



U.S. Department of  
**ENERGY**

**Department of Energy  
Activities Relating to the  
Defense Nuclear  
Facilities Safety Board  
Fiscal Year 2011**

**Report to Congress  
May 2012**

**United States Department of Energy  
Washington, DC 20585**



# Message from the Secretary of Energy

May 2012

Section 316(b) of the Atomic Energy Act of 1954, as amended, requires the Department of Energy to submit a written report to Congress addressing the Department's activities related to the Defense Nuclear Facilities Safety Board (Board). Enclosed is the fiscal year 2011 (FY11) report on Department of Energy Activities Relating to the Defense Nuclear Facilities Safety Board.

The Board has a critical advisory role within the Department's safety framework for defense nuclear facilities. Its expertise in reviewing the Department's safety directives and nuclear facility designs helps strengthen the safety protocols at the Department's facilities nationwide, and we welcome the Board's advice and recommendations. Through healthy exchanges with the Board and its staff, we can together fulfill our shared goal of protecting workers and the public at the Department's defense nuclear facilities. We look forward to continuing to work closely with the Board in the coming year and welcome Congress' review of the attached FY11 Annual Report.

Highlights of the Department's accomplishments are included in the report's Executive Summary. Additional details, as well as the status of the Department's commitments to the Board, are included in the body of the report.

This report is being provided to the following members of Congress:

- **The Honorable Joseph R. Biden, Jr.**  
President of the Senate
- **The Honorable Jeff Bingaman**  
Chair, Senate Committee on Energy and Natural Resources
- **The Honorable Lisa Murkowski**  
Ranking Member, Senate Committee on Energy and Natural Resources
- **The Honorable Daniel K. Inouye**  
Chair, Senate Committee on Appropriations
- **The Honorable Thad Cochran**  
Ranking Member, Senate Committee on Appropriations
- **The Honorable Dianne Feinstein**  
Chair, Senate Subcommittee on Energy and Water Development
- **The Honorable Lamar Alexander**  
Ranking Member, Senate Subcommittee on Energy and Water Development
- **The Honorable Carl Levin**  
Chair, Senate Committee on Armed Services
- **The Honorable John McCain**  
Ranking Member, Senate Committee on Armed Services

- **The Honorable Ben Nelson**  
Chair, Senate Subcommittee on Strategic Forces
- **The Honorable Jeff Sessions**  
Ranking Member, Senate Subcommittee on Strategic Forces
- **The Honorable John Boehner**  
Speaker of the House of Representatives
- **The Honorable Harold Rogers**  
Chair, House Committee on Appropriations
- **The Honorable Norman D. Dicks**  
Ranking Member, House Committee on Appropriations
- **The Honorable Rodney Frelinghuysen**  
Chair, House Subcommittee on Energy and Water Development
- **The Honorable Peter J. Visclosky**  
Ranking Member, House Subcommittee on Energy and Water Development
- **The Honorable Howard P. "Buck" McKeon**  
Chair, House Committee on Armed Services
- **The Honorable Adam Smith**  
Ranking Member, House Committee on Armed Services
- **The Honorable Michael R. Turner**  
Chair, House Subcommittee on Strategic Forces
- **The Honorable Loretta Sanchez**  
Ranking Member, House Subcommittee on Strategic Forces
- **The Honorable Fred Upton**  
Chair, House Committee on Energy and Commerce
- **The Honorable Henry A. Waxman**  
Ranking Member, House Committee on Energy and Commerce

If you have any questions or need additional information, please contact me or Mr. Jeff Lane, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,



Steven Chu

# Executive Summary

The Department of Energy (DOE or the Department) welcomes the opportunity to provide this annual report to Congress in accordance with Section 316(b) of the Atomic Energy Act of 1954, as amended. This report describes the Department's activities during fiscal year (FY) 2011 related to the Defense Nuclear Facilities Safety Board (Board), including the Department's safety initiatives and activities, the status of Board recommendations, and interface activities between the Department and the Board.

To enhance its nuclear safety posture at DOE's defense nuclear facilities, DOE supports a proactive, cooperative, and transparent relationship with the Board. Such a relationship enhances the Department's nuclear safety programs by promoting their continuous improvement; fully supports the health and well-being of the public, the environment, and DOE's workers; and advances the reliability of the DOE mission. The Department has a unique role as an owner, operator, and regulator. The Board's expertise can positively guide the Department's safety posture.

## Department Safety Initiatives

Section III of the report describes key recent safety initiatives the Department has implemented to reinforce and ensure its nuclear safety performance at defense nuclear facilities. These initiatives respond both to issues identified by the Board and to issues proactively identified by the Department through site and facility self-assessments and through the oversight activities of the DOE Office of Health, Safety and Security (HSS) at DOE defense nuclear facilities. The Department has undertaken numerous safety initiatives, each of which contributes to DOE-wide nuclear safety and risk reduction programs. Among these, three warrant particular mention for FY11: the DOE-wide safety and security reform initiative; efforts to enhance facility design and the adequacy of facility safety analysis; and Departmental efforts to ensure a robust safety culture throughout the Department.

### *Safety and Security Reform Initiative*

The goal of the directives reform initiative is to ensure that the Department has a comprehensive set of requirements that consistently and effectively protects workers, the public, and the environment. This effort was undertaken with the objective of not only strengthening and improving the system, but also continuing to assure adequate protection and accident prevention at our defense nuclear facilities. This initiative is the most significant review of DOE's governing safety requirements since 1995. It has improved the Department's body of safety requirements and has put DOE in a better position to manage and maintain its set of safety requirements in the future. HSS is nearing completion of this reform project and expects all directive revisions to be approved in FY12. HSS has significantly streamlined the directives set. These revisions give added emphasis to the essential safety requirements and responsibilities, and improve the Department's ability to accomplish its mission safely and efficiently. HSS has developed framework documents to describe how each set of topical area requirements documents provides for protection of public health and safety, worker safety, and the environment. HSS has also clearly established and documented the technical bases for each individual safety requirement. The Department met its major project milestone to have 100 percent of the HSS directives either complete or into concurrence review by September 30, 2011.

### *Facility Design and the Adequacy of Facility Safety Analysis*

In response to the March 2011 events at the Fukushima Daiichi nuclear power plant in Japan, DOE took a series of actions to review the safety of its nuclear facilities related to natural hazards and to identify opportunities for improvement. On March 23, 2011, the Secretary issued Safety Bulletin Number 2011-01, *Events Beyond Design Safety Basis Analysis*, which required DOE Program and Field Offices to review the safety of their nuclear facilities. In June 2011, the Deputy Secretary convened a nuclear safety workshop that was attended by senior nuclear safety managers and technical experts from the Department, the Board, the Nuclear Regulatory Commission, the Federal Emergency Management Agency, and representatives from the commercial nuclear power industry. In September 2011, the Deputy Secretary transmitted to the Board the report, *Review of Requirements and Capabilities for Analyzing and Responding to Beyond Design Basis Events*, which describes the opportunities for improvement identified by DOE's review and provides recommendations for short-term and long-term actions for improving nuclear safety at the DOE facilities.

### *Safety Culture*

Promoting a rigorous safety culture throughout DOE remains a top priority. HSS and the DOE Integrated Safety Management (ISM) Champions Council identified "safety culture" as a top ISM-related priority in 2007. Extensive operating experience in various industries has shown that certain cultural elements significantly influence overall operational and safety performance. The DOE ISM Champions Workshop, held September 12-15, 2011, in Kennewick, WA, featured a session dedicated to safety culture and how it relates to ISM. The joint DOE/Energy Facility Contractors Group task team produced guidance documents based on three key factors that will encourage a global view of safety, enhance employee engagement, and improve performance within DOE: organizational learning, high reliability organization, and human performance improvement.

### **Board Recommendations**

The Board issued three new recommendations in FY11: Recommendation 2010-1, *Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers*; Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*; and Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant*. No recommendations were closed during FY11. Thirteen recommendations remained open at the end of FY11. (Recommendation 2001-1, *High-Level Waste Management at the Savannah River Site*, was closed in early FY12.) Progress toward addressing each of these is discussed in Section IV of the report. The number of open recommendations has remained fairly constant, ranging from 10 to 14 over the past decade as new recommendations are issued and older ones closed.



# REPORT TO CONGRESS

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# I. Legislative Language

This report responds to legislative language set forth in 42 U.S.C. § 2286e, wherein it is stated:

SEC. 316. REPORTS. [42 U.S.C. § 2286e]

(b) DOE REPORT. The Secretary of Energy shall submit to the Committees on Armed Services and on Appropriations of the Senate and to the Speaker of the House of Representatives each year, at the same time that the President submits the budget to Congress pursuant to Section 1105(a) of Title 31, United States Code, a written report concerning the activities of the Department of Energy under this chapter during the year preceding the year in which the report is submitted.

# II. Introduction

The Department of Energy (DOE or the Department) welcomes the opportunity to provide this annual report to Congress that describes the Department's activities in fiscal year (FY) 2011 related to the Defense Nuclear Facilities Safety Board (DNFSB or Board).

The Board is an independent executive-branch agency established by Congress in 1988 to provide recommendations to the Secretary of Energy regarding public health and safety issues at the Department's defense nuclear facilities. The Board reviews and evaluates the content and implementation of standards relating to the design, construction, operation, and decommissioning of the Department's defense nuclear facilities. Figure 1 shows the locations of DOE's defense nuclear facilities.

The Board and the Department communicate and interact through a variety of mechanisms, including formal Board recommendations, formal reporting requirements, Board letters requesting action and information, letters providing suggestions, letters

providing information (e.g., staff trip reports and reports on specific issues), Board-sponsored public meetings, Board briefings, discussions, and Board site visits.

The remainder of this report is organized as follows:

- **Section III, "Department Safety Initiatives, Activities, and Reforms,"** describes broad-based Departmental activities affecting environment, safety, and health that are of interest to the Board.
- **Section IV, "Progress in Implementing Board Recommendations,"** describes Departmental activities completed or ongoing in FY11 to implement Board recommendations accepted by or under review by the Secretary of Energy.
- **Section V, "Interface Activities,"** describes Departmental activities to maintain communications and improve interaction between the Department and the Board.
- **Appendix A** contains several tables illustrating the status of specific Board recommendations and reporting requirements.
- **Appendix B** defines acronyms and abbreviations used in this report.

Site-specific activities and accomplishments for FY11 are provided in a supplement to this Annual Report to Congress. The supplement is available on the webpage of the Departmental Representative to the DNFSB (DR), which the reader can access at [www.hss.energy.gov/depdep](http://www.hss.energy.gov/depdep).

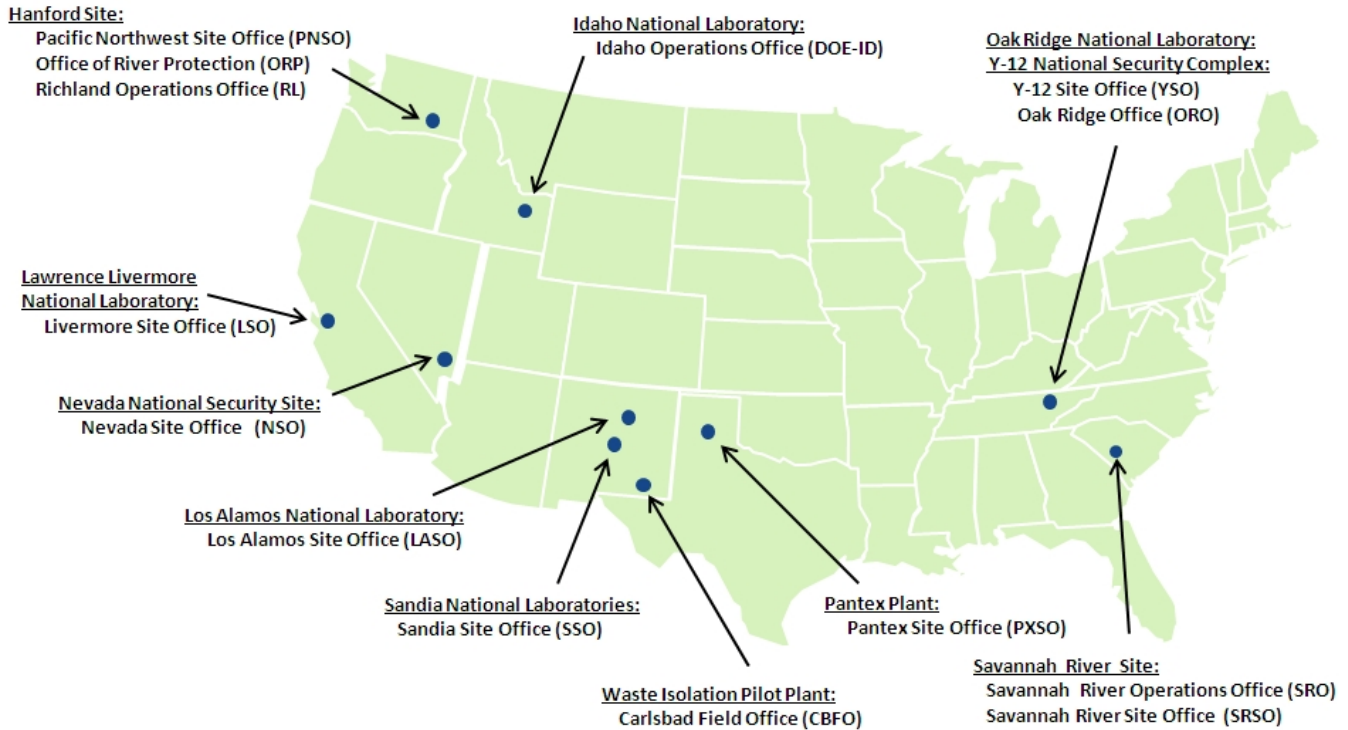


Figure 1. Department of Energy Defense Nuclear Facility Sites

### III. Department Safety Initiatives, Activities, and Reforms

This section describes the FY11 initiatives, activities, and reforms the Department is implementing to improve and ensure its nuclear safety performance throughout the complex. These activities address issues identified by the Board, as well as issues identified through self-assessments and independent oversight efforts undertaken by the Department at its defense nuclear facilities.

#### A. Directives Reform and Regulatory Structure

On March 16, 2010, the Deputy Secretary of Energy approved the Department's plan for safety and

security reform, which includes end-state visions for safety and security. The goal of the directives reform initiative, which is nearing completion, is to develop a set of Departmental safety and security requirements that is consistent with adequate consensus standards of safety and security and that provides for the effective and efficient protection of workers, the public, DOE's national security assets, and the environment. In implementing the initiative, we have not only streamlined requirements and eliminated duplications wherever possible to improve clarity and usability, but have also identified and addressed various gaps in existing requirements to ensure that the final set of requirements is complete and adequate. The

outcome of the initiative will be a system of directives that supports safe, secure, effective, and efficient performance in accomplishing DOE's current and future missions.

DOE acknowledges and appreciates the assistance the Board has provided to our directives reform initiative. By actively participating in the directives review cycle and by offering valuable insights and suggestions, the Board has facilitated and expedited the process of bringing this important safety and security enhancement to a positive conclusion.

In June 2010, the DOE Office of Health, Safety and Security (HSS) finalized its project management plan (PMP), Revision 2, to provide direction for implementing the Department's 2010 safety and security reform plan in a disciplined manner. The PMP establishes effective project controls based on stakeholder feedback, including establishment of executive steering committees, a requirements framework for each topical area to ensure that a systems approach is applied when changing requirements, multi-disciplinary expert and stakeholder reviews before submittal to DOE-wide reviews, and a checklist of review criteria that must be addressed for each directive. The project scope includes the following seven topical areas: worker safety and health; nuclear safety; environment and quality assurance; operational awareness; independent oversight; safeguards and security; and classification. This initiative is the most significant review of DOE's governing safety requirements since 1995. It has improved the Department's body of safety requirements and has put DOE in a better position to manage and maintain its set of safety requirements in the future.

For directives reform, changes have been made within the established Departmental directives program. For each identified directive action, formal justification memos were developed and approved by the Department's directives review board. Once the scope and schedule of planned actions were approved, revised, or consolidated, draft new directives were developed by teams of subject matter experts with input from the associated

topical area executive steering committee. The proposed changes were then released for DOE-wide review. Review, comment resolution, concurrence, and approval also proceeded in accordance with the Department's established directives process and direction from the Department's directives review board. The PMP provides effective controls by augmenting the established Departmental directives program with additional stakeholder reviews and inputs.

HSS is nearing completion of this reform project and expects all directive revisions to be approved in early FY12. HSS has achieved significant streamlining by reducing the number of directives. By removing unnecessary process requirements, these revisions give added emphasis to the essential safety requirements and responsibilities, and improve the Department's ability to accomplish its mission safely and efficiently. These revisions have improved clarity in applicability, requirements, and responsibilities, and have eliminated redundancies. In addition, HSS has developed framework documents to describe how each set of topical area requirements documents provides for the protection of public health and safety, worker safety, and the environment. HSS has also clearly established and documented the technical bases for each individual safety requirement. Taken together, these changes will help the Department maintain and improve its safety requirements set, both now and in the future.

As part of the review and revision process, the Department addressed identified gaps in safety requirements to make the requirements more comprehensive. Examples of improvements that have been made include:

- Enhanced the independence of accident investigations by requiring an off-site investigation leader for all accident investigations (Order 225.1B, *Accident Investigations*);

- Clarified requirements for federal personnel re-qualification (Order 426.1, *Federal Technical Capability*); and
- Clarified requirements for use of design codes and standards, and for confinement ventilation design in the draft revision to Order 420.1C, *Facility Safety*.

The Department met its major project milestone to have 100 percent of the HSS directives either complete or into concurrence review by September 30, 2011. As of the end of FY11, 98 of 107 HSS directives (92 percent) were complete (revised, re-certified, or cancelled), and the remaining directives are projected to be complete by the end of the second quarter of FY12. Revisions to safety policies and orders completed in FY11 are shown in Figure 2.

DOE Policy 420.1	<i>Department of Energy Nuclear Safety Policy</i> (February 2011)
DOE Order 458.1	<i>Radiation Protection of the Public and the Environment</i> (February 2011)
DOE Order 252.1A	<i>Technical Standards Program</i> (February 2011)
DOE Order 225.1B	<i>Accident Investigations</i> (March 2011)
DOE Order 210.2A	<i>DOE Corporate Operating Experience Program</i> (April 2011)
DOE Policy 226.1B	<i>Department of Energy Oversight Policy</i> (April 2011)
DOE Order 226.1B	<i>Implementation of DOE Oversight Policy</i> (April 2011)
DOE Order 414.1D	<i>Quality Assurance</i> (April 2011)
DOE Order 450.2	<i>Integrated Safety Management</i> (April 2011)
DOE Order 232.1B	<i>Environment, Safety and Health Reporting</i> (June 2011)
DOE Order 442.2	<i>Differing Professional Opinions for Technical Issues Involving Environment, Safety and Health</i> (July 2011)
DOE Order 232.2	<i>Occurrence Reporting and Processing of Operations Information</i> (August 2011)
DOE Order 227.1	<i>Independent Oversight Program</i> (August 2011)
DOE Order 426.1	<i>Federal Technical Capability</i> (September 2011)

**Figure 2. Revisions to Safety Policies and Orders Completed in FY11**

## B. Facility Design and Adequacy of Safety Analysis

In response to the March 2011 events at the Fukushima Daiichi nuclear power plant in Japan, DOE took a series of actions to review the safety of its nuclear facilities related to natural hazards and to identify opportunities for improvement. On March 23, 2011, the Secretary issued Safety Bulletin Number 2011-01, *Events Beyond Design Safety Basis Analysis*, which required DOE Program and Field Offices to review their nuclear facilities and report on the:

- Analyses that have been performed for beyond design basis events and controls in place to mitigate them;
- Ability to safely manage their nuclear facilities during a total loss of power;
- Operability of important safety systems; and
- Readiness of emergency management plans and procedures.

### Beyond Design Basis Accidents

“Beyond design basis” accidents are accident scenarios and sequences that are possible but were not fully considered in the design of a facility because they were judged to be too unlikely. In that sense, they are considered beyond the scope of “design basis” accidents, to which a nuclear or other high-hazard facility must be designed and built to withstand. Consequently, beyond design basis accidents are analyzed to fully understand how well a facility can tolerate an accident, however unlikely the accident scenario might be.

On June 6-7, 2011, the Deputy Secretary convened a nuclear safety workshop that was attended by senior nuclear safety managers and technical experts from the Department, the Nuclear Regulatory Commission (NRC), the Board, the Federal Emergency Management Agency; and representatives from the commercial nuclear power industry. Subsequently, the Department evaluated its existing requirements and guidance for safety analysis, facility design, and emergency response as they relate to beyond design basis events. At the same time, the Department reviewed commercial nuclear power industry requirements and guidance related to beyond design basis events, including recent efforts by the NRC and the European Union.

DOE nuclear facilities differ from the commercial nuclear power industry, but can still apply the lessons learned from the accident at the Fukushima Daiichi nuclear plant to improve their own nuclear safety. Although the responses to the safety bulletin confirmed that DOE has sound provisions in place to address beyond design basis accidents, the Department is taking additional actions to improve the criteria and guidance for evaluating such accidents and to determine whether improvements in emergency response capabilities are necessary. In September 2011, the Deputy Secretary issued the report, *Review of Requirements and Capabilities for Analyzing and Responding to Beyond Design Basis Events*. This report describes the opportunities for improvement identified by the DOE review and provides recommendations for short-term and long-term actions to improve nuclear safety at DOE facilities. DOE has begun implementing the report recommendations and expects to complete the actions in accordance with the completion dates identified in this report.

## C. Oversight

United States national and economic security demands that the DOE science, energy, environmental, and National Nuclear Security Administration (NNSA) enterprise missions maintain technological superiority and nuclear capabilities

second to none. To use its resources most efficiently while also ensuring the safe, secure, and reliable delivery of its mission, the Department is implementing oversight reform initiatives, often modeled on those undertaken by other highly reliable government and corporate organizations. Reform is being achieved: 1) through an improved understanding of how we govern and perform, and 2) by leveraging strong federal and contractor assurance systems that improve performance and accountability, reduce costs, and use validated industry standards for both nuclear and non-nuclear activities wherever and whenever possible.

On July 5, 2011, the Deputy Secretary issued the memorandum, "Roles and Responsibilities for the Central Technical Authority, Chief of Nuclear Safety/Chief of Defense Nuclear Safety, and Chief Operating Officer." The memorandum affirmed the roles and responsibilities for each position and named the individuals assigned to each Under Secretary.

### **Nuclear Safety and Security Council**

The Nuclear Safety and Security Council was chartered in June 2011 by the Deputy Secretary to support implementation of actions for transforming DOE's approach to safety and security as identified in the Department's strategic plan. The actions and recommendations of this Council directly affect the Department's nuclear safety and security mission. The Council, chaired by the Associate Deputy Secretary and with membership drawn from the senior management of each of the Program Offices and the Office of the General Counsel, addresses the nuclear safety and security management framework. The purpose is to improve communications across a wide variety of key leaders who are members of the Council and to propose measures to resolve technical and programmatic issues that are brought to their attention through recommendations to the Department's Chief Operating Officers.

The Council collaboratively evaluates nuclear safety and security issues during regularly scheduled meetings and agrees on actions to be taken. The

Council aims for continuous improvement of DOE safety and security performance in five broad areas: (1) strategy; (2) performance and accountability; (3) oversight; (4) training; and (5) infrastructure. Topics discussed by the Council to date include nuclear safety performance metrics, nuclear safety training, implementation plans for recommendations by the Board, the nuclear safety and security directives revision process, nuclear safety research and development, and other crosscutting topics to improve the nuclear safety and security mission.

### **HSS Oversight Initiatives**

Within HSS, ongoing oversight reform is evidenced by the establishment of a dedicated Office of Nuclear Safety (HS-30) in May 2011. This reorganization consolidated and realigned HSS resources to better focus on the Department's nuclear safety requirements, expectations, and research. As part of this reorganization, HSS created the Nuclear Safety Research and Development (NSR&D) Program within HS-30 to provide corporate-level leadership to support nuclear safety research and development throughout the Department. The HSS NSR&D Program will work with NNSA and the DOE program offices to (1) develop mechanisms for effectively sharing information on nuclear safety research and development activities and results, and (2) seek cost effective means to perform nuclear safety research and development that may have benefit DOE-wide. The NSR&D Program will also solicit input from the Nuclear Safety and Security Council.

HSS is also continuing to implement and refine a significantly modified approach to conducting independent oversight of nuclear safety through its Nuclear Safety Site Lead and Targeted Review Programs. These changes were initiated in part to address concerns raised by the U.S. Government Accountability Office in its 2008 report, *Nuclear Safety: Department of Energy Needs to Strengthen its Independent Oversight of Nuclear Facilities and Operations*.

Under the Nuclear Safety Site Lead Program, a designated nuclear safety professional from the HSS

Office of Enforcement and Oversight is assigned to monitor the activities at each DOE site that has one or more nuclear facilities or activities requiring a Documented Safety Analysis. The site leads are responsible for maintaining operational awareness of nuclear facilities and operations and using this information to make informed decisions about independent oversight review priorities that are tailored to site-specific conditions and operations. This program has given HSS a significantly increased on-site presence at the Department's highest priority nuclear sites. The independent oversight Targeted Review Program takes a Department-wide view of specific nuclear safety-related functional areas and topics. Topics are selected based on such factors as safety performance trends, new or changed nuclear safety requirements, and the need for additional information to assess the status and adequacy of site nuclear safety documentation and its implementation. The first targeted reviews, now underway, are evaluating (1) the quality of implementation verification reviews conducted to validate safety basis changes, (2) processes for procuring safety systems and components for nuclear facilities undergoing design or construction, and (3) emergency preparedness for severe natural phenomena events. These program enhancements provide the means for increased HSS monitoring of the status and implementation of nuclear facility safety bases and timely follow-up on corrective actions to evaluate effectiveness.

#### **D. Safety Culture**

Safety culture at the Waste Treatment and Immobilization Plant (WTP) at the Hanford Site is a topic specifically addressed by the DNFSB in Recommendation 2011-1, issued on June 9, 2011. DOE's progress in responding to this recommendation is discussed in Section IV. HSS has a longstanding focus on safety culture, having conducted an independent review of nuclear safety culture at the WTP and reported its findings in October 2010, prior to Recommendation 2011-1.

#### **Safety Culture**

Safety culture is defined as, "An organization's values and behaviors modeled by its leaders and internalized by its members, which serve to make safe performance of work the overriding priority to protect the workers, public, and the environment."

(DOE G 450.4-1C, *Integrated Safety Management Guide*)

HSS and the DOE Integrated Safety Management (ISM) Champions Council identified "safety culture" as a top ISM-related priority in 2007. DOE and the Energy Facility Contractors Group (EFCOG) jointly sponsored the ISMS Safety Culture Task Team specifically to address safety culture within the Department. The goal of this effort was to achieve an improved safety culture by promoting continuous improvement in ISM and building on operating experience from similar industries, such as the domestic and international commercial nuclear and chemical industries.

Extensive operating experience in various industries has shown that certain cultural elements have a significant influence on overall operational and safety performance. The ISMS Safety Culture Task Team has evaluated lessons learned from related industries and organizations, such as the Institute of Nuclear Power Operations (INPO), the NRC, the National Aeronautics and Space Administration (NASA), the Occupational Safety and Health Administration, and the International Atomic Energy Agency, and relevant information on safety culture issues from DOE oversight and enforcement programs.

The DOE ISM Champions Workshop, held September 12-15, 2011, in Kennewick WA, featured a session dedicated to safety culture and how it relates to ISM. The joint DOE/EFCOG task team produced guidance documents based on three key factors that will encourage a global view of safety,

enhance employee engagement, and improve performance within DOE: organizational learning; high reliability organization; and human performance improvement.

### E. Work Planning and Control

The purpose of work planning and control (WPC) is to ensure the protection of workers, the public, and the environment. Without such controls, all three would be placed at avoidable and unacceptable risk. Using ISM principles, WPC emphasizes using a graded approach in specifying the level of coordination required to identify and mitigate hazards to workers, the public, and the environment.

#### Work Planning and Control

Work planning and control is the use of formalized, standardized, and documented methods and processes for considering and mitigating risks when planning, authorizing, releasing, and performing work.

The DOE acquisition regulations (DEAR) require that work be performed in a manner that protects workers, the public, and the environment. They further require that the management of environment, safety, and health functions and activities be an integral and visible part of the work planning and execution process (48 CFR 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution*). The DEAR further require that work be managed and performed in accordance with a documented safety management system that describes how the contractor will ensure that the ISM five core functions and seven guiding principles are implemented. The ISM core functions require that work be defined, that the associated hazards be identified and analyzed, and

that work be performed within controls implemented to protect workers, the public, and the environment from the hazards.

In early FY11, The Office of Environmental Management (EM), HSS, NNSA, and EFCOG initiated a program and project plan expressly designed to improve contractor assurance and federal oversight of WPC across NNSA and EM sites. This initiative establishes a commitment by contractors to improve WPC throughout their operations.

HSS will engage with this initiative on matters of WPC policy and implementation. The initiative will also interface with EFCOG groups that focus on human performance improvement; safety culture; quality assurance; environment, safety, and health; contractor assurance; and work management to pursue WPC improvement and integrated solutions.

The project plan documents an initial approach for managing the EM/NNSA/EFCOG WPC improvement project. The plan will be finalized in FY12 to build on the existing WPC programs at EM and NNSA sites by sharing best practices and incorporating practices from INPO, NASA, and other external sources.

### F. Office of Environmental Management Activities

In FY11, EM continued its aggressive campaign to improve safety performance throughout the organization, including procurement; engineering; construction and commissioning; operations; and deactivation/decommissioning and environmental restoration. These efforts reduced EM's total annual recordable case rate and its cases of days away from work and on-job restriction or transfer, which remain significantly below the average DOE rates and comparable private construction and waste remediation industry rates.



### **ISM Five Core Functions and Seven Guiding Principles**

#### Core Functions

1. Define the scope of work
2. Analyze the hazards
3. Develop and implement hazard controls
4. Perform work within controls
5. Provide feedback and continuous improvement

#### Guiding Principles

1. Line management responsibility for safety
2. Clear roles and responsibilities
3. Competence commensurate with responsibilities
4. Balanced priorities
5. Identification of safety standards and requirements
6. Hazard controls tailored to work being performed
7. Operations authorization

EM remained vigilant in identifying emerging safety issues through ongoing awareness and analysis of operational experience and data on injuries and illnesses. EM has also addressed several overarching issues in performance, including safety performance, at the Separations Process Research Unit, the Idaho and Paducah cleanup projects, the WTP, and the Savannah River Site (SRS). Organization-wide issues were addressed through:

- Partnering with EFCOG and major corporations that support EM work in order to develop and enhance work planning expectations and best practices in the field;
- Developing criteria for Integrated Safety Management System (ISMS) effectiveness reviews for nuclear safety culture and

maintenance of a safety conscious work environment; and

- Implementing specific administrative controls, including comprehensive field reviews conducted by EM Headquarters.

EM is developing a suite of performance indicators that can be used to identify trends, positive and negative, so action can be taken before an event occurs. These indicators will be piloted at a site in FY12 to determine how well they work and implement identified improvements. EM will then expand their use throughout the organization.

EM provided direction to field managers that formalizes guidance and metrics for ensuring that at least 95 percent of the installed safety class and safety significant equipment/software contains no defects, and is not a “suspect or counterfeit” item. EM achieved a 99 percent success rate against this safety goal.

Other major EM safety-related initiatives in FY11 included:

- Co-sponsoring with CNS-Energy, and participating in, a workshop on safety decisions under uncertainty;
- Addressing the findings from the site evaluations of “beyond design basis events;”
- Improving the WPC process, including participating in the URS Corporation initiative to improve WPC;
- Serving on the EFCOG Executive Committee and providing program managers for EFCOG initiatives; and
- Establishing the EM acquisition center to standardize the acquisition planning process to achieve more efficient and timely acquisitions.

## CNS-Energy Oversight

During FY11, CNS-Energy continued to support line oversight activities through nuclear criticality safety program evaluations, operational awareness reviews, programmatic assessments of ISMSs, and construction project reviews (CPRs), which are further discussed below. The office also conducted 20 field activity reviews involving ten functional areas: facility safety/authorization basis, nuclear criticality safety, oversight program, seismic safety, project management/CPR, contract review, ISM, quality assurance and software quality assurance, operational readiness, and risk management.

CNS-Energy remained closely engaged in supporting and monitoring key technical issues involving the WTP, including pulse jet mixing (PJM) and solids accumulation, nuclear safety requirements, the evaluation of dry deposition velocity (DV), and the System for Analysis of Soil-Structure Interaction.

**Construction Project Reviews.** The CNS-Energy staff has continued to provide leadership and technical expertise to EM in establishing corporate CPRs, which were instituted to assess the progress of each EM capital project and provide proactive recommendations for achieving its next critical decision stage within the approved cost and schedule. The first round of CPRs was completed in 2009. CPR Committees evaluate project progress in such areas as technical execution; cost, schedule, risk, and contracts; management and prior reviews; environment, safety, and health; quality assurance; and commissioning.

**PJM and Solids Accumulation.** CNS-Energy has closely monitored the handling of a differing professional opinion (DPO), submitted by an Office of River Protection staff member, that raised a number of technical issues regarding WTP equipment design and operability. The DPO states that fabrication and construction of some equipment is premature because technical design issues have not been resolved. Through the Hanford Site DPO process, it was determined that the project adequately tracks all issues and that the timing of equipment fabrication ahead of final

design approval is a risk-management decision. After exhausting the site DPO process, an appeal of the DPO decision was submitted to CNS-Energy. Specifically, the DPO appeal requested that two issues be reviewed: whether proceeding with the fabrication violates the requirements of 10 CFR Part 830, *Nuclear Safety Management*, and whether the potential for excessive erosion could cause premature equipment failures. CNS-Energy has been delegated as the DPO manager for the appeal.

**WTP Nuclear Safety Requirements.** The CNS-Energy staff reviewed the draft requests for proposals that were prepared for the WTP and Tank Farms “one system” strategy for nuclear safety requirements. This strategy would align the two projects for early startup of the Low-Activity Waste Facility.

**Evaluation of DV at the WTP Project.** The CNS-Energy staff continued to work toward resolving the DNFSB’s concerns regarding DV, which is a factor that is used in calculating potential accident impacts. The WTP project, informed by CNS-Energy/DNFSB communications and consistent with ongoing efforts within HSS, has selected an appropriately conservative DV value that will result in a technically defensible accident analysis.

**System for Analysis of Soil-Structure Interaction.** The System for Analysis of Soil-Structure Interaction (SASSI) is a computer code used to evaluate and predict the effects of seismic ground motion on structures. SASSI is widely used by the nuclear industry and by DOE. The most recent SASSI user’s manual states that one of the methods used in the code, the subtraction method, “is the preferred method of analysis.” However, in August 2010, CNS-Energy learned of analyses showing that the subtraction method, under some conditions, yields results that deviate significantly from those obtained from the more computationally-intensive “direct method.” The subtraction method was found to both overestimate and underestimate a structure’s response to a seismic event, depending on the seismic conditions being examined. CNS-Energy, in consultation with subject matter experts, assessed the implications of SASSI errors for DOE

facilities and recommended actions the Department should take.

On April 8, 2011, the Board sent a letter to DOE expressing its concerns about the SASSI technical and software quality assurance issues. On July 29, 2011, DOE responded with a technical report and schedule of commitments to address the Board's concerns. The DOE response also noted that since many variations (i.e., modified versions) of the original SASSI code are currently in use, DOE would send a software quality assurance questionnaire to managers of construction projects that are using, or have used, SASSI. A summary report of responses was transmitted to the Board.

EM has the lead responsibility for coordinating the SASSI issue resolution with the Board, but does not currently use SASSI on any EM program. The SASSI code is used by NNSA on the Uranium Processing Facility at Y-12 and the Chemistry and Metallurgy Research Replacement Facility at Los Alamos National Laboratory (LANL) – two projects that would benefit most from resolution of SASSI issues. NNSA is developing and executing an integrated action plan to address the root cause of the SASSI errors, and to develop verification and validation problem sets to help ensure the accuracy of SASSI outputs. DOE will continue to work closely with the Board to resolve all outstanding SASSI issues.

### **CNS-Energy Continuous Learning**

CNS-Energy continues to sponsor a series of training courses using recognized experts from established training programs, such as the Safety Basis Academy and the American Society of Mechanical Engineers (ASME), to strengthen fundamental knowledge in critical technical areas. These offerings include: (1) ASME Code for the Design and Fabrication of Tanks, Vessels and Piping Systems with Applications at DOE Facilities; and (2) Seismic Design and Retrofit of Structures, Systems, and Components.

## **G. NNSA Defense Program Activities**

The NNSA Headquarters Office of Defense Programs (NA-10) provides direction and oversight of NNSA defense programs activities, including nuclear safety and operations, transportation, research, engineering, and production at the NNSA field offices. Significant activities during FY11 included taking action on the results of the Seismic Analysis of Facilities and Evaluation of Risk (SAFER) project for the LANL Plutonium Facility (PF-4) and making progress on improving NNSA WPC.

### **SAFER Project**

The SAFER project was initiated to analyze the seismic performance of selected structures, systems, and components (SSC) using recent information about an increase in the seismic ground motion estimate at LANL. The SAFER project analysis for PF-4 identified an increased potential for failure of certain SSCs in a maximum postulated earthquake event. In a justification for continued operations (JCO) document, LANL identified interim compensatory measures and longer-term structural corrective maintenance actions that are intended to result in the facility structure meeting the updated performance category 3 probability performance goal. Most of the corrective maintenance activities in the JCO were completed in 2011. The remaining significant structural corrective maintenance actions in the JCO are scheduled to be completed by mid FY12. A detailed structural analysis to determine if any additional structural corrective actions are required is expected to be complete by the 3<sup>rd</sup> quarter of FY12.

## Work Planning and Control

As discussed above, NNSA, in collaboration with EFCOG, EM, and HSS, implemented a project initiative to improve WPC during FY11. Accomplishments during the year include:

- Collecting WPC performance measures across DOE sites and with industry for evaluation and improvement;
- Establishing and collecting WPC tools for improvement across the DOE enterprise and applying these tools within a draft EFCOG WPC guideline document;
- Establishing a single set of criteria, review, and approach documents (CRADs) for WPC that combine the best practices from several prior CRAD sets. The CRADs are contained in the EFCOG WPC guideline document and are proposed for the draft DOE oversight guide;
- Supporting the EFCOG work management subgroup during WPC assist visits at the Nevada National Security Site and the Waste Isolation Pilot Plant.

## H. NNSA Chief of Defense Nuclear Safety Activities

DOE established Central Technical Authority (CTA) positions within the Department in response to DNFSB Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*. The CTA for NNSA is the NNSA Administrator, while the Chief of Defense Nuclear Safety (CDNS) provides technical support to the CTA in several areas, such as:

- Conducting biennial reviews of NNSA site offices;
- Granting exemptions from nuclear safety requirements;
- Performing liaison functions with the DNFSB;
- Approving delegations of nuclear safety authorities, and interpreting and developing nuclear safety policies, requirements, and guidance;
- Serving as DPO manager; and
- Conducting independent analyses and investigations.

Biennial reviews of NNSA site offices, initiated in 2005, continued in FY11. Since the first round of full-scope/baseline reviews, the tailored follow-up reviews have indicated overall continued good performance or improved performance. CDNS will continue the follow-up reviews in FY12.

### **Chief of Defense Nuclear Safety Accomplishments during FY11**

- ✓ Initiated a project to derive a first-of-a-kind set of site-specific correlations between calculated accident dose consequences at selected DOE site boundaries and the Department's quantitative safety objectives for nuclear facilities. This information can inform a variety of nuclear safety decisions.
- ✓ Created a new professional development course for the review and approval of safety basis documents and provided training to safety professionals through the National Training Center.
- ✓ Developed and completed a robust implementation program for the new readiness order that included briefings to senior managers at all NNSA sites to ensure a smooth transition to the revised requirements. The program resulted in full implementation of the order in an efficient manner.
- ✓ Supported the CTA responsibilities for ensuring adequate treatment of nuclear safety in the related DOE directives by completing the revision of 25 DOE directives, initiating the revision of 9 directives, and canceling 17 directives.
- ✓ Actively supported promotion and improvement of safety culture through the revision of Departmental directives that govern the process for disposition of DPOs on technical issues related to both nuclear and non-nuclear safety.
- ✓ Completed four baseline/full-scope biennial reviews that indicated continued improved performance at the Savannah River, Pantex, Nevada, and Livermore sites.
- ✓ Updating the final hazard categorization methodology for use in NNSA nuclear facilities to allow a significant additional margin for work with important isotopes. The approach, its basis, and lessons learned in implementation will provide useful data for updating the Department-wide standard (expected in 2012).

## IV. Progress in Implementing Board Recommendations

### A. Overview of Board Recommendations

The Board issues recommendations regarding the content and implementation of safety standards at defense nuclear facilities to the Secretary on issues or circumstances it believes must be resolved to assure adequate protection of public health and safety. The Secretary is required to respond to each Board recommendation within 45 days of its publication in the Federal Register (or longer, if granted additional time). In addition, the Secretary must provide an Implementation Plan (IP) to the Board within 90 days of publication in the Federal Register of the Secretary's acceptance of the recommendation (or longer, upon appropriate notice). The Department's policy is to begin IP development in parallel with the development of the Department's response if it is expected that the Secretary will accept the recommendation in whole or in part.

The Department is expected to complete all IP commitments within one year of issuance of the IP. However, most IP commitment schedules extend beyond one year due to the scope and technical complexity of the safety issues being addressed, the lengthy concurrence processes for revising DOE directives, and the challenges inherent in implementing and verifying changes throughout DOE's defense nuclear complex.

Thirteen recommendations remained open at the end of FY11.<sup>1</sup> The number of open recommendations has remained fairly constant, ranging from 10 to 14 over the past decade as new recommendations are issued and older recommendations are closed (Figure 3). A status

<sup>1</sup> The IP for Board Recommendation 2001-1, *High Level Waste Management at the Savannah River Site*, was closed in December 2011.

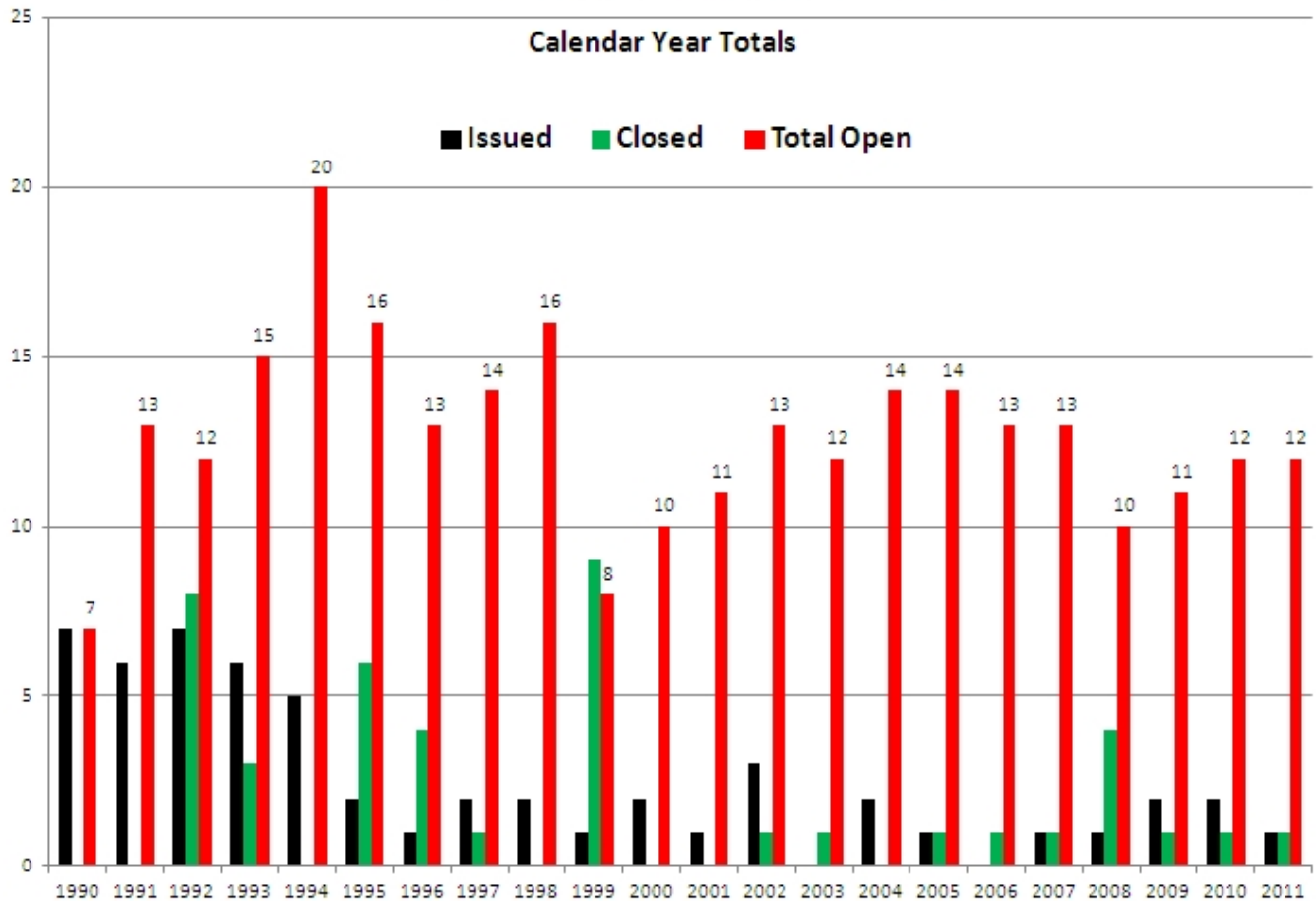
#### Open Board Recommendations

- 2000-1** Prioritization for Stabilizing Nuclear Materials
- 2002-3** Requirements for the Design, Implementation, and Maintenance of Administrative Controls
- 2004-1** Oversight of Complex, High-Hazard Nuclear Operations
- 2004-2** Active Confinement Systems
- 2005-1** Nuclear Material Packaging
- 2007-1** Safety-Related In Situ Nondestructive Assay of Radioactive Materials
- 2008-1** Safety Classification of Fire Protection Systems
- 2009-1** Risk Assessment Methodologies at Defense Nuclear Facilities
- 2009-2** Los Alamos National Laboratory Plutonium Facility Seismic Safety
- 2010-1** Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers
- 2010-2** Pulse Jet Mixing at the Waste Treatment and Immobilization Plant
- 2011-1** Safety Culture at the Waste Treatment and Immobilization Plant

update for each of the open recommendations is provided below.

Appendix A, Table A.1, Open Commitments, lists DOE projects' timeframes for completing the IPs for each open recommendation.

## DNFSB Recommendations



**Figure 3. Status of Board Recommendations in Calendar Years 1990-2011**

The Board issued three new recommendations in FY11: Recommendation 2010-1, *Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers*; Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*; and Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant*. These recommendations are discussed below. The other ten open recommendations are discussed in Section IV.C.

### **B. Recommendations Issued in FY11**

#### **2011-1: Safety Culture at the Waste Treatment and Immobilization Plant**

The Board issued Recommendation 2011-1 on June 9, 2011, addressing the safety culture at the Hanford Site WTP. The Secretary designated the Deputy Secretary as the Department’s responsible manager to oversee the IP development and execution. The Board designated its Vice Chairman to work directly with the Deputy Secretary.

On June 30, 2011, the Secretary accepted the recommendation. On August 12, 2011, the Board requested certain clarifications to the Secretary's response, which the Secretary provided in a letter dated September 19, 2011. The Recommendation 2011-1 IP was transmitted to the Board in early FY12. The Department committed to take broad and comprehensive actions focused on resolving safety culture deficiencies at the WTP and to examine and improve the safety culture throughout the DOE complex.

### **2010-2: Pulse Jet Mixing at the Waste Treatment and Immobilization Plant**

The Board issued Recommendation 2010-2 on December 17, 2010. The Recommendation addresses the Board's concern that equipment testing and analysis should be enhanced to establish with confidence that the PJM and transfer systems will perform adequately at full scale.

On February 10, 2011, the Secretary accepted the recommendation and committed to more testing to provide additional confidence that PJM and transfer systems for the WTP will meet their design and operating requirements. The acceptance letter included clarifications regarding four of the Board's specific technical recommendations. On June 20, 2011, the Secretary assured the Board that the acceptance letter was intended to clarify the actions being taken to validate the design, operation, and safety of the WTP PJM and transfer systems. The Secretary reaffirmed the acceptance of the recommendation, and the IP was delivered in early FY12.

### **2010-1: Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers**

The Board issued Recommendation 2010-1 on October 29, 2010. This recommendation calls for the amendment of 10 CFR 830, *Nuclear Safety Management*, by incorporating a revised DOE Standard 3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, into the text as a

requirement. The recommendation also requests that the revisions to DOE Standard 3009-94 reflect clearly delineated criteria for methodologies, accident scenarios, and mitigation options, as well as a clearly defined approval authority for safety analyses at defense nuclear facilities.

The Secretary partially accepted the recommendation on February 28, 2011, noting that the Department shared the Board's conviction that a clear set of requirements and standards is vital for safe operations. The Secretary noted that in 2008 the Department began a comprehensive reexamination of its nuclear safety requirements — the directives reform initiative — to ensure that all requirements and standards were clear, concise, complete, and up to date. The Secretary further noted that in March 2010, the Department had enhanced the directives reform initiative to better define and expedite it. The Secretary also clarified several of the responses to the associated sub-recommendations. On April 27, 2011, the Board advised the Secretary that the response constituted a partial rejection of the recommendation and reaffirmed the recommendation as originally issued. On May 27, 2011, the Secretary reaffirmed the analyses and conclusions in the original acceptance response and noted that the IP would achieve the underlying safety improvements identified in the recommendation.

DOE transmitted the Recommendation 2010-1 IP to the Board on September 26, 2011. The IP provides the approach for updating the Department's Documented Safety Analysis standards and requirements, which will improve the performance of hazard and accident analysis and the identification of safety controls. The IP reinforces and expands the improvements in the directives reform initiative, discussed in Section III.A.



### DOE Standard 3009-94

DOE's existing nuclear safety regulatory framework, which applies DOE Standard 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, as a safe harbor methodology for non-reactor hazard category 1, 2 and 3 facilities, can be used to effectively implement the 10 CFR Part 830 safety basis requirements.

## C. Other Open Recommendations

### 2009-2: Los Alamos National Laboratory Plutonium Facility Seismic Safety

The Board issued Recommendation 2009-2 on October 26, 2009. The recommendation calls for the Department to implement near-term actions and compensatory measures to reduce the consequences of potential seismic events at PF-4 and to develop and implement a longer-term strategy to reduce seismic event consequences. The Secretary accepted the recommendation on February 2, 2010, and transmitted the associated IP to the Board on July 13, 2010. The Board visited LANL November 29 through December 3, 2010, and noted progress on this recommendation.

The IP identifies near-term actions and a long-term strategy to mitigate the consequences of post-seismic events so that the DOE evaluation guideline of 25 rem is not exceeded. The plan includes 11 primary deliverables. Eight deliverables were completed in FY11, and completion of the remaining deliverables is anticipated in FY12. In the most recent update of the PF-4 Documented Safety Analysis the calculated mitigated radiological consequences to the maximally exposed off-site individual from a post-seismic fire event is significantly reduced as compared to the 2008 Documented Safety Analysis, which was the basis

for the recommendation. High-priority efforts in FY11 included implementation of the SAFER project for PF-4 and completion of a refined accident analysis and control selection for seismically induced events in the safety basis update. The SAFER project was an essential prerequisite for identifying the most appropriate seismic upgrades. It systematically identified the credited safety function; related this to a structural limit or mechanical function; calculated the performance achieved using the current seismic hazard analysis comparing it to performance goals; and recommended appropriate replacement or upgrades if the performance goals were not met.

### 2009-1: Risk Assessment Methodologies at Defense Nuclear Facilities

The Board issued Recommendation 2009-1 on July 30, 2009. The Secretary accepted the recommendation on November 3, 2009, and subsequently transmitted the IP to the Board. The recommendation calls for adequate policies and associated standards and guidance on the use of quantitative risk assessment methodologies (referred to as probabilistic risk assessment) at defense nuclear facilities. On April 27, 2010, the Secretary transmitted revision 1 to the IP to the Board. The revision included a commitment to periodically brief the Board or staff on progress and four other deliverables:

- Establish the Risk Assessment Technical Experts Working Group (RWG);
- Issue a nuclear safety risk assessment information notice;
- Revise and issue the DOE Nuclear Safety Policy to address the use of quantitative risk assessment in nuclear safety; and
- Transmit a letter to the Board on the Department's plans for the appropriate changes to directives or standards on the use of quantitative risk assessment at defense nuclear facilities based on the results of risk assessment studies.

The establishment of the RWG and issuance of the Information Notice were completed in 2010. DOE issued the revised Nuclear Safety Policy (DOE Policy 420.1) on February 8, 2011, which included DOE expectations regarding the use of quantitative or probabilistic risk assessment in nuclear safety decisions. The response to the Board addressing quantitative risk assessments remains to be completed.

To address the last deliverable in the recommendation, DOE conducted studies of the use of quantitative and probabilistic risk assessment within the DOE complex and in other agencies and industries that need to prevent and mitigate high-consequence/low-frequency events. The studies were supported by a DOE-sponsored interagency workshop on risk assessment and safety decision-making under uncertainty, data collection efforts, and interviews at DOE facilities and with representatives of other agencies and industry, including the NRC, the Nuclear Energy Institute, NASA, the Food and Drug Administration, the American Institute of Chemical Engineers Center for Chemical Process Safety, and the Federal Aviation Administration. The studies were completed in FY11, and the reports will be issued in FY12.

From these efforts, and based on feedback obtained during the development of the Nuclear Safety Policy, DOE developed a draft technical standard, *Development and Use of Probabilistic Risk Assessments in Department of Energy Nuclear Safety Applications*, and distributed it for interim use. The Department expects to publish the standard in FY12.

#### **2008-1: Safety Classification of Fire Protection Systems**

The Board issued Recommendation 2008-1 on January 29, 2008. The recommendation calls for development and revision of standards applicable to the design and operation of the fire protection systems that are relied on as a primary means of protecting the public and workers from radiological hazards at DOE defense nuclear facilities. The Secretary accepted the recommendation on March

19, 2008, and transmitted the associated IP to the Board on July 23, 2008.

The Department established a working group that includes EM, HSS, SC, NNSA Headquarters Program Offices, CNS-Energy, CDNS, and representatives of multiple sites and field offices. The Department drafted specific design and operational criteria for fire barriers other than sprinkler systems for nuclear facilities. The group continues its work on the actions in the IP.

During FY11, DOE made significant progress in revising DOE Standard 1066, *Fire Protection Design Criteria*, to incorporate the new sprinkler and fire barrier guidance while ensuring the consistent application of the standard within the planned revision of DOE Order 420.1B, *Facility Safety*. On September 30, 2011, the revised standard entered the RevCom<sup>2</sup> concurrence process, and DOE expects to complete the revision early in FY12. The Department is also addressing some additional comments from the Board.

#### **2007-1: Safety-Related In Situ Nondestructive Assay of Radioactive Materials**

The Board issued Recommendation 2007-1 on April 25, 2007. The recommendation addresses issues related to measuring radioactive material holdup at defense nuclear facilities and cites a need for three specific improvements: standardized requirements for performing measurements, design requirements to facilitate accurate holdup measurement in new facilities, and research and development on new instruments and/or measurement techniques.

The Secretary accepted the recommendation on June 28, 2007, and transmitted the associated IP to the Board on October 24, 2007. With the exception

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<sup>2</sup> RevCom is an online, real-time web application for managing and supporting the collaborative development, review, approval, and dissemination of new and revised Departmental directives.

of periodic reviews and briefings, the Department completed the remaining specific IP commitments during FY11. These included defining and prioritizing requirements, programs, and guidance to address gaps in training and qualification, equipment capabilities, directives, research and development, quality assurance, and oversight. The Department also provided the Board with a prioritized action plan, with a schedule and milestones, for addressing the gap analysis results. In May 2011, the Deputy Secretary committed to work closely with Board staff to address the gaps the Department has identified in the areas listed above.

Also in May 2011, DOE advised the Board that NNSA rather than EM would thereafter serve as the Department's designated lead organization responsible for the remaining open commitments in the IP. EM and NNSA will continue to interface on the completion of programmatic actions. Only one EM facility, the Plutonium Finishing Plant at Hanford, relies on in situ measurements for criticality safety. This facility is undergoing accelerated decommissioning and will likely be razed before the site-specific actions associated with Recommendation 2007-1 have been completed. Y-12 is the only NNSA site with a credible criticality risk that relies on nondestructive assay for prevention.

#### **2005-1: Nuclear Material Packaging**

The Board issued Recommendation 2005-1 on March 10, 2005. The recommendation acknowledges that DOE has made progress in stabilizing and storing its excess nuclear materials, but calls for DOE to further enhance nuclear safety by developing technically justified criteria for packaging systems for nuclear materials on a DOE-wide level.

The Secretary accepted the recommendation on May 6, 2005, and transmitted the associated IP to the Board on August 17, 2005. The IP identified several interim milestones and deliverables, including issuance of a new requirements document for packaging and storage of nuclear materials: DOE

Manual 441.1-1, *Nuclear Material Packaging Manual*, which was issued in March 2008. The Department completed the final IP deliverable in September 2009. Repackaging activities continued in FY11 and completion is expected in FY14, with an emphasis on repackaging higher-risk materials earlier in the schedule.

The first prototype of the next-generation special nuclear material container is undergoing design and test evaluation under the management of the LASO package certification group. DOE sites are developing detailed plans for repackaging campaigns, with the goal of repackaging all nuclear material into containers meeting the 2008 guidance within the next four years.

The Department expects to close this recommendation in FY12, after the new storage containers have been produced and repackaging of very high- and high-risk material is complete.

#### **2004-2: Active Confinement Systems**

The Board issued Recommendation 2004-2 on December 7, 2004. The recommendation cites the benefits that would accrue if the Department changed its safety policy to require active confinement ventilation systems for all new and existing hazard category 2 and 3 defense nuclear facilities where there is the potential for a radiological release. The Board also recommended that the Department evaluate all new and existing defense nuclear facilities and enhance and update associated DOE directives and standards.

The Secretary accepted the recommendation on March 18, 2005. Revision 1 to the IP, which was transmitted to the Board on July 12, 2006, commits the Department to reviewing all hazard category 2 and 3 defense nuclear facilities to assure that the selected confinement strategy is properly justified and documented. In accordance with the IP, priority was given to design and construction projects, including ongoing major modifications to existing facilities.

In a letter to the Board dated February 10, 2011, the NNSA announced the completion of deliverable 8.6.5, Program Secretarial Office concurrence and approval on disposition of gaps and upgrades identified in evaluations after coordination with the CTA, if necessary. This deliverable required non-excluded facilities to be evaluated for compliance with performance criteria identified in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety Related Systems* and the site-specific Documented Safety Analysis. Of the evaluated facilities, only the LANL PF-4 facility was identified as having performance gaps that required upgrades. However, NNSA has postponed the implementation of all PF-4 upgrades related to Recommendation 2004-2 until after the PF-4 seismic analysis in response to Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, has been completed.

With the completion of deliverable 8.6.5, DOE has met all IP commitments except for updating its nuclear safety directives to incorporate guidance on active confinement ventilation systems. HSS has developed draft revisions to the relevant directives (DOE Guide 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria Guide for Use with DOE Order 420.1, Facility Safety*, and DOE Order 420.1B Chg 1, *Facility Safety*). Both draft revisions have been submitted to RevCom, and DOE expects to complete this commitment in early FY12.

#### **2004-1: Oversight of Complex, High-Hazard Nuclear Operations**

The Board issued Recommendation 2004-1 on May 21, 2004, citing concerns about a number of safety issues related to creating the CTA, delegations of safety responsibilities, technical capability, NSR&D, lessons learned from significant external events, and ISM.

The Secretary accepted the recommendation on July 21, 2004. Revision 2 to the IP was transmitted to the Board on October 12, 2006 and updated on August 30, 2011. The IP identifies several broad areas for improvement, including strengthening federal safety assurance, learning from internal and

external operating experience, revitalizing ISM implementation, and improving NSR&D.

On May 25, 2011, the Board held the third in a series of public meetings in Washington, D.C. to examine the Department's implementation of this recommendation. Departmental progress on Recommendation 2004-1 during FY11 focused on IP commitments 7 and 8, which address the Department's corporate approach to NSR&D. In an August 30, 2011, letter to the Board, the Department updated the IP to reflect a change in the responsible organization for commitments 7 and 8. HSS (and the newly created HS-30) will now function as the integrating organization responsible for implementing these two commitments. HS-30 has appointed a lead for the Department-wide effort to address crosscutting NSR&D issues. A project plan has been developed specifically to re-invigorate current NSR&D throughout the DOE complex, and HSS will develop and maintain a Department-wide database of all NSR&D activities.

Additional progress in FY11 included completing an HSS effectiveness assessment of the Department's ability and processes to learn from both internal and external operating experiences.. Procedures and guidance have been adequately implemented and identified safety issues have been resolved.

#### **2002-3: Requirements for the Design, Implementation, and Maintenance of Administrative Controls**

The Board issued Recommendation 2002-3 on December 11, 2002. The recommendation cites technical inadequacies in a number of safety-related administrative controls (now called specific administrative controls) proposed for, or in use at, various defense nuclear facilities. The Board noted that in many cases DOE and/or its contractors have asserted that the methods used to establish specific administrative controls comply with existing DOE directives. However, the Board concluded that the DOE directives system did not contain adequate requirements for the design, implementation, and maintenance of specific administrative controls.

The Secretary accepted the recommendation on January 31, 2003, and transmitted the associated IP to the Board on June 26, 2003. HSS has undertaken efforts to bolster the Department's actions to support closure of this recommendation that involve site, Program Office, and HSS evaluations of specific administrative control implementation at targeted sites. These sites include LANL, Y-12, Lawrence Livermore National Laboratory, Pantex, SRS, Sandia National Laboratories, and the East Tennessee Technology Park. Program offices are working with these sites to ensure that the formal corrective actions are closed on a reasonable schedule. Additionally, the program offices must verify more broadly that specific administrative controls are being evaluated across all of the program sites. In FY11, DOE conducted reviews at multiple DOE sites and provided updates to the DNFSB. DOE expects that this recommendation will be closed in FY12.

#### **2001-1: High-Level Waste Management at the Savannah River Site**

Recommendation 2001-1 IP was closed in early FY12. It is discussed here for purposes of documenting progress made during FY11.

The Board issued Recommendation 2001-1 on March 23, 2001, addressing the margin of safety and the amount of available tank space in the SRS high-level waste system.

The Secretary accepted the recommendation on May 18, 2001, and transmitted IP Revision 6 to the Board on November 24, 2010. The Board expressed its continued concern over changes in strategy and several delays that could adversely affect the SRS high-level waste system on January 28, 2011. The Board urged DOE to pursue additional measures to mitigate the impacts of these delays and associated risks at the tank farms.

Progress during FY11 included the completion of key technical review and procurement commitments. Savannah River Remediation, LLC, issued contracts to purchase additional tanks needed to allow the use of Tank 590 for tank farm

service. DOE reviewed and certified completion of 35 percent design of the Tank 48 Treatment Project by a design review of the completed set of technical documents. However, DOE suspended the Tank 48 Treatment Project in July 2011 because of identification of a promising new technology for treating the waste, and an improved outlook on high-level waste tank space resulting from enhancements at the Defense Waste Processing Facility.

#### **2000-1: Prioritization for Stabilizing Nuclear Materials**

The Board issued Recommendation 2000-1 on January 14, 2000. The recommendation calls for an accelerated schedule for stabilizing and repackaging high-risk, unstable special nuclear materials, spent fuel, unstable solid plutonium residues, and highly radioactive liquids that pose potential safety concerns for the public, workers, and the environment. The Secretary accepted the recommendation on March 13, 2000. Revision 2 to the IP was transmitted to the Board on July 22, 2002. On July 23, 2004, DOE transmitted an IP update specific to LANL, and on November 28, 2005, DOE transmitted an IP update specific to Hanford.

This recommendation applies to both NNSA and EM sites. All NNSA commitments are complete with the exception of various stabilization activities at LANL, which are currently projected for completion by 2013. All EM commitments are complete with the exception of the stabilization of sludge materials at the Hanford K-Basin Sludge Treatment Project (STP).

On December 1, 2009, EM informed the Board of its plans regarding the STP, and on June 30, 2010, DOE provided the Board with the project execution plan for the project. In a follow-up communication dated June 23, 2011, EM informed the Board that the STP alternatives analysis had identified several contracting and technology issues. These issues have forced an extension of the alternatives evaluation, and a plan is now in place to complete the STP packaging technology evaluation in 2012.

## V. Interface Activities

### A. Briefings, Site Visits, and Other Board Interactions

The Board and its staff regularly visit the Department's defense nuclear facilities to review the implementation of safety initiatives, examine safety facilities and operations, and attend briefings. Information about DNFSB interactions with DOE is available on the DR website at [www.hss.doe.gov/depdep](http://www.hss.doe.gov/depdep).

### B. Responses to Board Reporting Requirements

During FY11, the Board issued 18 formal reporting requirements, as shown in Appendix A, Table A.2. Table A.3 lists the three active reporting requirements from prior years, and Table A.4 lists the 20 letter commitments DOE completed during FY11.

### C. Public Meetings

Three public meetings were held during FY11. The first took place October 7-8, 2010, in Pasco, WA and focused on concerns associated with safety-related aspects of the design and construction of the Hanford Site WTP. Technical issues reviewed included: (1) changes in safety-related design criteria resulting from modification of the material-at-risk characterization in tanks; (2) changes in design strategy to address hydrogen in pipes and

ancillary vessels; (3) criticality safety concerns and other safety-related risks for the PJM system; (4) reclassification of safety-related SSCs; and (5) safety-related design aspects of new facilities or modifications of existing facilities needed to deliver high-level waste feed.

The second meeting was held May 2-5, 2011, at the Board's public hearing room in Washington D.C. The Board discussed DOE's implementation of Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*.

The third meeting was held June 16, 2011, in Augusta, GA and addressed three topics concerning operations at the SRS: (1) liquid waste processing; (2) emergency preparedness; and (3) nuclear materials storage and disposition (the future of the H-Canyon facility).

Early in FY12, the DNFSB held a public hearing in Santa Fe, NM on the seismic safety of the LANL PF-4 facility. The hearing focused on DOE's definition of adequate public safety and highlighted the continuing points of discussion between DOE and the DNFSB on issues that are intrinsic to Recommendations 2009-2 and 2010-1. DOE will consider the concerns presented at the hearing and the ongoing discussions with the DNFSB, including their concerns regarding the schedule for planned installation of active confinement ventilation, as the final commitments are completed.

## Appendix A. Summary Status of Board Recommendations and Reporting Commitments

**Table A.1: Open Recommendations**

Recommendation Number	Title	Date Opened	Timeframe for Completing Implementation Plan
2000-1	Prioritization for Stabilizing Nuclear Materials	01/14/2000	Late 2015
2001-1	High-Level Waste Management at the Savannah River Site	03/23/2001	Closed 12/7/2011
2002-3	Requirements for the Design, Implementation, and Maintenance of Administrative Controls	12/11/2002	2012
2004-1	Oversight of Complex, High-Hazard Nuclear Operations	05/21/2004	2013
2004-2	Active Confinement Systems	12/07/2004	2012
2005-1	Nuclear Material Packaging	03/10/2005	All Plan Commitments Complete
2007-1	Safety-Related In Situ Nondestructive Assay of Radioactive Materials	04/25/2007	2012
2008-1	Safety Classification of Fire Protection Systems	01/29/2008	2012
2009-1	Risk Assessment Methodologies at Defense Nuclear Facilities	07/30/2009	2012
2009-2	Los Alamos National Laboratory Plutonium Facility Seismic Safety	10/26/2009	2012
2010-1	Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers	10/29/2010	2013
2010-2	Pulse Jet Mixing at the Waste Treatment and Immobilization Plant	12/17/2010	2016
2011-1	Safety Culture at the Waste Treatment and Immobilization Plant	06/20/2011	2013

**Table A.2: Formal Reporting Requirements Issued by the Board in FY11**

Date	Reporting Requirements	Days to Report
10/22/2010	A report on actions to correct work planning and control deficiencies at the Waste Isolation Pilot Plant	90
01/25/2011	A report and briefing on anticipated improvements to public and worker safety resulting from the expedited directives review process and resolution of staff comments on two DOE orders	30
02/04/2011	A report and briefing on Non-MAA [Material Access Area] Material Storage at Y-12 in Building 9720-5	90
02/08/2011	Briefing to discuss NNSA's decision process, timing, and bases for changes related to Board concerns resolved under the Chemistry and Metallurgy Research Replacement certification process at Los Alamos National Laboratory	30
03/28/2011	A report on work planning and control process improvements by the Nevada Site Office and National Security Technologies, LLC	90
04/05/2011	A report on the Department's spray leak analysis and methodology for the Waste Treatment and Immobilization Plant	60
04/05/2011	A report on actions taken to completely implement Standard DOE-NA-STD-3016-2006, Hazard Analysis Reports for Nuclear Explosive Operations at weapons design agencies	90
04/08/2011	A report and briefing on issues related to the SASSI computer software code	45
04/20/2011	A report and briefing on Safety Posture of Y-12 National Security Complex	30
04/26/2011	A report and briefing on actions to address the deficiencies associated with the waste transfer system at Hanford	90
05/05/2011	A report and briefing to address the deficiencies in the instrumentation and control system design for the Waste Treatment and Immobilization Plant	30
05/16/2011	A report and briefing to provide the rationale for the current proposed safety basis and control strategy for the Tritium Facility at Lawrence Livermore National Laboratory	30
06/07/2011	A report on the continued use of the Low Order Accumulation Model for accumulation of solids in Waste Treatment and Immobilization Plant vessel calculations	60



**Table A.2: Formal Reporting Requirements Issued by the Board in FY11 (cont'd)**

Date	Reporting Requirements	Days to Report
06/24/2011	A report Outlining actions taken or planned by DOE to address weaknesses in the fire protection program at Waste Isolation Pilot Plant	180
08/03/2011	A report on the validity of the heat transfer analyses from process vessels in the Pretreatment Facility at the Waste Treatment and Immobilization Plant	60
08/19/2011	A report and briefing on the revised safety basis at the Savannah River Site tritium facilities.	90
08/25/2011	A report and briefing on weaknesses in conduct of operations and technical procedures at the Y-12 National Security Complex	180
09/13/2011	A report on the hazards and controls associated with the anhydrous ammonia system at the Waste Treatment and Immobilization Plant	60

**Table A.3: Active Reporting Requirements Issued by the Board in Prior Years**

Date	Reporting Requirements	Frequency
8/7/2003 (Modified 1/28/2008)	Annual report on the Department's Nuclear Criticality Safety Program	1 year
9/9/2005	Annual briefing on the contents of the annual revision to the Pantex Nuclear Material Management Program	1 year
3/13/2007	Annual report on the annual assessment of the 9212 Complex, and the progress on the Uranium Processing Facility	1 year

**Table A.4: Letter Commitments Completed in FY11**

Letter Number	Commitment Title	Date Completed
SL10-009	Monthly briefings on DOE safety and security reform and DOE directives consolidation	10/25/2010
SL10-018	A report and briefing on analytical and implementation deficiencies in the Hanford Tank Farms Documented Safety Analysis	10/29/2010
SL10-016	A report and briefing on actions to bring the Savannah River Site Documented Safety Analysis procedures into compliance with 10 CFR 830	11/23/2010
SL10-021	A report on actions to correct work planning and control deficiencies by the Richland Operations Office and CH2M Hill Plateau Remediation Company	12/20/2010
SL10-020	A report on deficiencies in the electrical safety program and the 480V Motor Control Center in the Fire Water Pump Building at the Waste Isolation Pilot Plant	12/21/2010
SL09-014	Quarterly report on the status of the Structural Peer Review Team efforts regarding Waste Treatment and Immobilization Plant facilities	12/29/2010
SL05-026	Annual briefing on the contents of the annual revision to the Pantex Nuclear Material Management Program	01/20/2011
SL10-022	A report on actions to correct work planning and control deficiencies at Waste Isolation Pilot Plant	01/20/2011
SL10-019	A report and briefing on deficiencies in the accident analysis, control set, and safety system design for the Critical Experiments Facility at Nevada Test Site	02/10/2011
SL11-002	A report and briefing on anticipated improvements to public and worker safety resulting from the expedited directives review process and resolution of staff comments on two DOE orders	02/25/2011
SL03-031	Annual report on the Department's Nuclear Criticality Safety Program	03/15/2011
SL07-004	Annual report on the annual assessment of the 9212 Complex, and the progress on the Uranium Processing Facility	05/17/2011
SL11-003	A report and briefing on Non-MAA [Material Access Area] Material Storage at Y-12 in Building 9720-5	05/18/2011
SL11-008	A report on the Department's spray leak analysis and methodology for the Waste Treatment and Immobilization Plant	06/03/2011
SL11-013	A report and briefing to provide the rationale for the current proposed safety basis and control strategy for the Tritium Facility at Lawrence Livermore National Laboratory	06/15/2011
SL11-009	A report and briefing on Safety Posture of Y-12 National Security Complex	06/16/2011

**Table A.4: Letter Commitments Completed in FY11 (cont'd)**

<b>Letter Number</b>	<b>Commitment Title</b>	<b>Date Completed</b>
SL11-005	A report on work planning and control process improvements by the Nevada Site Office and National Security Technologies, LLC	06/22/2011
SL11-010	A report and briefing on actions to address the deficiencies associated with the waste transfer system at Hanford	08/02/2011
SL11-007	A report on actions taken to completely implement Standard DOE-NA-STD-3016-2006, Hazard Analysis Reports for Nuclear Explosive Operations at weapons design agencies	08/03/2011
SL11-016	A report on the continued use of the Low Order Accumulation Model for accumulation of solids in Waste Treatment and Immobilization Plant vessel calculations	08/05/2011

## Appendix B. Acronyms and Abbreviations

ASME	American Society of Mechanical Engineers
Board	Defense Nuclear Facilities Safety Board
CDNS	Chief of Defense Nuclear Safety
CFR	Code of Federal Regulations
CNS	Chief of Nuclear Safety
CTA	Central Technical Authority
CPR	Construction Project Review
CRAD	Criteria, Review, and Approach Document
DEAR	DOE Acquisition Regulations
Department	Department of Energy
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DPO	Differing Professional Opinion
DR	Departmental Representative to the DNFSB
DV	Deposition Velocity
EFCOG	Energy Facility Contractors Group
EM	Office of Environmental Management
FY	Fiscal Year
HSS	Office of Health, Safety and Security
HS-30	Office of Nuclear Safety
INPO	Institute of Nuclear Power Operations
IP	Implementation Plan
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JCO	Justification for Continued Operations
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
NASA	National Aeronautics and Space Administration
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
NSR&D	Nuclear Safety Research and Development
PF-4	Plutonium Facility
PJM	Pulse Jet Mixing
PMP	Project Management Plan
RWG	Risk Assessment Technical Experts Working Group
SAFER	Seismic Analysis of Facilities and Evaluation of Risk
SASSI	System for Analysis of Soil-Structure Interaction
SRS	Savannah River Site
SSC	Structures, Systems, and Components
STP	Sludge Treatment Project
WPC	Work Planning and Control
WTP	Waste Treatment and Immobilization Plant