

The Board has issued nine letters and one recommendation regarding safety-in-design concerns, based on its reviews of design and construction activities for new defense nuclear facilities across the DOE complex. These letters pointed out potential safety problems in the Uranium Processing Facility and Highly Enriched Uranium Materials Facility at Y-12; Chemistry and Metallurgy Research Replacement project and Replacement Radioactive Liquid Waste Treatment Facility at Los Alamos; Device Assembly Facility at Nevada Test Site; Integrated Waste Treatment Unit at Idaho National Laboratory; and the Waste Solidification Building at Savannah River Site. The Board issued three quarterly reports to Congress that explain the Board's concerns with these projects.

As noted in the report prepared jointly by the Board and DOE, quarterly discussions regarding resolution of issues began in 2007 and have continued throughout 2008. At these sessions, the Board's staff discussed resolution of pending issues and explored new issues with technical counterparts from DOE.

These meetings have generally been successful in explaining Board concerns and ensuring 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. Overall, the policies instituted by the Board and DOE on the safety-in-design initiatives have helped DOE provide appropriate attention to new facility design projects and have led to addressing several long-standing Board issues.

Following the Board's urging in a February 22, 2008, letter, DOE issued a new standard, DOE Standard 1189, *Integration of Safety into the Design Process*, and is implementing this standard for all new DOE projects. DOE issued a change to DOE Order 413.3A, including new requirements that provide consistency between the Order and DOE Standard 1189. DOE also issued 16 guides to support implementation of changes to DOE Order 413.3A. The Board is monitoring the implementation of these new requirements and guidance.

During its reviews of new defense nuclear facilities, the Board noted that the safety strategy for many of the facilities relied on fire suppression systems as one of the primary means for controlling radiological hazards. The Board concluded that DOE's guidance for design and construction of a fire suppression systems relied on for safety was not sufficient. In Recommendation 2008-1, *Safety Classification of Fire Protection Systems*, the Board recommended that DOE develop such guidance. (See Section 4.11 below.)

The Board issued Recommendation 92-4 in July 1992 to ensure that the design of the Multi-Function Waste Tank Facility at Hanford, and other new defense nuclear facilities, would incorporate engineering principles and approaches, detailed engineering criteria, and practices essential to ensure adequate protection of public health and safety. Although this facility was never constructed, the overarching tenets of the recommendation remained applicable to the design of new defense nuclear facilities. With the issuance of the DOE order, standard, and guides discussed above, the Board believes that Recommendation 92-4 has been implemented. Accordingly, the Board considers this recommendation closed.

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. The Board is continuing its review of design and construction of important-to-safety structures, systems, and components. During 2008, the Board's activities focused on the resolution of previously-identified issues.

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 prepared structural design criteria for implementing this strategy across the project and completed calculations to determine which steel members must be coated. On June 6, 2008, DOE provided the Board with a letter describing a strategy for resolving the remaining safety issues regarding the lack of fire protection coating for some of the structural steel. This letter stated that DOE and the Waste Treatment Plant contractor were pursuing a three-step approach: (1) demonstrating structural stability of the Waste Treatment Plant facilities without taking credit for unprotected structural steel, (2) demonstrating that concrete slabs in the Waste Treatment Plant facilities remain stable without the support of unprotected steel, and (3) determining the potential for thermal expansion of unprotected steel to affect protected structural steel in a fire. DOE transmitted a second letter on July 31, 2008, forwarding a report from the Waste Treatment Plant contractor regarding the impacts of thermal expansion of unprotected steel in a representative section of the Low-Activity Waste facility. This letter stated that DOE believes it has resolved all issues related to fire protection of structural steel at Waste Treatment Plant.

The Board subsequently performed an independent evaluation of the technical issue and concluded that the fire protection strategy for structural steel at Waste Treatment Plant is acceptable from a nuclear safety perspective; however, the Board's rationale differed from DOE's in several important respects. The Board believes that the current plans protect sufficient structural steel in the Low-Activity Waste and laboratory facilities to support fire area barriers as required by DOE Standard 1066-99, *Fire Protection Design Criteria*. In the case of the High Level Waste and Pretreatment facilities, there is no significant radioactive material source term in the areas where structural steel is uncoated. Accordingly, the Board agrees that the lack of coatings on structural steel does not cause a direct concern for confinement of nuclear materials in those facilities. However, the redundancy of safety-class systems must be assured to minimize the potential for on-site or off-site radiological consequences for a fire in these facilities. The Board believes that the construction requirements invoked for the Pretreatment facility provide assurance that a fire will not spread to an adjacent fire area, protecting the redundancy of safety-class systems. Similarly, the fire protection coating specified for the High-Level Waste facility is adequate. This issue is considered closed by the Board.

Compliance with DOE Standard 1066. In January 2008, the Waste Treatment Plant contractor submitted a request to modify fire safety design requirements for protection of confinement ventilation systems in the Waste Treatment Plant from the effects of a fire. The intent of the request was to provide an alternative means of protecting the final high-efficiency particulate air filters of the confinement ventilation systems in a manner equivalent to the features prescribed in DOE Standard 1066.

In a June 24, 2008, letter to DOE, the Board noted that DOE Standard 1066 permits the use of equivalent or superior methods of fire protection for nuclear final filter plenums, but identified significant issues pertaining to the proposed tailoring of the standard, adherence to higher-tier policies, and the underlying technical justification for the request. DOE found similar issues and subsequently rejected the contractor's request. The contractor subsequently prepared a revised proposal to resolve outstanding technical issues and initiated work to address DOE and Board concerns.

In January 2009, DOE reversed its approach to the resolution of these concerns and suspended all ongoing contractor activity while it is pursuing an exemption to the requirements of DOE-STD-1066. DOE now supports the idea that protection of the confinement ventilation system from the effects of fire is not necessary since the calculated radiological consequences from fire fall below evaluation guidelines used to classify safety systems. This new approach ignores the application of defense-in-depth principles and calls into question commitments made by DOE in its implementation plan for Recommendation 2004-2. The Board is working to address these deficiencies with DOE.

Interim Pretreatment System. The Interim Pretreatment System is intended to pretreat liquid waste from tanks at the Hanford Tank Farms that contain lower concentrations of cesium and strontium. The system will remove sufficient solids and radioactivity to allow immobilization of the waste through early operation of Waste Treatment Plant's Low-Activity Waste Facility and/or supplemental low activity waste immobilization facilities. The project received approval of Critical Decision-0 (approval of mission need) on December 21, 2007. Technology alternatives were evaluated, and a safety design strategy was developed based upon the installation of cross-flow filters, ion exchangers, and other equipment in concrete vaults. Subsequently, DOE elected to evaluate the feasibility of in-tank pretreatment using rotary microfiltration units and ion exchange columns in double-shell tanks and pump pits, with other equipment being placed on skids. The Board has initiated its review of this project.

4.4 Savannah River Site

Plutonium Storage and Disposition. On June 27, 2008, DOE approved a revised preferred alternative for the Plutonium Preparation Project at the Savannah River Site. This revised alternative involves the installation of equipment and upgrades in the K-Area complex. Such upgrades will permit disposing of some excess plutonium materials in the Mixed-Oxide Fuel Fabrication Facility and some in H-Canyon. This action subsumed the Container Surveillance and Storage Capability Project and revised the scope of the Plutonium Disposition Project. The Board has initiated its review of this project.

Salt Waste Processing Facility. The Salt Waste Processing Facility will treat salt waste from high-level waste tanks by removing highly radioactive cesium, strontium, and actinides from the bulk salt solution feed. During 2008, the Board continued its review of this facility's design and processes, as well as the resolution of previously identified issues.

Structural design. In a letter to DOE dated January 10, 2007, the Board pointed out deficiencies in the analysis of the facility's ability to resist natural phenomena hazards. The Board's review of the structural design focused on the resolution of these deficiencies. The Board completed its review of the finite element analysis and structural design calculations for the basemat and walls to the 116-foot elevation, and all concerns were resolved. The Board has initiated its review of the remainder of the structural design.

Hydrogen generation. The Board previously identified the need to establish the technical basis for estimating hydrogen generation in process vessels due to thermolysis through experimentation. DOE has developed plans for experimental determination of the generation of flammable gases as a result of thermolysis. The Board reviewed these plans and found them acceptable.

Waste Solidification Building. The Waste Solidification Building will solidify liquid waste streams from the Mixed-Oxide Fuel Fabrication Facility and the Pit Disassembly and Conversion Facility. NNSA has approved Critical Decision-2 (approval of the Performance Baseline) and Critical Decision-3 (approval to start construction) on December 10, 2008. The Board reviewed the final design for this facility, focusing on safety basis documentation, quality assurance, process safety, seismic and structural design, fire protection, mechanical equipment design, and confinement ventilation design.

Structural design. The Board identified deficiencies in the structural analysis of the building in a letter to DOE dated June 25, 2008. DOE revised the design package and corrected these deficiencies. The Board's subsequent review of the revised design noted that design checks were performed inadequately and the building could not be qualified for its design basis settlement. The project team agreed, revised this calculation, and added needed reinforcement to the building design. The Board is continuing its review of the structural design.

Safety basis. The Board identified deficiencies in the safety basis in a letter to DOE dated July 15, 2008. The primary deficiency was that the criterion used to evaluate hydrogen explosion scenarios did not ensure integrity of the primary confinement boundary. DOE modified the hydrogen explosion criterion to properly demonstrate preservation of primary confinement boundaries. The Board also noted that DOE Standard 1189 was not applied to the project. DOE revised the safety basis documents to demonstrate compliance with this standard.

4.5 Y-12 National Security Complex

Highly Enriched Uranium Materials Facility. The Highly Enriched Uranium Materials Facility will replace several aging storage facilities at Y-12. The new facility will reduce the site footprint of uranium storage, enhancing safety and simplifying safeguards and security measures. The design of this facility is complete. Construction began in early 2005 and is essentially complete, with startup of operations projected for late 2009. Several areas of concern arose during the construction phase:

Fire Water Supply. In correspondence dated February 6, 2008, the Board noted that NNSA had not made adequate progress in addressing the need for a safety-significant fire water supply system for the Highly Enriched Uranium Materials Facility. The Board requested that NNSA provide its plan for near-term improvement of the operational reliability of the water supply as well as its long-term plans for providing a safety-significant water supply. NNSA communicated its plans for closure of this issue in a report and briefing provided in May 2008.

For the near term, NNSA is providing positive configuration control of the existing water supply using valve locks or tags on a defined water supply path to the facility's fire water pumps. A safety-significant pressure monitor also will be installed to verify supply pressure. In the long term, the Highly Enriched Uranium Materials Facility will tie into a safety-significant water supply to be constructed in conjunction with the planned Uranium Processing Facility.

Safety Basis. The Board reviewed the Preliminary Documented Safety Analysis for the facility. The Board provided comments to NNSA regarding storage requirements, fire protection, and safety management programs. NNSA has committed to addressing the Board's concerns in the Documented Safety Analysis, which is being drafted, and during procedure development prior to startup.

Concrete Placement. NNSA found quality problems with concrete placements in the loading bay roof and other areas of the facility; the most severe problem involved the loading bay. The loading bay roof was replaced in May 2008 due to extensive concrete honeycombing problems. The Board ensured that NNSA took appropriate actions to nondestructively evaluate the remaining problem areas. These tests showed that the concrete does not have reduced strength in the tested areas. The Board will complete its assessment of the test results in early 2009.

Safety-Class Storage Racks. During installation of the safety-class storage racks, several bolts broke, and other deficiencies in the installation of fasteners were noted. The Board reviewed the adequacy of the fastener assemblies and installation procedures and subsequently aided NNSA in resolving issues with the fasteners. The Board's review resulted in the identification of quality assurance problems with procurement, engineering, and construction. The Board will work to ensure that NNSA documents the lessons learned from these construction quality problems to help eliminate such problems in the future, particularly during construction of the Uranium Processing Facility.

Uranium Processing Facility. The Uranium Processing Facility is a new project intended to replace the aging facilities that process enriched uranium at Y-12. The Board has resolved safety concerns related to the dose consequence methodology used in safety analyses for the planned facility, use of consensus standards for seismic design, and DOE oversight that the Board identified at the completion of conceptual design (Critical Decision-1).

The Board conducted reviews of the preliminary design, focusing on important design input information such as the soil structure analyses and design criteria. The project addressed the findings from the Board's reviews, resulting in an improved starting point for the preliminary design. The Board also reviewed the maturity of technology planned for use in the facility and judged that it is sufficient to support preliminary design. The Board found that NNSA lacked a formal means for incorporating lessons learned from currently operating facilities and processes into the design process. DOE has issued guidance for documenting and transferring such information to the project.

4.6 Los Alamos National Laboratory

Chemistry and Metallurgy Research Replacement Facility. The Board's review of the preliminary design and draft Preliminary Documented Safety Analysis for this facility identified several issues with the safety strategy and selection of safety controls. During the past year, progress has been made towards addressing these concerns, and general agreement on the facility safety strategy has been reached. DOE has revised the safety strategy and safety documentation and plans to complete a Technical Independent Project Review before proceeding to the final design stage. As part of completing the certification mandated by Congress, the Board will review the completed preliminary design and Preliminary Documented Safety Analysis to ensure that the Board's safety issues have been adequately resolved and that the project is ready to proceed into final design.

Radioactive Liquid Waste Treatment Facility Replacement Project. The Radioactive Liquid Waste Treatment Facility Replacement Project will replace the existing facility that processes transuranic and low-level radioactive liquid wastes. The Board reviewed the preliminary design of the facility, and concluded the poor integration of the safety and design processes and weak federal oversight resulted in problems with safety basis development, material selection, determination of seismic design requirements, and configuration management. These issues were pointed out to NNSA in a letter dated March 5, 2008. NNSA is working to resolve the Board's concerns.

Transuranic Waste Facility Project. The Board reviewed the conceptual design for the new Transuranic Waste Facility. This project will replace aging facilities that store, characterize, repackage, size-reduce, and load solid transuranic waste for shipment. The Board found inadequate integration of safety into the conceptual design. In particular, concerns were noted with inconsistencies between controls identified in the conceptual design package and the preliminary safety basis, the ability of the design to meet required safety functions, the lack of engineered controls for worker protection, and the thoroughness of the required independent review of nuclear safety. NNSA subsequently elected to delay proceeding with approval of the alternative selection (Critical Decision-1) to allow additional analysis and design work.

4.7 Idaho Cleanup Project

Integrated Waste Treatment Unit. The Integrated Waste Treatment Unit will convert approximately 900,000 gallons of acidic sodium-bearing waste at the Idaho National Laboratory to a dry carbonate product for disposal at the Waste Isolation Pilot Plant. DOE evaluated the maturity of the steam reforming process in a one-tenth size engineering scale demonstration (pilot plant) using surrogate, non-radioactive materials. 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. The Board focused its review in 2008 on the resolution of these issues.

Charcoal bed over-temperature event. DOE determined the root cause of an over-temperature event in the pilot plant's charcoal bed. Design modifications to prevent and mitigate the event were assessed by the Board to be satisfactory.

Waste characterization. Further characterization of the waste was needed to ensure that the assumptions in the safety basis regarding the radionuclide content of the waste were valid. Additional sampling data was compiled and analyzed. Evaluation of the accident consequences assuming the worst case inventory from the various waste tanks show that even with this very conservative assumption, the control strategy for the facility is adequate. The Board found this analysis to be satisfactory.

Distributed Control System Design. The design of the Distributed Control System needed enhancement to ensure that the chemical process could be placed in a safe configuration following off-normal operational events. The design was revised to clarify that the Distributed Control System would not be relied upon for safety functions. As an additional improvement, the power supply for safety-related components will be isolated from the power supply for non-safety-related systems. American National Standards Institute/International Society of Automation Standard 84.00.01, *Safety Instrumented Systems for the Process Industry Sector*, will be incorporated into the design requirements to ensure the operational reliability of the safety-related control system. These design changes satisfied the Board's concerns.

4.8 Nevada Test Site

Device Assembly Facility. NNSA continues to expand the potential missions of this facility. New missions include receipt and storage of special nuclear material; operations involving special nuclear material; criticality experiments; and nuclear explosive operations. The Board expressed concerns with respect to the reliability of the facility's fire suppression system in letters to NNSA on November 3, 2004, and November 28, 2005. Continued evaluation by the Board resulted in a letter to NNSA on January 18, 2008. This letter challenged NNSA claims concerning availability and reliability of fire protection features credited as safety-class or safety-significant controls.

The fire suppression system does not meet typical design features for either a safety-class or safety-significant system. The Board is especially concerned about the continuing degradation of the underground piping that supplies water to the fire protection system. This degradation results in unacceptable amounts of debris in the water supply, which can adversely impact the fire protection system by potentially clogging sprinklers. In response, NNSA initiated an improvement project to assess the condition of the system, analyze and prioritize needed improvements, and prepare an implementation plan to resolve the problems.

The Board continued to focus effort on understanding the significance of numerous cracks within the Device Assembly Facility structure. The Board's basic concern was that the cracking could be indicative of poor construction practices that adversely affected the concrete's strength. At the Board's urging, NNSA conducted nondestructive testing that confirmed that the cracking was not associated with low concrete strength. The Board now considers this concern resolved.

4.9 Filter Test Facility

DOE uses the Filter Test Facility to test the performance of high-efficiency particulate air filters used in safety-related confinement ventilation systems throughout the DOE complex. The Board noted an increase in the failure rates of these filters in recent years. The Board issued a letter to DOE dated March 17, 2008, identifying the need for action to correct the root causes of the increased rejection rates and evaluate any safety impacts for filter attributes not tested at the Filter Test Facility. DOE developed a corrective action plan and initiated its implementation. Filter failure rates declined in 2008.

4.10 Seismic Hazard Analysis

The Board continued its review of DOE studies on seismic ground motion across the complex. The Board has provided feedback to DOE as new seismic ground motion criteria are developed and probabilistic hazard assessments updated. The Board has stressed the importance of adequate review, including independent peer review, of both the acquisition of site-specific data and subsequent analysis to ensure that ground motions for design basis earthquakes are based on accurate scientific knowledge.

Probabilistic hazard assessment. The probabilistic seismic hazard assessment for the Nevada Test Site was updated. The Board reviewed this update and identified concerns with modeling of local soil conditions. These concerns were resolved, and the Board considers the final seismic design ground motions for the Nevada Test Site to be adequate.

DOE is sponsoring a project jointly with the United States Nuclear Regulatory Commission and the Electric Power Research Institute to update the Central and Eastern United States Seismic Source Characterization for Nuclear Facilities. The Board is part of the participatory peer review panel for this project. Results from this project will be used to update the probabilistic seismic hazard analysis for the Savannah River Site, the Y-12 National Security Complex, and the Pantex Plant.

Seismic design of new facilities. Geologic field work was performed to determine if active faulting was present at the site for the Chemistry and Metallurgy Research Replacement facility at Los Alamos National Laboratory. The Board reviewed this work and agrees with the conclusion that no active seismogenic faults exist at this site. The Board's review of the seismic design for the facility indicated that the assumed vertical ground motions are resulting in significant challenges to the current design. The Board issued a letter to DOE describing these issues on May 30, 2008. DOE is reviewing the basis for the assumed vertical ground motions to determine if they are too conservative and can be reduced. The Board will review this work as it becomes available. Data was collected at the site for the Uranium Processing Facility at the Y-12 National Security Complex to assess how near-surface material influences design ground motions. The Board reviewed this work and considered it adequate.

4.11 Recommendation 2008-1

During its reviews of new designs for defense nuclear facilities and major modifications of existing defense nuclear facilities, the Board observed that DOE was increasing its reliance on fire protection systems as a primary line of defense against accidents. For example, the following projects initially planned or reclassified fire protection systems as safety-class or safety-significant:

- Chemistry and Metallurgy Research Replacement Project, Los Alamos
- Device Assembly Facility, Nevada Test Site
- Building 9212, Y-12 National Security Complex
- Explosive Bays and Cells, Pantex Plant
- Building 332, Lawrence Livermore National Laboratory
- Highly Enriched Uranium Materials Facility, Y-12 National Security Complex
- Uranium Processing Facility, Y-12 National Security Complex
- K-Area Container Surveillance and Storage Capability, Savannah River Site

While the Board can support reliance on fire protection systems as primary safety measures, the Board was not comfortable with such widespread reliance in the continued absence of specific criteria for the design and operation of such systems. This lack of guidance makes design of new facilities more difficult and time-consuming and renders problematic the assessment of proposed enhancements to fire protection systems in existing facilities. Multiple projects in the past eight years have used fire suppression systems as part of the primary means for radiological hazard protection. All would have benefitted from the availability of such guidance.

Accordingly, on January 29, 2008, the Board unanimously approved Recommendation 2008-1, *Safety Classification of Fire Protection Systems*. This recommendation identifies the need for standards applicable to the design and operation of fire protection systems being relied upon as a primary means of protecting the public and workers from radiological hazards at DOE's defense nuclear facilities. DOE accepted the recommendation and provided an acceptable implementation plan on July 23, 2008.

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 assessments of both the federal line management and contractor efforts by DOE's Office of Health, Safety and Security. 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 with competing demands that must be reconciled to ensure that the overall mission is achieved safely.

5.1.2 Recommendation 2004-1

The Board continues to drive 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 2008:

- Strengthened the Operating Experience Program by creating a complex-wide "Operating Experience Committee" chaired by the DOE Office of Health, Safety, and Security—with members representing each Headquarters office and site—to facilitate gathering, analyzing, and disseminating lessons learned throughout the DOE complex.
- Created an Integrated Safety Management Council with a permanent co-chair from the Office of Health, Safety, and Security and a rotating co-chair from one of the line organizations. In continuation of efforts initiated in 2007, the Integrated Safety Management Council joined with the Energy Facility Contractors Operating Group to conduct a conference on "Reinvigorating Integrated Safety Management" in 2008.

- Revised the Integrated Safety Management Manual to include a requirement that each Headquarters program office and field office develop an integrated safety management system description and update the description on an annual basis. This was a major stimulus toward reinvigorating integrated safety management in 2008.

While the Board has noted progress in some areas, other elements will require continued attention in 2009.

- Implementation of the Central Technical Authority functions in NNSA and DOE resulted in a strengthening of the safety network. However, a recent reorganization within NNSA transferred a number of highly qualified technical personnel from the Chief of Defense Nuclear Safety's staff to the operational line organization. This transfer of personnel severely weakened the ability of NNSA's Chief Technical Authority to perform oversight and evaluation of safety matters affecting NNSA operations.
- DOE has made limited progress in establishing a nuclear safety research function, and this will continue to be an area of focus for the Board in 2009. The Board highlighted 13 worthy safety-related research projects in its 2007 Annual Report, but DOE has not created an effective mechanism to identify, prioritize, and fund needed nuclear safety research.
- NNSA continues to work on a modified oversight approach intended to focus its oversight on the facilities where a high-consequence accident is credible while increasing reliance on the contractor to oversee the remainder of the facilities. The Board continues to expend significant effort in 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.
- Recommendation 2004-1 called for development and issuance of a safety oversight guide for effectively implementing the DOE order on federal oversight. 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 in 2009.

In the past year, the Board has developed an improved understanding of how organizational behavior (referred to as *culture*) influences the safety performance of an organization. The Board is applying that understanding to DOE's defense nuclear facility operations. The Board has encouraged DOE and its contractors, through a variety of speeches and meetings, to proactively pursue improvements in their safety cultures. Besides providing a better understanding of how culture influences safety performance, the effort has also provided insights as to how to identify a collection of metrics to monitor the safety performance of an organization in a predictive manner. Such metrics are referred to as *leading indicators*. As a result, the Board has also been actively promoting the development of leading indicators for defense nuclear facilities. Several DOE sites are in the process of implementing leading indicator programs, and a joint DOE/contractor working group has developed and promulgated guidance for assessing and improving safety culture within the complex.

5.1.3 Staffing and Competence of Federal Oversight Corps

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 Operations 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 successfully completed the Technical Qualification Program accreditation process for two NNSA sites, specifically Sandia National Laboratories and the NNSA Service Center. These sites were found to have adequate technical competence and mix of skills for carrying out nuclear safety oversight. While this is a laudable accomplishment, the Board notes that complex-wide only 64% of the identified technical capabilities (i.e., the combination of knowledge, skills, and abilities) are being met by fully qualified personnel. DOE must increase and retain the number of qualified personnel throughout the complex.

5.1.4 Criticality Safety Engineers

The Board followed progress made by DOE in the areas of nuclear criticality training and staffing at several DOE site offices. Each site office now has at least one criticality safety engineer engaged in oversight of fissionable material activities. All of these personnel have either finished qualification requirements in the DOE technical qualification standard (DOE-STD-1173, *Criticality Safety Functional Area Qualification Standard*) or will finish within the next few months. DOE still does not have a defined methodology for determining the number of criticality safety personnel needed at each site to provide effective oversight. The Board will review site office staffing for criticality safety oversight during the coming year, and continues to require annual reporting by DOE on this and other criticality-related topics.

5.1.5 Facility Representatives

The DOE Facility Representative program is critical in providing oversight of the operational activities throughout the complex. As with the Technical Qualification Program, staffing of fully qualified individuals is a concern; the number of facility representatives required throughout the complex is up from last year by 13, and only four fully qualified personnel have been added. DOE has taken several steps towards filling current vacancies, including increasing the grade level of fully qualified facility representatives to GS-14 and instituting retention bonuses, but these incentives are being discontinued or reconsidered at some sites. Overall, DOE lacks a vigorous, forward-looking plan for staffing facility representatives that integrates planned losses, recruitment, and time required to complete the training pipeline.

5.1.6 Safety Basis Academy

The Safety Basis Academy is a series of pilot courses, endorsed by the Board in 2004, intended to provide a training program to meet the needs of personnel with safety basis responsibilities at hazardous DOE facilities. Each year, about a half dozen pilot courses are offered covering a wide range of topics.

The courses are attended by both contractor and DOE personnel with varying degrees of expertise. Student and instructor feedback is relied upon to determine the quality of the course and make any necessary changes. Approved courses are finalized and transferred to the DOE National Training Center. The ultimate goal is to implement a comprehensive Safety Analyst Training Program, which could be used to certify safety analysts who have completed the appropriate courses.

While the Safety Basis Academy cannot provide new safety analysts with all the knowledge and experience necessary to be effective, it can establish a sound technical base upon which to build these skills. The Board's staff has evaluated several of these pilot courses and believes they will make a valuable contribution towards establishing a standard training program for safety analysts. The Board believes that the Safety Basis Academy is a positive step forward in establishing a formal certification process for safety analysts and encourages its continued development, to include a definitive plan for the course of instruction leading to qualification of personnel in safety-related positions.

5.1.7 Vital Safety Systems

In 2007, the Board decided to close Recommendation 2000-2 and address the remaining implementation issues on a site-by-site basis. The Board's review of vital safety systems at Los Alamos National Laboratory later that year revealed deficiencies warranting a reporting requirement. In 2008, the Board conducted reviews of safety system design, functionality, and maintenance at a number of defense nuclear facilities. These reviews identified a number of deficiencies and weaknesses in credited safety systems. DOE will be working to disposition these findings during 2009.

5.1.8 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 safety controls, and appropriate feedback mechanisms are used to ensure continuous improvement at the activity level. During 2008, the Board reviewed work planning processes at four sites. The reviews of work planning and control processes at Los Alamos and Lawrence Livermore National Laboratories indicated that their programs have not been fully implemented, and weaknesses still remain. DOE efforts to address these weaknesses to date have been inadequate. The Board is continuing to work to drive improvement in this critical area.

5.1.9 Independent Validation – Safety Basis Controls

The process of independently validating implementation of safety basis controls is vitally important to nuclear safety. While a number of DOE sites have protocols for performing such independent validation reviews, complex-wide requirements and guidance that would compel and define such reviews are lacking. The Board issued a letter to DOE in February 2008 identifying this deficiency and requesting DOE to evaluate the need for such requirements and guidance.

In response, DOE indicated that general quality assurance program requirements are adequate but that additional guidance in this area is needed and will be developed. The Board does not believe that general quality assurance program requirements specifically compel timely, adequate independent validation reviews. For this reason, the Board has urged DOE to revisit the assessment and develop specific requirements for independent validation reviews.

5.2 Health and Safety Directives

5.2.1 Improvement of Directives

In 2008, as part of its ongoing review of new and revised DOE directives, the Board and its staff evaluated and provided constructive critiques of 52 directives associated with, but not limited to nuclear explosive safety, safety oversight, radiation protection, project management, and maintenance management. At year's end, the Board was working to resolve issues on six pending directives to improve the content, clarity, and consistency in safety requirements and guidance. The Board was actively reviewing seven directives to ensure requirements and guidance adequately protect the health and safety of the public. Work was completed on 34 directives; examples are listed below.

- DOE Order 430.1B Chg 1, *Real Property Asset Management*
- DOE Manual 441.1-1, *Nuclear Material Packaging Manual*
- DOE Handbook 1145-2008, *Radiological Safety Training for Plutonium Facilities*
- DOE Handbook 1113-2008, *Radiological Safety Training for Uranium Facilities*
- DOE Order 4501.A, *Environmental Protection Program*
- DOE Manual 460.2-1A, *Radioactive Material Transportation Practices Manual for Use with DOE Order 460.2A*
- DOE Standard 1098-2008, *Radiological Control*
- DOE Order 413.3A Chg 1, *Program and Project Management for the Acquisition of Capital Assets*
- DOE Guide 413.3-1, *Managing Design and Construction Using Systems Engineering for Use with DOE Order 413.3A*
- DOE Guide 413.3-15, *Project Execution Plans*
- DOE Guide 413.3-17, *Mission Need Statement Guide*

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.

The Board maintained a high level of oversight of this effort to ensure that the current margin of safety embodied in DOE directives is maintained or increased. During 2008, the Board reviewed the following draft directives resulting from DOE’s effort to implement the Secretary’s memorandum:

- DOE Order 425.1D, *Startup and Restart of Nuclear Facilities*
- DOE Manual 426.1-1B, *Federal Technical Capability Manual*
- DOE Order 433.1A, *Maintenance Management Program for DOE Nuclear Facilities*
- DOE Order 422.X, *Conduct of Operations* (formerly Order 5480.19A)
- DOE Order 426.X, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities* (formerly Order 5480.20)

5.2.3 Departmental Directives Program

During 2008, the DOE Office of Management revised DOE Order 251.1B, *Departmental Directives Program*, to comply with principles outlined by the Secretary of Energy in his September 2007 memorandum. Because this order establishes the framework for the entire directives program, it is a key safety directive. The Board has worked closely with the Office of Management and other key stakeholders in DOE and NNSA with the objective of ensuring retention of key attributes of the directives system, such as:

- DOE’s use of a management tool to track requirements, usually referred to as a crosswalk, to ensure that requirements are not inadvertently dropped when revising directives,
- the preparation of guides as a means of documenting best practices and preferred methods of implementing requirements, and
- preventing cancellation of directives affecting health and safety at defense nuclear facilities without concurrence from the office of primary interest.

DOE issued the revised order on January 15, 2009. The Board expects that this order, if implemented, will require a large expenditure of time and resources to ensure that the conversion to orders improves safety and that safety standards, guides, and manuals are not lost or made ineffective.

5.2.4 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 this document for review in its Revcom process. After a lengthy review and revision period, DOE published the revised standard on March 31, 2008.

5.2.5 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 with the intent of revising DOE-STD-1027-92 in 2010 to incorporate this guidance. The Board has determined that since the supplemental guidance was not formally transmitted to the sites by DOE, as a directive change normally would be, only a few sites have actually implemented the supplemental guidance. Thus, the Board will work to accelerate revision of DOE-STD-1027-92.

5.2.6 Acquisition of Capital Assets

In 2008, DOE revised Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets* and moved all requirements from Manual 413.1-1, *Project Management for the Acquisition of Capital Assets*, to Order 413.3A. The remaining guidance contained in Manual 413.1-1 was converted to sixteen different guides, all developed and published in 2008. The Board reviewed these guides to ensure the guidance provided adequate protection of the public, environment, and workers at defense nuclear facilities. Following completion of work on the new guides, DOE plans to cancel the Manual.

5.3 Safety Programs

5.3.1 Administrative Controls

In January 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 additional field verification reviews to fully identify and correct the implementation deficiencies. DOE has also promulgated additional guidance and expectations for implementation and has added the review of specific administrative controls as a focus area for headquarters review efforts.

5.3.2 Active Confinement Systems

During 2008, all of the Office of Environmental Management's candidate facilities were reviewed against criteria developed under the implementation plan for Recommendation 2004-2; many gaps were identified. DOE officials are to review these gaps and the sites' proposed actions for their resolution and submit to the Board recommended actions for modifications to meet the commitments in the implementation plan. Similarly, NNSA has performed an assessment of about a dozen facilities and identified gaps that need to be resolved through facility modifications or compensatory measures. The Board has reviewed DOE's design and construction projects to ensure that the proposed design will meet the intent of the recommendation and DOE's expectations as documented in the implementation plan. Several design modifications have been proposed by the Board and implemented by the projects that will significantly enhance the safety posture of these new facilities.

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 improve DOE's policies and practices regarding software design, implementation, testing, configuration management, and training of personnel. The implementation plan for this recommendation is complete except for one action on software tools to be upgraded and maintained in a new Safety Software Central Registry.

In early 2008, DOE provided the Board with a plan and schedule to upgrade and maintain the software tools in the Safety Software Central Registry. In accordance with this plan, DOE has increased the number of codes by one, updated an original code with a later version, and is in the process of adding another toolbox code to the Central Registry. DOE's plan to complete implementation plan commitments involves the resolution of toolbox code gaps identified in the toolbox code gap analysis reports. It may be possible to close this recommendation in 2009.

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. DOE responded by agreeing 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 DOE's initial draft policy 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 new draft policy and implementation guidance in 2008. The Board provided numerous comments on the documents and continues to aid DOE in refining and revising these documents. These new drafts will be circulated for wider departmental review in 2009.

At a time when governments, financial institutions and industries worldwide are expediting the implementation of enterprise-wide risk governance programs, DOE's slow pace for developing a policy is of serious concern.

5.3.5 Criticality Safety

The Board continued to assess DOE's progress in improving nuclear criticality safety programs. In a January 2008 letter the Board expressed concern to DOE that reviews of criticality safety by DOE's Chief of Nuclear Safety and NNSA's Chief of Defense Nuclear Safety may not be of sufficient depth to accurately assess the health of nuclear criticality safety programs. The problems discovered by the Board at Los Alamos National Laboratory in 2007 underscore the need for an effective review strategy, since these problems had been missed during earlier reviews by DOE.

The Board modified the reporting requirements from the closure of Recommendation 97-2 to obtain more specific information on the status of criticality safety throughout the DOE complex. This includes line management assessments by DOE on the adequacy of contractor and site office nuclear criticality safety programs, metrics used to monitor contractor performance related to criticality safety, and staffing of criticality safety engineers for contractors and site offices.

In 2008, the Board reviewed the DOE annual report on criticality safety for 2007 (issued on July 23, 2008) and was subsequently briefed on the report by DOE. Overall, the report was responsive in addressing the modified reporting requirements. The Board is using this report to help identify areas for follow-up. The DOE Nuclear Criticality Safety Program continues to provide a source of stable funding for many essential activities related to criticality safety. Machines needed to conduct critical experiments have been relocated to the Critical Experiments Facility at the Nevada Test Site. Several criticality experiments are scheduled following facility startup, projected to occur in 2010.

5.3.6 Readiness Reviews

The Board continues to review directives related to startup and restart of nuclear facilities, as well as their implementation at defense nuclear facilities. In 2007, DOE formed a readiness review working group to ensure a more rigorous and conservative implementation of DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*, and to address other complex-wide startup and restart issues. The working group evaluated the applicable directives and has proposed revisions to DOE Order 425.1C and DOE Standard 3006, *Planning and Conduct of Operational Readiness Reviews*. In 2007, the Board observed many of the discussions concerning the proposed revisions to understand the basis for any changes that were proposed. In 2008, the Board worked with the authors and evaluated revisions to DOE Order 425.1C to ensure the specific tenets of Recommendation 92-6 are incorporated in the updated directives. DOE Order 425.1C and DOE Standard 3006 are expected to enter DOE's revision-and-comment process in 2009. The Board remains concerned that DOE has yet to develop an implementation plan to institute the positive revisions the authors of these documents are proposing.

5.3.7 Justifications for Continuing Operations

The Board continued its review of DOE's use of justifications for continuing operations at defense nuclear facilities. The Board had previously documented weaknesses in this important area in a letter to DOE dated April 19, 2007. In response, DOE established a working group which collected data that determined the need for additional emphasis and oversight in this area. In response to the Board's concerns, DOE is developing revised guidance for use in the field in the development and implementation of justifications for continuing operations.

5.3.8 Recommendation 2007-1

As a result of recent incidents across the DOE complex involving inaccurate measurements of radioactive material using in situ nondestructive assay, the Board issued Recommendation 2007-1 in April 2007. DOE accepted the recommendation in June 2007 and issued an implementation plan for the recommendation in October 2007. The Board determined that the implementation plan did not adequately capture all of the items called for in the recommendation. The Board worked with DOE in the ensuing months to communicate these deficiencies. As a result, DOE issued a letter to the Board in February 2008 committing to address the problem areas. The implementation plan and February 2008 letter, taken together, were considered adequate to encompass all of the actions from the recommendation; therefore, the Board accepted the implementation plan in April 2008.

DOE has accomplished the first milestones under the plan, including establishment of a Technical Support Group comprising senior DOE and contractor personnel with significant experience in nondestructive assay. This group held its first meeting in August 2008 at the Hanford Site. During this meeting, draft lines of inquiry to be used during site reviews of in situ nondestructive assay programs were identified; these have been further refined and were issued as final in December 2008. The group will begin site reviews in early 2009.

6. Public Outreach and Agency Administration

6.1 Responding to Public Requests

The Board answered numerous informal public requests for documents and information and responded to 24 formal requests filed under the Freedom of Information Act. The average response time for Freedom of Information Act requests was 6.3 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.

6.2 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.

6.3 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 2008, the Board directed inquiries into health and safety issues at the Hanford Site and Los Alamos National Laboratory. These inquiries led to safety improvements in the conduct of work at the respective sites.

6.4 Investigation of Negative Feedback

From time to time, the Board receives criticism from outside parties, which may be members of the public, other federal agencies, or Congress. The Board takes such criticism seriously and endeavors to determine in each case whether improvements are needed in the Board's oversight policies and objectives.

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, 2008, 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 and maintains continuous contact with them using all available communication media.

6.6 Human Resources

During fiscal year 2008, the Board succeeded in increasing its staff from 94 to 95 government personnel. Eleven engineers were hired. However, the Board lost ten 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 2009.

The Board has assembled a professional staff of exceptional technical capability. Staff members' expertise covers 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 percent of the Board's technical staff hold advanced science and engineering degrees, with 21 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 three-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 three more expected to enter the program in June 2009. 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 2008 the Board continued to strengthen its internal controls and ensure compliance with the requirements of the Federal Information Security Management Act, as well as other security guidance. The Board achieved a major milestone by certifying and accrediting its internal and external information technology systems. This certification and accreditation contributed to an unqualified audit opinion, with no reportable conditions.

The Board continued to implement processes called for by Homeland Security Presidential Directive 12. As of December 31, 2008, the Board had issued 104 credentials complying with this directive, out of a total of 111 eligible employees, contractors and other individuals. The Board also installed a new physical access control system that allows the use of the new credentials for access to Board office space.

The Board formed an Information Technology Users Group, drawn from its administrative, legal, and technical staffs, to coordinate information technology efforts agency-wide. In 2008, the group completed a complete overhaul of the Board's Intranet web pages, making information more readily available to the staff.

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 third 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.

Appendix A: Recommendation 2008-1

January 29, 2008

The Honorable Samuel W. Bodman
Secretary of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Bodman:

On January 29, 2008, the Defense Nuclear Facilities Safety Board (Board), in accordance with 42 U.S.C. § 2286a(a)(5), unanimously approved Recommendation 2008-1, *Safety Classification of Fire Protection Systems*, which is enclosed for your consideration. This Recommendation identifies the need for standards applicable to the design and operation of fire protection systems being relied upon as a primary means of protecting the public and workers from radiological hazards at the Department of Energy's (DOE) defense nuclear facilities. Multiple projects in the past eight years have used fire suppression systems as part of the primary means for radiological hazard protection. All would have benefitted from the availability of such guidance.

After you have received this Recommendation and as required by 42 U.S.C. § 2286d(a), the Board will promptly make it available to the public. The Board believes that this Recommendation contains no information that is classified or otherwise restricted. To the extent that this Recommendation does not include information restricted by DOE under the Atomic Energy Act of 1954, 42 U.S.C. §§ 2161- 2168, as amended, please arrange to have it placed promptly on file in your regional public reading rooms. The Board will also publish this Recommendation in the *Federal Register*. The Board will evaluate DOE's response to this Recommendation in accordance with the Board's Policy Statement 1, *Criteria for Judging the Adequacy of DOE Responses and Implementation Plans for DNFSB Recommendations*.

Sincerely,

A. J. Eggenberger
Chairman

c: Mr. Mark B. Whitaker, Jr.

Enclosure

RECOMMENDATION 2008-1 TO THE SECRETARY OF ENERGY
Safety Classification of Fire Protection Systems
Pursuant to 42 U.S.C. § 2286a(a)(5)
Atomic Energy Act of 1954, As Amended

Date: January 29, 2008

Fire protection systems in defense nuclear facilities have generally not been designated as “safety-class” as that term pertains to protection of the public from accidents. Such designation would bring into play a variety of Department of Energy (DOE) rules and directives, among them DOE Order 420.1B, *Facility Safety*, and DOE Guide 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria*. While these documents describe general requirements for safety-class systems, e.g., redundancy and quality assurance, they do not provide specific guidance on how a fire protection system such as an automatic sprinkler system should be designed, operated, and maintained.

Accordingly, when DOE’s Savannah River Site contractor proposed in the late 1990s that certain fire protection systems employed in the site’s tritium facilities be designated as safety-class (and thus credited with protecting the public from accidents involving an offsite release of tritium), both DOE and the Defense Nuclear Facilities Safety Board (Board) were forced to conduct reviews of the proposal on an ad hoc basis without reference to specific guidance. The Board’s review led to a March 18, 1999, letter to the Secretary of Energy agreeing with the reclassification of certain fire protection systems at the site’s tritium facilities. The technical basis for the Board’s agreement is found in the report appended to the letter:

Controlling incipient fires through operability of a more reliable fire suppression system would make large fires less likely to occur. To substantially reduce the predicted likelihood of such fires to the “extremely unlikely” frequency range, WSRC reclassified the fire suppression (and some detection) systems as safety class. TSRs will be applied to fire protection systems falling in this category . . . WSRC acknowledges that installed fire suppression systems will not meet criteria such as redundancy or nuclear-grade quality assurance, nor are these systems seismically qualified. Imposition of safety-class requirements means that, in addition to meeting National Fire Protection Association (NFPA) code requirements, higher levels of maintenance and surveillance and of operability for these systems will be addressed in the TSRs. The intent is to increase the reliability of the suppression systems to maintain the SAR assumption that full-facility fires will be extremely unlikely. The TSRs will require that immediate actions be taken, such as cessation of operations and posting of a fire watch, should a safety-class fire suppression system be taken out of service or found to be inoperative.

In June of 2000, the Board addressed more broadly the safety classification of fire protection systems. In Section 3.3 of Technical Report DNFSB/TECH-27, *Fire Protection at Defense Nuclear Facilities*, the Board stated:

Designation of safety-class or safety-significant structures, systems, and components (SSCs), administrative controls, and engineered design features is determined through a prescribed methodology (DOE-STD-3009-94, [U.S. Department of Energy, 1994] and DOE G 420.1-2, [U.S. Department of Energy, 2000]) that relies to a large extent on the engineering judgment of the safety analysts and designers. Overall, the objective is to prevent a fire, or to control and confine a fire should one occur. Methods of accomplishing this objective are set forth in NFPA codes that have been a requirement of the DOE program for decades. It is essential that decisions concerning the application of these codes and the selection of features and controls be made by qualified and experienced fire protection engineers.

This section of the report provided additional guidance on application of these principles to the control of ignition sources, use of passive fire barriers, suppression of incipient fires, minimization of transient combustibles, and enhancement and protection of confinement systems such as ventilation through HEPA (high efficiency particulate air) filters. The report acknowledged the Board's letter regarding Savannah River's tritium facilities and encouraged the safety designation of suppression systems when they are relied on for critical safety functions: "Fire sprinkler systems relied upon for worker safety and public protection should be classified as safety-class or safety-significant SSCs because they provide the most effective, automated, and quick response to a fire." (Report, p. 3-3) The report noted that the Los Alamos National Laboratory had identified the fire sprinkler system in the Chemistry and Metallurgy Research Facility as a vital system and had begun an effort to inspect and test the system for functional performance.

Subsequent to the Board's 1999 letter and 2000 technical report, DOE expanded its reliance on fire protection systems as primary lines of defense against accidents. For example, the following projects initially planned or reclassified fire protection systems as safety-class or safety-significant:

- Chemistry and Metallurgy Research Replacement Project, Los Alamos
- Device Assembly Facility, Nevada Test Site
- Building 9212, Y-12 National Security Complex
- Explosive Bays and Cells, Pantex Plant
- Building 332, Lawrence Livermore National Laboratory
- Highly Enriched Uranium Materials Facility, Y-12 National Security Complex
- Uranium Processing Facility, Y-12 National Security Complex
- K-Area Container Surveillance and Storage Capability, Savannah River Site

Although it should be clear from the Board's earlier statements that it can support reliance on fire protection systems as primary safety measures, the Board is no longer comfortable with such widespread reliance in the continued absence of specific criteria for the design and operation of such systems. At this time, DOE's fire protection guidance documents do not provide design and operational criteria for fire protection systems designated as safety-class or safety-significant. This lack of guidance makes design of new facilities more difficult and time-consuming and renders problematic the assessment of proposed enhancements to fire protection systems in existing facilities. In the latter case, possible upgrades to existing systems can be evaluated using a procedure developed by the Energy Facility Contractors Group (EFCOG), *Safety System Design Adequacy* (August 2004). Proper application of this procedure demands that an existing system be compared with "a set of appropriate design, quality, or maintenance requirements, specifically including applicable current codes and standards." At present, DOE does not have a set of requirements that would permit use of the EFCOG procedure.

Lack of suitable requirements and guidance does not pose an immediate safety issue, because each separate project listed above can be evaluated on an ad hoc basis both by DOE and by the Board. However, this unstructured approach is wasteful of DOE and Board resources and prevents the sharing of technical knowledge and engineering solutions throughout the complex. More importantly, the Board's enabling legislation, 42 U.S.C. § 2286a(a)(1) requires that it

. . . recommend to the Secretary of Energy those specific measures that should be adopted to ensure that public health and safety are adequately protected. The Board shall include in its recommendations necessary changes in the content and implementation of such standards, as well as matters on which additional data or additional research is needed.

Because the Department has chosen to increase its reliance on fire protection systems as primary safety systems, the Board concludes that the Department should without delay develop standards in this area. These standards should be sufficiently specific to guide both the design of new fire protection systems and the reclassification of existing systems. All of the necessary attributes of a safety-class or safety-significant fire protection system should be identified, leaving room for engineering judgment and innovative approaches in achieving high reliability and quality.

The Board observes that work on revising a key fire protection directive, DOE-STD-1066-99, *Fire Protection Design Criteria*, is expected to commence early in 2008 and be completed by the end of the year. Incorporation of suitable guidance for safety classification of fire protection systems in this standard would be a good starting point for carrying out the purposes of this Recommendation. Other guides that may need enhancement or revision include DOE Guide 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria*, and DOE Guide 420.1-3, *Implementation Guide for DOE Fire Protection and Emergency Services Programs*. Safety classification of fire protection systems may necessitate changes to other DOE orders or directives.

Pursuant to its statutory mandate to recommend needed changes in DOE's standards for safety at defense nuclear facilities, the Board recommends that DOE:

1. Develop design and operational criteria for safety-class and safety-significant fire protection systems.
2. Use the revision of DOE-STD-1066-99, *Fire Protection Design Criteria*, as a starting point to provide suitable guidance for safety classification of fire protection systems. The revision to this standard must incorporate:
 - a. Design approaches for a variety of fire protection systems, e.g., automatic sprinklers, gaseous suppression, alarm, detection, and passive barriers, that can be used to achieve safety-class or safety-significant designation.
 - b. Guidance on technical safety requirements and administrative controls, in areas such as maintenance, tests, and configuration control, so as to ensure the operability of safety-class and safety-significant fire protection systems.
3. Identify design codes and standards for safety-class and safety-significant fire protection systems and their components, and incorporate them into DOE Guide 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria*.
4. Modify other DOE directives and standards as necessary to ensure consistency with the new guidance for fire protection systems.

A. J. Eggenberger, Chairman

Appendix B: Recommendations Cited

Number	Date	Title
92-4	July 6, 1992	Multi-Function Waste Tank Facility at the Hanford Site
92-6	August 26, 1992	Operational Readiness Reviews
94-1	May 26, 1994	Improved Schedule for Remediation in the Defense Nuclear Facilities Complex
95-2	October 11, 1995	Safety Management
97-1	March 3, 1997	Safe Storage of Uranium-233
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
2008-1	January 29, 2008	Safety Classification of Fire Protection Systems

Appendix C: Reporting Requirements

Date	Addressee	Site or Topic
January 17	Administrator, NNSA	Airborne release fractions at Y-12
January 18	Administrator, NNSA	Device Assembly Facility fire protection systems
January 29	Deputy Secretary of Energy	Nuclear Critically Safety program reviews
February 5	Deputy Secretary of Energy	Independent validation of safety basis control
February 6	Deputy Administrator for Defense Programs	Highly Enriched Uranium Material Facility at Y-12
February 22	Deputy Secretary of Energy	DOE-STD-1189, <i>Integration of Safety into the Design Process</i>
March 5	Deputy Administrator for Defense Programs	Radioactive Liquid Waste Treatment Facility Replacement Project, Los Alamos
March 17	Chief of Health, Safety and Security	HEPA filters
March 20	Administrator, NNSA	B53 weapon system at Pantex
May 16	Administrator, NNSA	Chemistry and Metallurgy Research building, Los Alamos
June 25	Administrator, NNSA	Structural design, Waste Solidification Building at Savannah River Site
June 25	Assistant Secretary for Environmental Management	Vital safety systems, high-level waste tanks at Savannah River Site
July 8	Administrator, NNSA	Contractor training and qualification program at Pantex
July 15	Administrator, NNSA	Waste Solidification Building at Savannah River
August 8	Administrator, NNSA	W76 nuclear explosive operations at Pantex
September 4	Assistant Secretary for Environmental Management	High-Level Waste Tank Integrity Program at Savannah River
September 17	Assistant Secretary for Environmental Management	Safety of the electrical systems at Hanford
December 8	Administrator, NNSA	Schedule of actions for the Baseline Needs Assessment at Los Alamos
December 16	Administrator, NNSA	Nuclear Explosive Safety Studies

Appendix D: Correspondence

Hanford

April 29 letter to the Assistant Secretary for Environmental Management regarding CH2M Hill's activity-level work planning and control process.

June 24 letter to the Assistant Secretary for Environmental Management regarding the Authorization Basis Amendment Request, *Tailoring of DOE-STD-1066-97, Fire Protection Design Criteria, Section 14, Nuclear Filter Plenum Protection Based on Hazard Analysis*.

July 15 letter to the Assistant Secretary for Environmental Management regarding the corrective actions for the spill of waste from single-shell Tank S-102.

September 17 letter to the Assistant Secretary for Environmental Management establishing a 90-day reporting requirement regarding the safety of the electrical systems.

September 17 letter to the Assistant Secretary for Environmental Management regarding a series of reviews regarding the integrity of high-level waste tanks and the long-term viability of the supporting safety systems.

October 30 letter to the Assistant Secretary for Environmental Management regarding the reviews on the Activity-Level Work Planning for the River Corridor Closure Project.

Fernald

July 15 letter to the Secretary of Energy acknowledging the safe completion of the Fernald Closure Project.

Idaho National Engineering Laboratory

May 1 letter to the Assistant Secretary for Environmental Management regarding the seismic/structural design of the Integrated Waste Treatment Unit.

Los Alamos National Laboratory

March 5 letter to the Deputy Administrator for Defense Programs establishing a 60-day reporting requirement regarding the design and safety basis for the replacement Radioactive Liquid Waste Treatment Facility.

May 16 letter to the Administrator, NNSA, imposing a 30-day reporting requirement regarding the safety of operations at the Chemistry and Metallurgy Research facility.

May 30 letter to the Administrator, NNSA, regarding the Plutonium Facility and the Chemistry and Metallurgy Research Replacement facility.

December 8 letter to the Administrator, NNSA, imposing a 90-day reporting requirement regarding immediate actions to be taken to improve fire and emergency response capabilities and a 180-day reporting requirement regarding the plan and schedule to fully implement the Baseline Needs Assessment.

Pantex Plant

March 20 letter to the Administrator, NNSA, establishing a 60-day reporting requirement regarding the dismantlement strategies considered for the B53 weapon system.

July 8 letter to the Administrator, NNSA, imposing a 60-day reporting requirement regarding long-term fidelity of weapon trainer units.

August 8 letter to the Administrator, NNSA, imposing a reporting requirement regarding W76 nuclear operations.

Nevada Test Site

January 18 letter to the Administrator, NNSA, imposing a 45-day reporting requirement to describe corrective actions taken and schedule to improve the Device Assembly Facility's fire protection systems.

Sandia National Laboratories

July 31 letter to Principal Deputy Administrator, NNSA, regarding a letter from the Executive Director, Citizen Action New Mexico, which focuses on concerns with the Mixed Waste Landfill facility.

Savannah River Site

June 25 letter to the Administrator, NNSA, establishing a 60-day reporting requirement regarding the structural design of the Waste Solidification Building.

June 25 letter to the Assistant Secretary for Environmental Management establishing a 90-day reporting requirement regarding the vital safety systems in the high-level waste tank farm facilities.

July 15 letter to the Administrator, NNSA, imposing a reporting requirement regarding the Preliminary Documented Safety Analysis for the Waste Solidification Building.

September 4 letter to the Assistant Secretary for Environmental Management imposing a 45-day reporting requirement regarding the High-Level Waste Tank Integrity Program.

Y-12 National Security Complex

January 17 letter to the Administrator, NNSA, imposing a 90-day reporting requirement regarding airborne release fractions.

February 6 letter to the Deputy Administrator for Defense Programs imposing a 90-day reporting requirement regarding the fire water supply system for the Highly Enriched Uranium Materials Facility.

July 8 letter to the Administrator, NNSA, regarding the review of the design, functionality, and maintenance of selected safety systems.

Other Correspondence

January 29 letter to the Deputy Secretary of Energy regarding modifying the annual reporting requirement established for the closure of Recommendation 97-2 and granting a one-time extension of 60 days beyond the deadline for the due date of the 2007 Annual Report.

January 29 letter to the Secretary of Energy forwarding Recommendation 2008-1, *Safety Classification of Fire Protection Systems*.

February 5 letter to the Deputy Secretary of Energy establishing a 90-day reporting requirement regarding independent validation of safety basis control at all sites.

February 12 letter to the Secretary of Energy forwarding the Fourth Quarterly Report to Congress on the status of significant unresolved issues with design and construction of DOE's defense nuclear facilities.

February 22 letter to the Deputy Secretary of Energy imposing a 60-day reporting requirement regarding DOE-STD-1189, *Integration of Safety into the Design Process*.

February 29 letter to Secretary of Energy forwarding the 18th Annual Report to Congress.

March 17 letter to the Chief Health, Safety and Security Officer establishing a 60-day reporting requirement regarding the quality of HEPA filters.

March 28 letter to the Secretary of Energy regarding the closing of Recommendation 98-1, *Resolution of Issues Identified by Department of Energy Internal Oversight*.

April 4 letter to the Secretary of Energy accepting the Implementation Plan for Recommendation 2007-1, *Safety-Related In Situ Nondestructive Assay of Radioactive Materials*.

April 29 letter to the Secretary of Energy announcing the closing of the Recommendation 97-1, *Safe Storage of Uranium-233*.

April 29 letter to the Secretary of Energy announcing the closing of Recommendation 94-1, *Improved Schedule for Remediation in the Defense Nuclear Facilities Complex*.

May 21 letter to the Secretary of Energy transmitting the Fifth Quarterly Report to Congress on the status of significant unresolved issues with design and construction of DOE's defense nuclear facilities.

June 11 letter to the Secretary of Energy congratulating Mr. Glyn Trenchard as the 2007 Department of Energy Facility Representative of the Year.

August 8 letter to the Deputy Administrator for Naval Reactors, NNSA, commending Naval Reactors' continued exceptional performance.

September 11 letter to the Secretary of Energy acknowledging receipt of the Implementation Plan for Recommendation 2008-1, *Safety Classification of Fire Protection Systems*.

September 25 letter to the Secretary of Energy transmitting the Sixth Quarterly Report to Congress on the status of significant unresolved issues with design and construction of DOE's defense nuclear facilities.

October 30 letter the Administrator, NNSA, transmitting a list of questions to open discussions at a proposed December 5, 2008, public hearing and requesting each DOE and NNSA speaker to provide a draft written testimony prior to the public hearing.

December 16 letter to the Administrator, NNSA, closing Recommendation 98-2 and establishing a 60-day reporting requirement for an evaluation of the disposition of the findings from the Nuclear Explosive Safety Studies, Nuclear Explosive Safety Change Evaluations, and Operational Safety Reviews.