

# FY 2011 BUDGET REQUEST TO THE CONGRESS

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Defense Nuclear Facilities Safety Board

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February 1, 2010

## **GOVERNMENT PERFORMANCE & RESULTS ACT**

### **GPRA Strategic Planning Reporting Requirements**

The Government Performance and Results Act of 1993 (GPRA) requires each agency to prepare and submit a strategic plan establishing long-term programmatic, policy, and management goals. The Defense Nuclear Facilities Safety Board's Strategic Plan for FY 2003-2009 has been made available on the Internet at [www.dnfsb.gov](http://www.dnfsb.gov). In addition, agencies are also required to develop a performance budget with annual performance objectives that indicate the progress toward achievement of the strategic plan's goals and objectives. The Board's performance objectives for FY 2010 and FY 2011, as well as representative accomplishments for FY 2006 through FY 2009, are included in this budget request in accordance with the requirements of OMB Circular A-11.

For a comprehensive review of the Board's activities to improve the safety of the Department of Energy's defense nuclear facilities see the Board's Reports to Congress, which may be reviewed at the Board's Web address (referenced above).

**Defense Nuclear Facilities Safety Board  
FY 2011 Congressional Budget Request**

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# 1. INTRODUCTION

## Defense Nuclear Facilities Safety Board FY 2011 Congressional Budget Request

### APPROPRIATION & EXPENSE SUMMARY

(Tabular dollars in thousands)

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#### OPERATING EXPENSES

	<u>ACTUAL FOR FY 2009</u>	<u>FINANCIAL PLAN FOR FY 2010</u>	<u>BUDGET REQUEST FOR FY 2011</u>
New Budget Authority	25,000*	26,086 **	28,640
Obligations	24,863	28,203	30,273
Outlays	24,043	27,639	29,668

\* P.L. 111-008, "Omnibus Appropriations Act, 2009."

\*\* P.L. 111-085, "Energy & Water Development and Related Agencies Appropriations Act, 2010."

Enabling Statute:

National Defense Authorization Act, Fiscal Year 1989 (Pub. L. 100-456, September 29, 1988), amended the Atomic Energy Act of 1954 (42 U.S.C. 2286 et seq.) by adding new Chapter 21– Defense Nuclear Facilities Safety Board,

As Amended by:

National Defense Authorization Act for Fiscal Year 1991  
(Pub. L. 101-510, November 5, 1990),

National Defense Authorization Act for Fiscal Years 1992 and 1993 (Pub. L. 102-190, December 5, 1991),

Energy Policy Act of 1992 (Pub. L. 102-486, October 24, 1992), and National Defense Authorization Act for Fiscal Year 1994 (Pub. L. 103-160, November 30, 1993),

Federal Reports Elimination Act of 1998 (Pub. L. 105-362, November 10, 1998) and National Defense Authorization Act for Fiscal Year 2001 (Pub. L. 106-398, October 30, 2000),

National Defense Authorization Act for Fiscal Year 2003 (Pub. L. 107-314, December 2, 2002).

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**PERSONNEL SUMMARY**

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	<u>FY 2009 ACTUAL</u>	<u>FY 2010 FINANCIAL PLAN</u>	<u>FY 2011 BUDGET REQUEST</u>
Statutory Personnel Ceiling: (FTEs) <sup>1/</sup>	150	150	150
FTE Usage <sup>2/</sup>	99	110	117.5
<hr/>			
Board Members and Permanent Employees at End of Fiscal Year	102	115	120

<sup>1/</sup> National Defense Authorization Act for FY 1992 and FY 1993, Pub. L. 102-190, raised the Board's statutory employee ceiling from 100 to 150 full-time staff to accommodate mandated additional nuclear weapons oversight responsibilities. See 42 U.S.C. § 2286b (b) (1) (A).

<sup>2/</sup> Includes five full-time Board Members appointed by the President, by and with the advice and consent of the Senate.

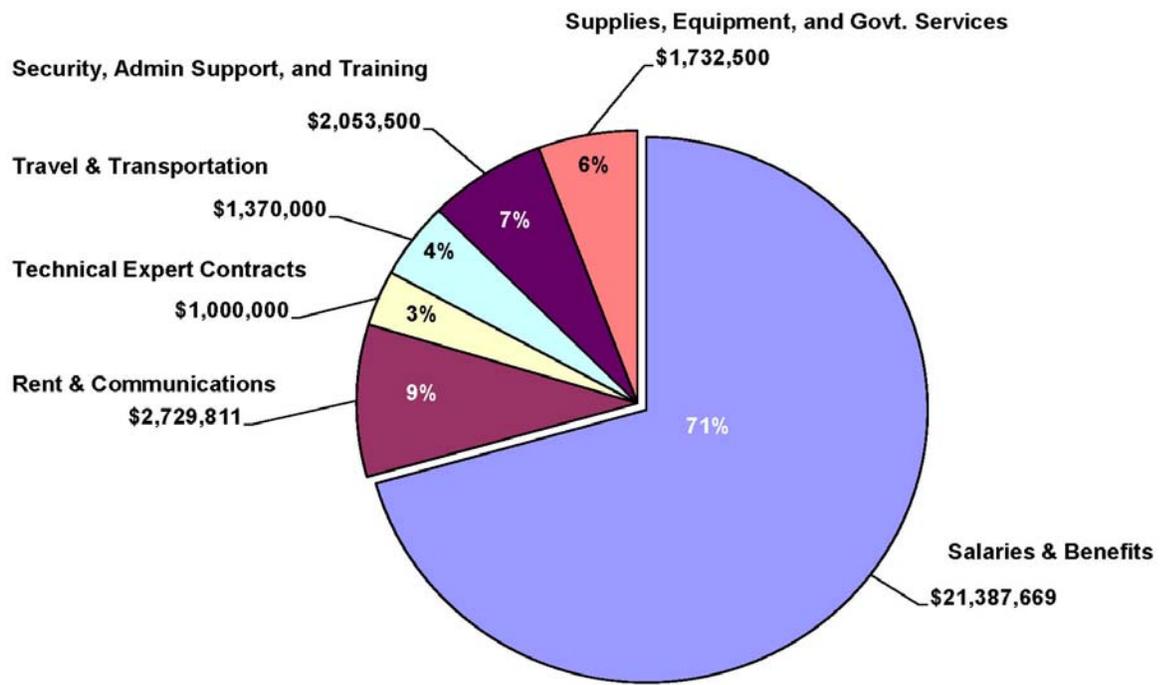
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**PROPOSED APPROPRIATION LANGUAGE**

**SALARIES AND EXPENSES**

For necessary expenses of the Defense Nuclear Facilities Safety Board in carrying out activities authorized by the Atomic Energy Act of 1954, as amended by Public Law 100-456, section 1441 [\$26,086,000] \$28,640,000 to remain available until expended. [*Energy and Water Development and Related Agencies Appropriations Act, 2010*]

FY 2011 Total Projected Obligations = \$30,273,480



## 2. BUDGET REQUEST SUMMARY

The Board’s FY 2011 Budget Request for \$28,640,000 and 117.5 FTEs includes funding for statutory increases in civilian salaries and associated employee benefits (i.e., employer contributions to employee health benefit and retirement accounts, matching Thrift Savings Plan contributions, etc.), a program increase of 7.5 FTEs, increases in rent and inflationary increases in other non-personnel accounts, and funding to address a significant decrease in unobligated balances available as a budgetary resource. A brief description of each requirement and associated funding request follows (a full explanation is included on the referenced page number):

	<b><u>New Budget Authority</u></b>	<b><u>FTEs</u></b>	<b><u>Page Ref.</u></b>
<b>Baseline - FY 2010 President’s Budget Request</b>	\$26,086,000	110	
<b>Funding for the proposed 1.4% civilian pay raise effective in January, 2011 and other salary adjustments.</b> [Note: budget projection based on paying increased salaries and benefits for nine months in FY 2011 for a 1.4% federal pay raise and other salary adjustments.]	\$182,000		12
<b>Funding for additional FTEs to meet increasing workload in FY 2011 as a result of Congressional direction for increased oversight, increased activity at DOE defense nuclear facilities (including resulting from funding provided by the stimulus bill), and increased review of DOE Publications.</b> [Note: in response to Congressional direction (e.g., The Duncan Hunter National Defense Authorization Act of 2009) to improve the integration of safety early in the design process, the Board’s level of oversight and interaction with DOE in the area of design and construction on over 20 new defense nuclear facilities and its oversight of all existing DOE defense nuclear facilities is increasing.]	\$1,500,000	7.5	8-11
<b>Funding to address a decrease in unobligated balances from previous year.</b> [Note: additional new budget authority needed for FY 2011 budgeted obligations to make up for decrease in unobligated balance available as a budgetary resource.]	\$718,000		12
<b>Funding for increases in rent and inflation (non-personnel accounts).</b> [Note: based on the GSA FY11 rent estimate and an assumed 1.0% increase due to inflation in non-personnel accounts excluding rent (e.g., other services, supplies and materials)]	\$379,000		13

	<b><u>New Budget Authority</u></b>	<b><u>FTEs</u></b>	<b><u>Page Ref.</u></b>
<b>Less: Program Reductions and Administrative Savings.</b> [Note: five program reductions and administrative savings actions.]	(\$225,000)		13
<b>Total Additional Funding Requirements in FY 2011 Budget Request.</b>	<b>\$2,554,000</b>	<b>7.5</b>	
<b>FY 2011 New Budget Authority.</b>	<b>\$28,640,000</b>	<b>117.5*</b>	

\*Note: This represents a prorated value as the Board ramps up to 120 FTEs.

### 3. EXECUTIVE SUMMARY

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. To accomplish this mission in Fiscal Year 2011, the Board is requesting a total of \$28,640,000 in new budget authority and 117.5 FTEs. Within this request, the Board seeks additional budget funding of \$2,554,000, of which \$2,061,000 (offset by \$225,000 in program and administrative savings/reductions) will support the salary and benefits needs for the increased staff and help offset the impact of nondiscretionary cost-of-living pay adjustments, an increase in rent, and other inflation-based cost increases for the Board's existing positions. The remaining amount of \$718,000 is additional funding needed due to the lower amount of unobligated balances that can be used as a budgetary resource in FY 2011 compared to FY 2010 (see page 12).

In FY 2011, the Board will continue to evolve its health and safety oversight plan to address an unprecedented convergence of increased workload generated by the Department of Energy and the Board's Congressional oversight and appropriations committees.

First, the Board is performing safety oversight on more than 20 DOE design and construction projects with an estimated value of more than \$20 billion, including \$12.2 billion for the Hanford Waste Treatment Plant (see Exhibit A). The design and construction reviews conducted by the Board on DOE facilities are resource-intensive and time consuming, but these time-sensitive safety reviews are key to preventing safety flaws in design and construction that could render a newly constructed facility unusable and without adequate safety controls to protect the public, the workers, and the environment. The Board's oversight early in the design phase provides a way to avoid hundreds of millions of dollars of increased program costs.

Second, the Board's Congressional oversight and appropriations committees have continued to direct the Board to increase both the scope and pace of its independent health and safety oversight reviews at all DOE defense nuclear facilities, with special attention on new facilities in various design and construction stages, while continuing to ensure that legacy facilities are properly and competently maintained. Having noted repeated problems with DOE's new construction programs and associated cost overruns where significant safety flaws were not identified by DOE or its contractors early in the project development cycle, these committees have called upon the Board to apply its health and safety expertise at higher and higher levels of scrutiny. In perhaps the ultimate recognition of the Board's unique capabilities 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 (CMRR) Project at Los Alamos National Laboratory until the Board and the National Nuclear Security Administration (NNSA) certified that certain design issues reported by the Board had been resolved. Certification involves a level of rigor and expenditure of resources that is an order of magnitude greater than typical review activities.

Third, in early 2009, the DOE Office of Management revised DOE Order 251.1B, *Departmental Directives Program*, which establishes the framework for the entire DOE directives program and is a key safety directive. As a result of this revision, DOE will reissue all documents containing safety requirements during the coming years. This will be another resource-intensive and time-consuming task for the Board as it ensures DOE properly reissues appropriate safety-related DOE directives while preserving the nuclear safety requirements that have been painstakingly developed in the course of more than 60 years of nuclear operating experience.

Fourth, the American Recovery and Reinvestment Act of 2009 provided \$6B to DOE for environmental clean-up, of which over \$4.8B has been allocated for defense nuclear facilities. DOE plans on using these funds to increase the pace and scope of its cleanup effort, resulting in additional burden on the Board's resources. Continuing to provide adequate health and safety oversight not only meets the Board's mandated responsibilities, but is also consistent with the President's goal of "unprecedented accountability, responsibility, and transparency" of Recovery Act funds.

In its FY 2009 Budget Request, the Board implemented a strategy to increase its staff over several budget cycles to meet its increased oversight responsibilities. By the end of FY 2009, the Board had 102 of the target 105 personnel on board, with one unfilled position on its technical staff, one vacancy in the administrative staff, and one among the Board members. The FY 2010 Budget Request included a request for 110 FTEs to allow for an increase to 115 personnel by the start of FY 2011. The Board has already begun its efforts to achieve that goal and continues to devote considerable resources on recruiting highly-qualified technical personnel in an extremely competitive job market. To continue building on its successful efforts to increase its personnel resources in the face of the continued growth in scope and pace of oversight activities, the Board includes funding for 7.5 additional FTEs in its FY 2011 Budget Request to 120 positions.

The Board notes that the cost of re-engineering and making post-construction modifications to complex DOE defense nuclear facilities, due to the late identification of significant design flaws that could impact public and worker health and safety, would require significantly more resources than the requested budget increase. When incomplete or incorrect safety features are identified late in the design stage (or worse, in the construction stage) project costs are typically increased and schedules are delayed while corrections are made. With DOE's design and construction budget approaching \$20 billion, each increase in project cost of one percent (1%) equates to an increase of \$200 million. Increases in project cost well in excess of this amount have driven the Congress, as evidenced by Public Law 110-417, to insist on identification of safety issues and their resolution early in the design stage. In this context, the Board provides cost-effective oversight.

In line with Congressional actions thus far, the Board believes it is prudent to proactively address DOE safety issues and requires the additional resources addressed in this budget submission to accomplish its expanded workload. The Board's FY 2011 budget request of \$28,640,000 in new budget authority and 117.5 FTEs is necessary to ensure the scientific and

technical resources required to address nuclear safety issues are available to review expanding DOE design and construction, remediation, and future weapons programs in a timely and efficient manner, address Congressional concerns, and meet the President's guidance concerning oversight of Recovery Act funds.

## 4. FY 2011 BUDGET REQUEST

<i>FY 2011 Request Summary</i>	<i>Permanent Positions</i>	<i>FTE</i>	<i>Amount (\$000)</i>
FY 2009 Actual	102	99	\$25,000
FY 2010 Budget Request	115	110	\$26,086
FY 2011 Budget Request	120	117.5	\$28,640
Total Change 2010-2011	5	7.5	\$ 2,554

### **The DNFSB Mission**

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. Under its legislative mandate (Exhibit B), the Board plays a key role in maintaining the future viability of the Nation's nuclear deterrent capability by:

- Ensuring that the health and safety of the public and workers at the DOE defense nuclear facilities located throughout the United States are adequately protected, as DOE attempts to maintain the readiness of the nuclear arsenal, dismantles surplus weapons, disposes of excess radioactive materials, cleans up surplus defense facilities, and constructs new defense nuclear facilities;
- Enhancing the safety and security at our Country's most sensitive defense nuclear facilities when hazardous nuclear materials and components are placed in more secure and stable storage; and
- Providing for the early identification of health and safety vulnerabilities, allowing the Secretary of Energy to address issues before they become major problems.

### **The Challenge**

The Board uses its oversight authority to reduce the nuclear safety risks that exist in the defense nuclear complex to the greatest extent possible. The DOE nuclear weapons program remains a technically challenging and hazardous operation. Many tons of radioactive and toxic materials exist throughout the defense nuclear complex, either in storage or in use. There are multiple pathways by which these hazards might be released in the environment, creating risks to the workers and the public. A large number of the complex's facilities were constructed decades ago and are deteriorating.

The Board oversees nuclear facilities at primarily 10 DOE sites. It maintains Site Representatives at six of the sites and maintains a cadre of technical staff at its Headquarters that is organized to perform oversight roles as required. Over the next several years, the Board's safety focus at these sites will be on the following:

- **Pantex Plant in Texas.** Stewardship and maintenance of the nuclear weapons stockpile, including assembly and disassembly, evaluation, maintenance, and dismantlement of nuclear weapons and the storage of special nuclear material, particularly plutonium pits.
- **Oak Ridge National Laboratory / Y-12 National Security Complex in Tennessee.** Stewardship and maintenance of nuclear weapons stockpile, including assembly and disassembly, evaluation, maintenance, and dismantlement of nuclear weapon components; fabrication of nuclear weapon components, including highly enriched uranium processing; and storage of nuclear materials, including uranium from weapon components.
- **Savannah River Site (SRS) in South Carolina.** Tritium operations, storage of special nuclear material, the stabilization of high-level waste and residual nuclear materials from previous defense nuclear operations, and the disposition of excess plutonium.
- **Los Alamos National Laboratory (LANL) in New Mexico.** Stockpile management and stewardship of the nation's nuclear weapons stockpile, including research and enhanced surveillance of weapons, processing of nuclear materials, and pit production.
- **Lawrence Livermore National Laboratory (LLNL) in California.** Management and stewardship of the nuclear weapons stockpile, including research and enhanced surveillance of weapons, and the processing of nuclear materials.
- **Nevada Test Site in Nevada.** Stewardship of the nuclear weapons stockpile, including subcritical experiments and criticality experiments, the packaging and disposal of radioactive waste, and the potential operations with damaged nuclear weapons and improvised nuclear devices.
- **Sandia National Laboratories (SNL) in New Mexico and California.** Management and stewardship of the nuclear weapons stockpile, including research and enhanced surveillance of weapons.
- **Hanford Site in Washington.** Storage and disposition of high-level waste, stabilization of residual sludge from corroded spent nuclear fuel, stabilization of other residual nuclear material from previous operations, and the dismantling and disposition of excess defense nuclear facilities.
- **Idaho National Laboratory (INL) in Idaho.** Storage and stabilization of high-level waste, the storage and disposition of spent nuclear fuel, packaging and disposition of radioactive waste, and the dismantling and disposition of excess defense nuclear facilities.
- **Waste Isolation Pilot Plant (WIPP) in New Mexico.** Receipt, handling, and permanent deep geological disposal of transuranic wastes.

## The Risks

The potential for release of hazardous materials to the environment by the DOE defense nuclear facilities continues to pose safety and health risks to the public and the facility workers. Many current facilities are old and deteriorating, while containing significant amounts of hazardous materials, especially nuclear waste. These current facilities require careful risk analysis as operations continue or as they undergo decommissioning and cleanup. New facilities being built to replace current ones or to process, stabilize, and dispose nuclear waste stockpiles in turn create their own new waste streams, and require extensive planning to mitigate risks of environmental release. The design of new and old facilities or structures to prevent the release of hazardous materials must be equal to the challenges provided by earthquakes, extreme winds, floods, lightning, and other such natural phenomena.

Other potential release mechanisms include inadequate safety controls in new and old facility designs, human errors, equipment malfunctions, chemical reactions, fire, detonation of explosives, and inadvertent nuclear criticality events. Many DOE facilities continue to contain sufficient amounts of fissionable material such that the risk of an accidental nuclear criticality exists and must be controlled. Chemical reactions in materials used in defense nuclear work need to be carefully monitored. As the massive DOE nuclear waste cleanup effort continues, the use of leading edge technologies in new facilities can create additional nuclear safety risks due to lack of experience designing, constructing, operating, and maintaining these facilities. DOE's nuclear weapons stockpile stewardship and management operations are unique in that they include nuclear explosive activities and experiments involving co-located high explosives and nuclear material. Unlike commercial nuclear facilities, the risks at these defense nuclear facilities are not solely a function of the quantities of nuclear material present but more importantly, the material processes involved and the potential for explosive dispersal of radioactive materials or inadvertent nuclear detonation.

## Strategic Goals

The Board is developing a revised strategic plan. **Technical Nuclear Safety Oversight** is the number one priority for the Board and encompasses activities as outlined in the Board's enabling legislation and other Congressional direction included in authorization and/or appropriations legislation. As will be discussed in more detail later in this budget request, the Board focuses its Technical Nuclear Safety Oversight through four interdependent strategic goals

Strategic Goal # 1: Safe Nuclear Weapon Operations

Strategic Goal # 2: Effective Nuclear Safety Programs and Analysis

Strategic Goal # 3: Safe Processing and Stabilization of Nuclear Materials

Strategic Goal # 4: Safety in Nuclear Facilities Design and Infrastructure

In order to properly support and manage its technical nuclear safety oversight mission, the Board has identified a fifth goal that supports the other strategic goals.

Strategic Goal # 5: Management Excellence

**Human Capital - The Board's Greatest Asset**

Seventy-one percent of the Board's budget request is dedicated to salaries and benefits for its staff and Board Members. The Board must function as an oversight organization comprising leading technical experts who quickly recognize problems in the hundreds of hazardous operations conducted daily throughout the DOE defense nuclear complex. The Board relies on a determined, focused, and well-executed human capital program that uses all available tools to attract and retain the technical talent necessary to accomplish the Board's congressionally mandated mission. After years of experience, the Board has determined that its technical staff requires scientists and engineers with extensive backgrounds in technical disciplines such as nuclear-chemical processing; conduct of operations; facility safety analysis; conventional and nuclear explosive technology and safety; nuclear weapons safety; storage of nuclear materials; nuclear criticality safety; and waste management. Virtually all of the technical staff personnel have technical master's degrees; those personnel who do not are actively pursuing graduate degrees. Approximately 22 percent of the technical staff has doctoral degrees. Because the Board's health and safety Recommendations and other advisories to the Secretary of Energy are based on in-depth technical information and detailed safety analyses, recruitment and retention of scientific and technical staff members with outstanding qualifications continues to be critical to successful accomplishment of the Board's mission.

As of September 30, the Board increased its staff from 95 personnel at the beginning of FY 2009 to 102, despite losing three people to retirement and other attrition, including the Board Chairman. The Board continues to make hiring a priority and plans to achieve full manning of 115 personnel by the end of FY 2010 consistent with the President's FY 2010 Budget.

Building on its hiring successes of 2008 and 2009, the Board will continue an aggressive approach to reach out to mid-career and senior-level scientists and engineers. The combination of an aging workforce and high demand for experienced scientists and engineers by other organizations will impact Board operations if not dealt with in an aggressive manner. Approximately 17 percent of the Board's technical staff is eligible for regular retirement today. Competition for scientists and engineers with the Board's required expertise continues to be very stiff due to the expected growth of the commercial nuclear industry in the near future, the consequent need for increased technical expertise by the Nuclear Regulatory Commission, the Department of Defense's emphasis on combating weapons of mass destruction, and DOE's nuclear weapons complex activities. Consequently, the Board expects the need to spend more resources on recruiting highly qualified technical personnel in a highly competitive job market.

In addition to continuing to recruit experienced scientific and engineering talent to fill immediate staff needs, the Board will continue to focus on attracting the next generation of scientists and engineers. The Board will continue its highly competitive three-year Professional Development Program (PDP), which brings entry-level technical talent into professional

positions within the Board straight from college. Through a technical mentor, individuals are provided a series of individually tailored developmental assignments, formal academic schooling, and a one-year, hands-on field assignment. The Board met its goal of recruiting three people into the program in FY 2009, and now has a total of six in the program at various stages of development.

### **Health and Safety Oversight Resource Requirements**

In order to maintain an effective, independent oversight program over a vast array of DOE defense nuclear programs and projects in geographically dispersed locations, the Board must continually balance and redirect its health and safety oversight resources with careful consideration of the following factors:

- (1) Nuclear safety oversight activities are prioritized predominantly on the basis of risks to the public and the workers, the types and quantities of nuclear and hazardous material at risk, and the process and setting of the operations involved.
- (2) Identifying potential accident conditions and mitigating their consequences are very important for risk management. Safety is assured by working to understand and reduce the likelihood of events that adversely affect safety and by limiting the consequences of events if they do occur. In addition, safety is assured through robust systems that employ defense in depth, using multiple layers of protection such that no single layer is depended upon to ensure safety.
- (3) Safety is not an afterthought in the design-bid-build process. “Safety-in-design” requires integration of safety considerations early in the design and construction process of DOE nuclear facilities. The result of DOE adhering to this concept should be decreased project costs associated with retrofitting or redesigning facilities as they are constructed.
- (4) Equally important to safety-in-design is ensuring the facility’s safety systems will meet the functional design requirements through careful oversight of the quality assurance practices and testing programs as the facilities are built and placed into operation. Evaluating the transition of a facility from construction to operation requires additional oversight during the startup process and into operation.
- (5) Another key facet to a facility’s nuclear safety posture is the proper development of Technical Safety Requirements during the construction phase. Typically, Technical Safety Requirements are only preliminary when construction commences; as the facility approaches operation, these key safety provisions are fully developed and implemented. Technical Safety Requirements must be conservatively determined based on a thorough understanding of the safety features in the design and properly implemented during the transition to facility operation; otherwise, the facility will not achieve the required level of safety in operation.

In preparing this budget request, the Board compared its current resources and capabilities against its projected workload, which is derived from three sources: current DOE programs and

projects, Congressional direction, and new DOE projects and programs. In FY 2011, the Board will need an additional \$1.054M just to maintain the 110 FTE level in the President's FY 2010 Budget, and 7.5 additional FTEs and a \$1.500M budget increase in order to meet significant increases in its safety oversight responsibilities and corresponding workload. A summary follows:

- **Increased Congressional concerns about facilities and DOE operations.** Congress has continued to express its concern, both during hearings and in legislation, with DOE's ability to manage its nuclear programs. With its well-recognized technical expertise and cost-effective methods for conducting nuclear health and safety oversight, the Board has been asked to do more to assist the DOE in meeting mission requirements. For example, 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 applied significant effort toward accomplishing this certification. The Board reviewed design documentation, including the Preliminary Documented Safety Analysis, supplied by NNSA and established a process that allowed NNSA and the Board to reach mutual agreement on issues identified by the Board. This effort required the Board to prioritize other oversight work within available staff resources.

- **Increased activity at DOE defense nuclear facilities.** The risks and challenges facing DOE continue to grow. DOE is pursuing more than 20 major design and construction projects to build nuclear material waste treatment facilities (Exhibit A). The Board is required by law to review DOE's design and construction projects to ensure that the health and safety of the public and workers is addressed early in the design process. In FY 2011, the Board will be required to expend considerable resources to review ongoing design efforts, as well as construction activities. More DOE defense nuclear facility design and construction projects are planned for the near future.

- **Review of DOE directives.** DOE Order 251.1C, *Departmental Directives Program*, was approved in January 2009. This directive codifies a set of principles relating to directives intended to simplify and clarify requirements, reduce redundancy and unnecessary burden, and support improved departmental management and mission accomplishment as outlined in a memorandum issued by the Secretary of Energy on September 10, 2007. Because DOE Order 251.1C establishes the framework for the entire directives program, it affects all DOE safety directives. Further, DOE's Office of Health, Safety and Security (HSS) has been leading a multi-phased, multi-year effort to review and streamline key safety directives to ensure they meet the Secretary of Energy memorandum on an individual basis. HSS revised six safety directives in 2009. Those directives were submitted to a DOE red team and the Board's staff for an intensive review prior to the formal DOE review and comment process. The reviews of the HSS safety directives will continue for the next several years, demanding rigorous review by the Board and its staff to maintain the requisite nuclear safety requirements.

The resource implications of these revision efforts are potentially immense. As DOE reissues its directives to comply with the new program, and continues the HSS directive-by-directive reviews, the Board will need to review all of them to ensure health and safety requirements are properly included in the new directives.

### **Recovery Act Oversight**

The American Recovery and Reinvestment Act of 2009 provided \$6B to DOE for environmental clean-up, of which over \$4.8B has been allocated for defense nuclear facilities. These new projects add to the Board's workload. The Board has already begun to perform safety oversight of the planning and execution of Recovery Act projects, including the adequacy of training of new cleanup workers and the effectiveness of DOE's safety oversight.

A summary of the \$4.8B+ in projects that DOE has identified as being allocated for defense nuclear facilities is as follows:

- Hanford (Richland Operations Office) (\$1.635 billion) - Demolish nuclear facilities and support facilities, remediate waste sites, remediate contaminated groundwater, and retrieve solid waste from burial grounds. Accelerate cleanup of facilities, waste sites, and groundwater along the Columbia River to support shrinking the active area of cleanup at the 586-square-mile Hanford Site to 75 square miles or less by 2015.
- Hanford (Office of River Protection) (\$326 million) - Accelerate design and construction of infrastructure and systems to transfer radioactive liquid waste from aging underground tanks to a waste treatment facility for immobilization and disposal. Accelerate design for the high-level waste storage facility. Upgrade the effluent treatment facility to continue waste volume reduction operations and the 222-S Analytical Laboratory to allow continued retrieval of waste from aging single-shell tanks. Develop single-shell tank integrity programs for safe storage of waste.

- Savannah River Site (\$1.615 billion) - Accelerate decommissioning of nuclear facilities and contaminated areas throughout the site, including in-place decommissioning of two nuclear materials production reactors. Recovery Act work includes shipping more than 4,500 cubic meters of waste out of South Carolina and will reduce the site's industrial area by 40 percent, or 79,000 acres, by September 2011.
- Oak Ridge (\$755 million) - Accelerate demolition and disposal of remaining uranium enrichment plant buildings, surplus Manhattan Project era buildings, and highly contaminated uranium processing buildings, and perform soil remediation to protect area groundwater. Accelerate cleanup of the most significant sources of off-site mercury release to East Fork Poplar Creek to prevent further contamination of the area.
- Idaho National Laboratory (\$468 million) - Accelerate demolition of excess nuclear and radiological facilities resulting in a footprint reduction of more than 800,000 square feet. Retrieve targeted waste per the agreement with the state of Idaho and accelerate the shipment of waste offsite for disposal.
- Los Alamos National Laboratory (\$212 million) - Demolish 35 buildings and structures across the complex, reducing the footprint by more than 260,000 square feet.
- Nevada Test Site (\$44 million) - Identify waste characteristics within the soil at three corrective action sites and install groundwater monitoring wells to provide additional data on groundwater contamination to support future cleanup work. Demolish three major facilities and two smaller structures, removing contaminated materials.

### **Technical Staffing Requirements**

The Board needs to recruit and retain additional technical staff in order to have the capability to perform nuclear safety oversight commensurate with the projected workload in FY 2011. For FY 2011, the Board requires additional staffing in the following areas:

- Experienced engineers to perform oversight functions to meet the Board's four technical safety oversight goals (Safe Nuclear Weapon Operations, Effective Nuclear Safety Programs and Analysis, Safe Processing and Stabilization of Nuclear Materials, and Safety in Nuclear Facilities Design and Infrastructure) to meet the increased workload generated by DOE, including the work relating to the Recovery Act. The Board's near-term emphasis will be on engineers in disciplines relevant to nuclear facility design, nuclear safety analysis, and oversight of nuclear operations, including cleanup activities. The Board estimates this additional level of effort to be 4.5 FTEs for FY 2011.
- Experienced engineers with backgrounds in safety standards who can review new DOE safety documents to ensure policies and procedures have been properly transferred from current orders, manuals, and other documents, and that changes in policies and procedures do not degrade the safety margin for defense nuclear facilities. The Board estimates that for FY 2011, this level of effort will increase the Board's workload by three FTEs.

## **Additional Funding Needs**

In addition to the funding needed for the increased 5 positions (7.5 FTEs) required to address the Board's growing workload, the Board's budget request includes funding to pay for the proposed January 2011 Federal pay raise. It also includes funding for an increase in rent (based on the FY 2011 rent estimate received from GSA) and inflationary cost increases to other non-personnel accounts, although \$225,000 will be offset by program reductions and administrative savings in five areas. Also, a reduction of \$718,000 in carryover from the previous fiscal year available as a budgetary resource requires additional new budget authority in that amount. An explanation of each requirement and associated funding impact and object class (OC) is discussed as follows:

- **Fully Fund the Salaries and Benefits Account for FY 2011 (OC 10)**

The Board needs additional funding to help pay for impact of the proposed salary increases in January 2011. An additional \$182,000 is needed to fund the President's proposed FY 2011 civilian pay raise of 1.4 percent. With 71 percent of the Board's budget dedicated to paying for staff salaries and benefits, the Board is unable to absorb pay increases without a corresponding staff reduction. The financial impact of these unfunded cost-of-living pay increases is especially severe since the Board does not have the financial flexibility to recover from shortfalls in our salary and benefits account.

- **Funding to Offset a Reduction in Carryover Available as a Budgetary Resource**

Historically, the Board has end-of-year carryover of approximately 10% of its budget due to the difficulties the Board had in hiring qualified personnel. These carryovers have allowed the Board to otherwise reduce its annual requests for new budget authority. However, in FY 2010, the end-of-year carryover is projected to be significantly reduced based on the success of the Board's hiring program. The Board's budgeted obligations included in the President's FY 2010 Budget are \$28.438M based on budgetary resources of \$29.177M, which consist of \$26.086M in new budget authority and \$3.091M in projected unobligated balances carried over from FY 2009. The Board is currently projecting a carryover of unobligated balances of only \$1.735M from FY 2010 into FY 2011. Thus, while it appears the Board is requesting a significant increase in its budget authority in FY 2011, the request actually reflects a more accurate representation of projected obligations. Consequently, in order for the Board to have available budgetary resources match the same baseline level as FY 2010, before even considering programmatic increases and higher personnel costs due to proposed pay raises, it requires new budget authority of \$1.356M simply to make up the difference. Of this amount, \$638K can be offset by having a lower ending FY 2011 unobligated balance (\$101K) versus the amount included in the President's FY 2010 Budget (\$739K), leaving a balance of \$718K. Without this new budget authority, the Board would have to reduce its obligations by the same amount which would equate to approximately 3–4 FTEs (each FTE is estimated to require \$200,000 in obligations including salaries, benefits, travel, and other miscellaneous expenses).

- **Funding for Increases in Rent and Inflation in Other Non-Personnel Accounts**

The Board’s FY 2011 rent estimate received from the General Services Administration (GSA) is \$2,504,811, a \$315,000 increase from the amount included for rent in the President’s FY 2010 Budget Request. In addition, the Board is experiencing increased costs due to inflation in non-personnel accounts (excluding rent) such as other services, communications and utilities, supplies and materials, software licenses, etc. The Board requires an additional \$64,000 to fund these increased costs (based on an estimate of 1.0% of non-personnel and rent costs), for a total of \$379,000.

**Program Reductions and Administrative Savings**

The Board’s FY 2011 Budget Request is based on accomplishing the following program reductions and administrative savings (shown by Object Class (OC)) totaling \$225,000, which otherwise offsets the need for additional new budgetary in that amount.

<b>OC</b>	<b>Budget Account (FY10 Baseline)</b>	<b>Reduction or Savings</b>	<b>Description</b>
21	Travel (\$1,015,000)	\$50,000 (~5%)	The Board anticipates by more aggressively utilizing a recently deployed Video Teleconferencing system, and taking other measures (e.g., more critically assessing the need for attendance at conferences), we will achieve 5% administrative savings in travel.
24	Printing & Reproduction (\$50,000)	\$2,500 (5%)	The Board anticipates by evaluating its printing practices (e.g., utilizing double-sided printing more extensively, disseminating its print documents electronically to the maximum extent practicable), we will achieve 5% administrative savings in printing and reproduction.
25.1	Advisory & Assistance Services (\$1,100,000)	\$100,000 (9.1%)	The Board anticipates as it further builds its in-house capabilities by ramping up to 115 personnel by the end of FY 2010, it will be able to “in-source” additional expertise, and therefore reduce its technical consulting contracts by \$100,000.
25.2	Other Services (\$1,850,000)	\$50,000 (2.7%)	The Board anticipates by using strengthened acquisition practices (e.g., improved upfront planning, clearer specification of requirements, and advantageous choice of contract type) it will reduce its administrative support contracts by \$50,000.
31	Acquisition of Assets (\$450,000)	\$22,500 (5%)	The Board anticipates by taking such actions as a greater use of bulk purchasing for hardware supplies, critically assessing the number/level of software license, etc., we will achieve 5% administrative savings in the acquisition of assets.

## **The Bottom Line**

The Defense Nuclear Facilities Safety Board's mandate is to provide vital technical health and safety oversight of the Department of Energy's defense nuclear facilities and activities in order to protect the health and safety of the public and workers. To accomplish this mission in FY 2011, the Board is requesting a total of \$28,640,000 in new budget authority, and 117.5 FTEs.

The Board understands that the cost of re-engineering and making post-construction modifications to complex DOE defense nuclear facilities, due to the late identification of significant design flaws that could impact public and worker health and safety, would require significantly more resources than the requested increase. In addition to the \$20 billion in new DOE design and construction already planned, DOE is planning to spend nearly another \$5B in Recovery Act funds on environmental cleanup at defense nuclear facility sites. Based upon prior experience, the Board's oversight early in the design phase provides a way to avoid hundreds of millions of dollars of increased program cost. In this regard, the Board's increase in requested funding is an inexpensive insurance policy to address Presidential and Congressional priorities.

The Board believes this is not the time to reduce the Board's oversight capability by reducing its resources just as it is achieving success in assembling its requisite staff. The complexity and scope of the DOE defense nuclear weapons complex continues to grow. The Board's budget request of \$28,640 million in new budget authority and 117.5 FTEs is necessary to ensure the scientific and technical resources required to address the nuclear safety issues are available to oversee the expanding DOE cleanup program, assess the application of stimulus funding, and oversee modernization of the weapons complex.

**Exhibit A. Planned or Underway DOE Design/Construction Projects**

SITE	FACILITY	TOTAL PROJECT COST (\$M)	STATUS – January of 2010		
			Critical Decision Approved	Design Completion	Construction Completion
Hanford Site	<b>Waste Treatment Plant</b>	12,263			<i>(Operational 2019)</i>
	a. Pretreatment Facility		CD-3	76%	27%
	b. High Level Waste Treatment Facility		CD-3	81%	22%
	c. Low Activity Waste Facility		CD-3	90%	55%
	d. Analytical Laboratory Facility		CD-3	78%	53%
	<b>Demonstration Bulk Vitrification System Project</b>	224	CD-1	95% <b>On hold</b>	<i>(Operational on hold)</i>
	<b>Interim Pretreatment System</b>	182-310	CD-0	<5% <b>On hold</b>	<i>(Operational on hold)</i>
	<b>K-Basin Closure Project Sludge Treatment</b>	Phase 1: 240  Phase 2: to be determined	Phase 1: CD-0  Phase 2: CD-0	Phase 1: 85% of conceptual design.  Phase 2: 0%	<i>(Operational to be determined)</i>
	<b>Large Package and Remote Handled Waste Packaging Facility</b>	390	CD-0	0%	Deferred <i>(Operational to be determined post-2016)</i>
	<b>Tank Retrieval and Waste Feed Delivery System</b>	1,140	One sub-project not using the formal CD process.	Various degrees of completion.	Various degrees of completion and operations
<b>Immobilized High-Level Waste Interim Storage Facility</b>	100	CD-3	90%	Deferred <i>(Operational to be determine)</i>	
<b>Idaho National Laboratory</b>	<b>Integrated Waste Treatment Unit project</b>	570.9	CD-3	>95%	55% <i>(Operational 2011)</i>

<b>Los Alamos National Laboratory</b>	<b>Chemistry and Metallurgy Research Replacement Project Nuclear Facility</b>	>2,000 Being reevaluated	CD-1	100% Preliminary design	Some ground work <i>(Operational to be determined)</i>
	<b>Technical Area 55 Safety System Upgrades</b>	Phase 2: 91-100	Phase 2: CD-2A	Various degrees of completion	<b>(Phase 2 Complete 2017)</b>
	<b>Upgrades to Pit Manufacturing Capability at Tech Area 55</b>	Annual funding	Not formally implementing critical decision process	Various degrees of completion	Work ongoing
	<b>Radioactive Liquid Waste Treatment Facility Upgrade Project</b>	119-172	CD-1	60% of total design	<i>(Operational 2014)</i>
	<b>New Solid Transuranic Waste Facility Project</b>	133-199	CD-0	60% <b>On hold</b>	<i>(Operational to be determined)</i>
	<b>Nuclear Material Safeguards and Security Upgrades Project Phase 2</b>	245	CD-3B	100%	<i>(Operational 2013)</i>
	<b>Technical Area 55 Radiography Project</b>	38	CD-0	90% <b>On hold</b>	<i>On hold</i>
<b>Nevada Test Site</b>	<b>Device Assembly Facility -- Criticality Experiments Facility</b>	150	CD-3	100%	> 90% <i>(Operational 2010)</i>
<b>Oak Ridge National Laboratory</b>	<b>Building 3019 -- Uranium-233 Downblending and Disposition Project</b>	477	CD-2/3A	60%	<i>(Operational 2012)</i>
<b>Pantex Plant</b>	<b>Weapon Surveillance Facility (previously called Component Evaluation Facility)</b>	130	CD-0	<b>On hold</b>	<i>(Operational on hold)</i>
<b>Savannah River Site</b>	<b>Pit Disassembly and Conversion Project (combines Pit Disassembly and Conversion Facility and Plutonium Preparation Project)</b>	Under Evaluation	CD-0	<5%	<i>(Operational being evaluated)</i>
	<b>Salt Waste Processing Facility</b>	1,340	CD-3	95%	17% <i>(Operational 2015)</i>
	<b>Tank 48 Treatment Process Project</b>	122-138	CD-1	< 5%	<i>(Operational 2014)</i>
	<b>Waste Solidification Building</b>	345	CD-2/3	100%	12% <i>(Operational 2013)</i>
<b>Y-12 National Security Complex</b>	<b>Uranium Processing Facility</b>	1,400-3,500	CD-1	35%	<i>(Operational 2018)</i>

## **Exhibit B. The Board's Legislative Mandate**

The Board's specific duties and responsibilities are delineated in its enabling statute, 42 U.S.C. § 2286, *et. seq.*, which states:

- The Board shall review and evaluate the content and implementation of the standards relating to the design, construction, operation, and decommissioning of defense nuclear facilities of the Department of Energy (including all applicable Department of Energy orders, regulations, and requirements) at each Department of Energy defense nuclear facility. The Board shall 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.
- The Board shall investigate any event or practice at a Department of Energy defense nuclear facility which the Board determines has adversely affected, or may adversely affect, public health and safety.
- The Board shall have access to and may systematically analyze design and operational data, including safety analysis reports, from any Department of Energy defense nuclear facility.
- The Board shall review the design of a new Department of Energy defense nuclear facility before construction of such facility begins and shall recommend to the Secretary, within a reasonable time, such modifications of the design as the Board considers necessary to ensure adequate protection of public health and safety. During the construction of any such facility, the Board shall periodically review and monitor the construction and shall submit to the Secretary, within a reasonable time, such recommendations relating to the construction of that facility as the Board considers necessary to ensure adequate protection of public health and safety. An action of the Board, or a failure to act, under this paragraph may not delay or prevent the Secretary of Energy from carrying out the construction of such a facility.
- The Board shall make such recommendations to the Secretary of Energy with respect to Department of Energy defense nuclear facilities, including operations of such facilities, standards, and research needs, as the Board determines are necessary to ensure adequate protection of public health and safety. In making its recommendations, the Board shall consider the technical and economic feasibility of implementing the recommended measures.

## Annual Performance Budgeting Objectives for Fiscal Year 2011

The Defense Nuclear Facilities Safety Board (Board) is an independent, Executive Branch federal agency charged by statute with providing technical safety oversight of the Department of Energy's (DOE) defense nuclear facilities and activities in order to protect the health and safety of the public and the workers.

The Board's Strategic Plan presents the four Technical Nuclear Safety Oversight performance goals, summarized below, from which annual performance objectives are derived.

1. **Nuclear Weapon Operations:** DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of the health and safety of the workers and the public.
2. **Nuclear Material Processing and Stabilization:** The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of health and safety of the workers and the public.
3. **Nuclear Facilities Design and Infrastructure:** New DOE defense nuclear facilities and modifications to existing facilities are designed and constructed in a manner that ensures adequate protection of health and safety of the workers and the public.
4. **Nuclear Safety Programs and Analysis:** DOE Regulations, requirements, and guidance are developed, implemented, and maintained, and safety programs at defense nuclear facilities are established and implemented as necessary to ensure adequate protection of the health and safety of the workers and the public.

Each of these four performance goals is reviewed in the sections that follow.

To facilitate strategic management, the Board has organized its technical staff into four groups. The Technical Lead of each group is assigned responsibility for one of the four performance goals in the strategic plan, and for executing the performance objectives associated with that goal. As required by Office of Management and Budget (OMB) guidance governing compliance with the Government Performance and Results Act of 1993, the Board has produced measurable performance goals for FY 2010 and FY 2011 that, when executed, will demonstrate continued progress toward the Board's goals. These annual performance objectives and measures establish projected levels of performance and reflect the nature of the Board's independent oversight function.

The Board's objectives as outlined in its strategic plan address multi-year efforts and encompass a broad spectrum of technical areas relevant to the safety of DOE's defense nuclear mission. This submission includes the Board's *Annual Performance Plan for FY 2011*, which identifies annual performance objectives that consist of technical issues to be evaluated in support of the Board's strategic plan, and the identification of specific candidate topics for these reviews. An outcome measure for each objective is described as part of the discussion of each

annual performance goal. Assessments of the outcome associated with each annual performance goal are provided in the Board's annual performance reports.

The Board measures progress toward achieving each annual performance goal in three stages by evaluating:

- DOE's acknowledgment that a safety enhancement is needed after the Board communicates the results of its technical reviews;
- DOE's subsequent development of appropriate corrective actions to resolve the Board-identified safety issue; and
- DOE's implementation of the necessary corrective actions, leading to the successful resolution of the safety issue and resulting in improved protection of the public, the workers, and the environment.

The basis of measurement for the qualitative assessment includes formal correspondence from DOE and its contractors, the Board's correspondence, reports from the Board's staff, public testimony by DOE and contractor personnel, and other sources. Past reporting (see the Board's Annual Reports to Congress) of Board-identified issues and associated DOE responses demonstrates that the Board has a sustained, clear, and substantial positive impact on the safety of DOE's defense nuclear activities.

Because of the variability of DOE's plans and schedules, some candidate areas identified in the Board's annual performance plan may not be addressed during a performance period. However, the Board's annual performance report will document that an equivalent level of effort was expended in support of the strategic objective, and describe the alternative area that was selected for review.

To facilitate an integrated review, the tables in the four major performance goals that follow are formatted to show the flow-through from the general objective set forth in the Board's Strategic Plan to the specific Annual Performance Objectives for FY 2010 and FY 2011. To place this planning information in context, the performance goals are followed by examples of the Board's accomplishments during the years FY 2006 through FY 2009, as required by OMB's instructions on preparing and submitting a performance budget.

A comprehensive assessment of progress during Calendar Year (CY) 2008 appears in the Board's *Nineteenth Annual Report to Congress*. The Board's annual performance reports are available for review on the Internet at [www.dnfsb.gov](http://www.dnfsb.gov) under the *Public Documents/Reports to Congress* search headings.

## 5. PERFORMANCE GOAL 1: NUCLEAR WEAPON OPERATIONS

**DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of the health and safety of the workers and the public.**

**OUTCOME:** DOE will have acknowledged, acted upon, and/or resolved the health and safety issues raised by the Board, and the facilities are operated to approved safety standards, rules, orders, and directives. Follow-up technical evaluation of DOE's nuclear stockpile activities will verify necessary improvements in safety.

### **SUMMARY:**

Focused oversight of nuclear weapon activities at the Pantex Plant, in response to stockpile reduction initiatives, life extension programs, and stockpile surveillance requirements, will continue to be a major priority for the Board in FY 2011. Ongoing programmatic operation of aged facilities at the Y-12 National Security Complex (Y-12), in parallel with preparations to construct and transition into modern facilities, will likewise present the need for significant safety oversight activities by the Board. The relocation of hazardous missions to the Nevada Test Site (NTS) will also be a focus area for the Board's safety oversight. Key areas of safety oversight for the Board in FY 2011 will include:

- *Nuclear Explosive Operations*—DOE's efforts to maintain an increased operational tempo at Pantex are expected to continue, due to life extension programs for aging weapon systems as well as the need to dismantle retired weapons as the nuclear weapons stockpile is reduced. DOE is expected to implement "safety by design" re-engineering known as Seamless Safety for the 21st Century (SS-21) for proposed B53 dismantlement operations and W84 operations at Pantex. When this effort is complete, all nuclear explosive operations at Pantex will have been re-designed to meet SS-21 technical safety objectives.
- *Y-12 Modernization*—The Board will need to carefully evaluate continued programmatic operations at Y-12, particularly the need for upgrades to preserve safety in aging facilities that are overdue for replacement. Safety oversight is also needed for activities required to transition to new facilities (e.g., processing and packaging materials for transfer to the Highly Enriched Uranium Materials Facility, following the Operational Readiness Review scheduled to be complete in January 2010).
- *Nevada Test Site Nuclear Activities*—There is significant work to be done for DOE to develop a capability at NTS to disposition a damaged nuclear weapon or improvised nuclear device. In addition, further subcritical experiments are expected to be conducted at NTS in support of nuclear weapon programs. Finally, the Nation's single capability to perform nuclear criticality experiments is being moved from Los Alamos National Laboratory (LANL) to NTS. The Board will be required to assess the safety of criticality operations at NTS beginning in FY 2010.

- *Safety Upgrades at the National Laboratories*—Safety-related events in FY 2005 led to the shutdown of nonessential activities at LANL, and operations at the Lawrence Livermore National Laboratory (LLNL) plutonium facility later were curtailed based on assessments of its safety programs. Similarly, reviews by the Board at the Sandia National Laboratories (SNL) found deficiencies in the authorization bases and safety programs for its nuclear facilities. Progress is being made, but resolution of the underlying safety-related deficiencies will require years of effort by DOE and the laboratories and will require continued Board oversight.

**Performance Goal 1**

**Nuclear Weapon Operations.** DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of health and safety of the workers and the public.

**FY 2011 Performance Objectives**

The Board and its staff will verify the safety of DOE's defense nuclear facilities and activities relating to the maintenance, storage, and dismantlement of the nuclear weapon stockpile, quality assurance of the stockpile, as well as its associated research and development, and the capability to test nuclear weapons and disposition damaged or improvised nuclear devices (such as a terrorist device).

The Board and its staff will conduct assessments of DOE's efforts to develop and implement safety management systems for stockpile management activities. The Board's evaluations will be split between DOE efforts to develop safety systems (e.g., system and process designs, safety bases, control schemes, and administrative programs) and DOE efforts to implement safety management systems. These reviews will focus on activities at the Pantex Plant, Y-12 National Security Complex (Y-12), Savannah River Site (SRS) tritium facilities, Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and the Nevada Test Site (NTS).

Representative areas for Board and staff review include:

- Development, implementation, and refinement of site-wide and facility-specific safety analyses and controls for nuclear facilities and activities (e.g., safety analysis reports and annual updates developed per 10 CFR 830).
- Weapon-specific safety analyses and controls identification and implementation for nuclear weapon activities (e.g., B53, W76, W84, and W88).
- Nuclear explosive operations at Pantex (e.g., conduct of operations, procedures, lightning protection, electrostatic discharge controls), and adequacy of the Nuclear Explosive Safety Study process.
- Laboratory support of nuclear explosive operations at Pantex (e.g., sensitivity testing of high explosives, electrostatic discharge and lightning protection studies, weapon response evaluation and documentation).
- Cross-cutting functional areas at Pantex, Y-12, NTS, LANL, LLNL, SNL, or SRS tritium facilities (e.g., legacy material disposition, nuclear criticality safety, fire protection, nuclear explosive safety, seismic design, conduct of operations, work planning, training, maintenance, configuration management).
- Special studies of unique or significant hazards at DOE nuclear facilities (e.g., classified projects, process technology alternatives, and disposition of special items and by-product materials).
- Modernization plans and infrastructure upgrades at Y-12.
- Uranium chemical processing and component assembly/disassembly operations at Y-12 (e.g., conduct of operations, criticality safety, and fire protection).
- Plutonium pit manufacturing and certification at LANL.
- Corrective actions to strengthen institutional safety programs and infrastructure at LANL, LLNL, and SNL including reviews of the adequacy of Vital Safety System assessments and the implementation of Conduct of Operations and Engineering at various LANL facilities.
- Readiness to dispose of damaged nuclear weapons or improvised nuclear devices at NTS.
- Subcritical experiments at NTS.
- Nuclear explosive operations at the Device Assembly Facility at NTS.
- Operation of the Criticality Experiments Facility at NTS.
- Implementation of Recommendation 2005-1, *Nuclear Material Packaging*.

While performing its reviews, the staff will assess the effectiveness of ISM implementation and the safety controls identified for ongoing operations as well as any new weapon system surveillance, life extension, or dismantlement projects at Pantex, Y-12, or NTS that start in FY 2011.

**Performance Goal 1**

**Nuclear Weapon Operations.** DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of health and safety of the workers and the public.

**FY 2010 Performance Objectives**

The Board and its staff will verify the safety of DOE's defense nuclear facilities and activities relating to the maintenance, storage, and dismantlement of the nuclear weapon stockpile, quality assurance of the stockpile, as well as its associated research and development, and the capability to test nuclear weapons and disposition damaged or improvised nuclear devices (such as a terrorist device).

The Board and its staff will conduct assessments of DOE's efforts to develop and implement safety management systems for stockpile management activities. The Board's evaluations will be split between DOE efforts to develop safety systems (e.g., system and process designs, safety bases, control schemes, and administrative programs) and DOE efforts to implement safety management systems. These reviews will focus on activities at the Pantex Plant, Y-12 National Security Complex (Y-12), Savannah River Site (SRS) tritium facilities, Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and the Nevada Test Site (NTS).

Representative areas for Board and staff review include:

- Development, implementation, and refinement of site-wide and facility-specific safety analyses and controls for nuclear facilities and activities (e.g., safety analysis reports and annual updates developed per 10 CFR 830).
- Weapon-specific safety analyses and controls identification and implementation for nuclear weapon activities (e.g., B53, W76, W84, and W88).
- Nuclear explosive operations at Pantex (e.g., conduct of operations, procedures, lightning protection, electrostatic discharge controls), and adequacy of the Nuclear Explosive Safety Study process.
- Laboratory support of nuclear explosive operations at Pantex (e.g., sensitivity testing of high explosives, electrostatic discharge and lightning protection studies, weapon response evaluation and documentation).
- Cross-cutting functional areas at Pantex, Y-12, NTS, LANL, LLNL, SNL, or SRS tritium facilities (e.g., legacy material disposition, nuclear criticality safety, fire protection, nuclear explosive safety, seismic design, conduct of operations, work planning, training, maintenance, configuration management).
- Evaluation of the safety culture of the Pantex Plant and associated design agencies.
- Special studies of unique or significant hazards at DOE nuclear facilities (e.g., classified projects, process technology alternatives, and disposition of special items and by-product materials).
- Readiness activities for the Highly Enriched Uranium Materials Facility.
- Modernization plans for Y-12, including startup of the Beryllium Capability Project, accelerated dismantlement of weapons components, and infrastructure upgrades.
- Plutonium pit manufacturing and certification at LANL.
- Corrective actions to strengthen institutional safety programs and infrastructure at LANL, LLNL, and SNL.
- Readiness to dispose of damaged nuclear weapons or improvised nuclear devices at NTS.
- Subcritical experiments at NTS.
- Nuclear explosive operations at the Device Assembly Facility at NTS.
- Readiness for Criticality Experiments Facility operations at the Device Assembly Facility at NTS.
- Authorization of SNL Auxiliary Hot Cell Facility and the Radioactive Mixed Waste Management Facility as Hazard Category 3 facilities.
- Implementation of Recommendation 2005-1, *Nuclear Material Packaging*.

While performing its reviews, the staff will assess the effectiveness of ISM implementation and the safety controls identified for ongoing operations as well as any new weapon system surveillance, life extension, or dismantlement projects at Pantex, Y-12, or NTS that start in FY 2010.

**Performance Goal 1**

**Nuclear Weapon Operations.** DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of health and safety of the workers and the public.

**FY 2009 Performance Accomplishments**

**Continued Operation of the LANL Chemistry and Metallurgy Research Facility.** In letters dated October 23, 2007, and May 16, 2008, the Board questioned DOE's decision to operate the 55-year-old Chemistry and Metallurgy Research facility an estimated six years past the previously planned shutdown date of 2010. Given the age, material condition, nuclear material inventory, and seismic fragility of the facility, the Board encouraged DOE to assess these risks promptly and evaluate alternative means of accomplishing programmatic requirements. In May 2009, the Board reviewed LANL's proposed safety basis for operations beyond 2010, identified inconsistent or inadequate assumptions in the safety analysis, and pointed out opportunities to improve safety by reducing the radioactive material at risk. LANL is revising the proposed safety basis.

**Integrated Nuclear Planning.** The Board identified that DOE had not demonstrated formal mechanisms to ensure that design requirements and interfaces for pit manufacturing at LANL were appropriately managed and controlled across the suite of projects that contribute to the future plutonium processing infrastructure. In response, DOE developed an Integrated Nuclear Planning process to improve coordination among its projects as national security mission requirements are refined. The Board has participated in four Integrated Nuclear Planning workshops this fiscal year and believes the process is effective and continues to improve.

**Transuranic Waste Operations at LANL.** In a letter dated January 18, 2007, the Board urged NNSA to promptly develop a viable pathway for shipping high-activity transuranic waste drums from LANL to the Waste Isolation Pilot Plant for disposal. Postulated accident scenarios involving these drums predict high consequences to the public because of their radiological loading, the proximity of the storage area to the site boundary, and the lack of robust engineered controls. In response, DOE has bolstered waste disposition work at LANL by facility infrastructure upgrades, new safety basis documents, and training and qualification of operators. By April 2008, NNSA had remediated all of the high-activity drums then available for processing. Preparations are underway to vent the remaining drums to allow processing and disposal.

**Nuclear Criticality Safety at LANL.** In a September 10, 2007, letter to NNSA, the Board expressed concern that a software tool (MASS) was being relied upon by operators as a control to ensure compliance with criticality safety limits without appropriate Software Quality Assurance. In response to the Board letter, NNSA committed to modifying procedures and retraining facility staff at LANL to ensure that MASS is not used to determine compliance with criticality safety limits. NNSA also stated that the Los Alamos Site Office (LASO) would review this issue during planned assessments. Overall, the actions that were taken by LANL resulted in a strengthened safety posture, and the schedule for bringing the nuclear criticality safety program into full compliance with industry standards and DOE directives appears acceptable.

**LANL Plutonium Facility Confinement Ventilation.** The decade-old safety basis for the Plutonium Facility credits a passive confinement strategy instead of active confinement ventilation as a safety-class control to protect the public from postulated accidents. As part of DOE's implementation plan for the Board's Recommendation 2004-2, an evaluation of the facility's confinement strategy was conducted along with a parallel effort to develop a new safety basis for the facility. The Board issued DOE a reporting requirement on January 13, 2009, to follow through on the DOE's commitment to deliver the Ventilation System Evaluation Report to the Board (originally due December 21, 2006) and provide Program Secretarial Office concurrence with and approval of the upgrades in coordination with the Central Technical Authority (originally due March 20, 2007). In its June 16, 2009, response, DOE asserted that some modifications identified as needed in the confinement ventilation evaluation may have subsequently been determined to be unnecessary to meet the overall safety strategy and goals under the final approved documented safety analysis. The DOE response contained inconsistencies regarding the course of action to address the scenario of a seismic event followed by a fire. The Board is continuing to engage DOE to ensure support for improvements to the safety posture of defense nuclear facilities is appropriate and timely.

**LANL Plutonium Facility Vault Water Bath.** The Board identified issues with the storage of plutonium-238 materials in the cooling water bath in the LANL Plutonium Facility's storage vault. Many of the containers lacked

manufacturing pedigree and data on the condition of their contents. In response, the laboratory developed a plan to repack or overpack all questionable containers into robust packaging by June 2010.

**LANL Weapons Engineering Tritium Facility.** In October 2008, LANL ceased operations at the tritium facility due to a Technical Safety Requirement violation and problems with the pressure safety program. These issues were initially identified by a Board review in July 2007 and communicated to DOE by letter on October 16, 2007. To comply with the facility's safety basis, changes were made to the piping system, pressure relief components, and the facility's pressure safety procedures. The Board carefully tracked these changes and questioned the laboratory's plan (viewed as acceptable by the NNSA Los Alamos Site Office) to restart operations without a formal readiness review. In response to the Board's concerns, NNSA-Headquarters held discussions with its site office and the laboratory, with the result that LANL developed a detailed Plan of Action for a formal contractor Readiness Assessment that will also include significant Federal oversight.

**Nuclear Explosive Safety.** The Board evaluated 9 Nuclear Explosive Safety (NES) studies or change evaluations conducted at Pantex, including Master Studies of Pantex Special Purpose facilities and Support Activities. In a letter dated December 12, 2008, the Board identified shortcomings in the current NES process, including the designation of findings that must be addressed before or after nuclear operations are allowed to continue or start. In response, NNSA held a workshop to discuss these shortcomings and is pursuing actions to address the Board's concerns.

**Revised Nuclear Explosive Safety Directives.** In response to changes in operational and organizational realities and observations communicated by the Board, DOE completed the revision and implementation of key nuclear explosive safety directives, including DOE Order 452.1C, *Nuclear Explosive and Weapon Surety Program*; DOE Order 452.2C, *Safety of Nuclear Explosive Operations*; and DOE-STD-NA-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*.

**Quality of Safety-Related Information for Nuclear Explosive Operations.** The Implementation Plan for Recommendation 98-2, *Safety Management at the Pantex Plant*, addressed the need for DOE 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 would include the needed requirements for these analyses. In FY 2009, the Board reviewed the design laboratories' implementation of the standard and closed Recommendation 98-2 based on the finding that each laboratory had developed a process that would meet the standard.

**Lightning and Electrostatic Discharge Protection at Pantex.** The Board issued a letter on March 30, 2007, identifying that work remained to adequately address the hazards posed by the indirect effects of a lightning strike on Pantex facilities. DOE responded by forming the Nuclear Weapons Complex Electromagnetics Committee to analyze both lightning and electrostatic discharge (ESD) hazards. The Committee has begun to execute a plan to systematically address the Board's concerns and to improve the safety of operations at Pantex relative to lightning and ESD hazards. In FY 2009, the concern for concrete spalling was addressed, and testing for intrinsic bonding in nuclear explosive facilities was initiated. The Board has engaged experts in the field of lightning effects to verify DOE's analyses.

**Pantex Procedures.** In 2009, the Board completed a series of onsite reviews and provided immediate feedback to Pantex on areas where immediate improvements could be made in nuclear explosive operating procedures. Pantex took action to address the deficiencies identified during the reviews.

**W76 Restart at Pantex.** On August 8, 2008, the Board issued a letter detailing concerns with the process DOE used to authorize restarting W76 nuclear explosive operations following a safety-related work suspension. The Board reviewed the technical basis for the controls that were put in place to address the hazards that caused the work suspension and determined the controls were adequate to ensure public health and safety.

**Pantex Safety Basis.** In a letter dated July 30, 2007, the Board identified issues with the Pantex safety basis, including the treatment of beyond design basis accidents, the level of detail in some technical safety requirements, and a systematic lack of timeliness in declaring potential inadequacies in the safety basis. In December 2008, DOE began work to upgrade the safety basis at Pantex by reviewing all Technical Safety Requirements and

recategorizing all Specific Administrative Controls to be consistent with DOE-STD-1186-2004, *Specific Administrative Controls*. The Board is reviewing the progress of this initiative and its impact on nuclear explosive operations.

**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 DOE program for providing weapons training units sufficient to conduct high fidelity training and with the lack of design agency training for Pantex employees on specific skills critical to nuclear explosive operations. DOE developed a program to periodically review the training needs of each weapon program and incorporate provision of high fidelity trainer units into the budget. In FY 2009, Pantex completed this review on several programs.

**Pantex Tooling Review.** In 2009, the Board completed a review of the Pantex tooling program and provided immediate feedback on the strengths and weaknesses of the administrative procedures that govern the tooling program.

**Y-12 Activity-Level Work Planning.** The Board provided the results of its review of Y-12 activity-level work planning in a letter to DOE dated January 22, 2009. The Board identified several weaknesses with the planning, control, and oversight of work. In response to the Board's concerns, some activities were placed on hold until work planning problems could be resolved and corrected.

**Y-12 Nuclear Criticality Safety.** The Board completed a review of nuclear criticality safety evaluations that found that certain evaluations failed to meet select requirements, potentially compromising the safety margin for fissionable material operations. In response to the Board's January 23, 2009 letter documenting the review, evaluations were strengthened and weaknesses identified during an extent of conditions review were corrected.

**Special Capability Glovebox Project at Y-12.** The Board's review of the Special Capability Glovebox design in 2007 found no major design issues but identified questions regarding administrative controls. The Board continued its review in FY 2009 and found no issues that would impact the plan to begin operations in FY 2010.

**Conduct of Operations at Y-12.** After several operational events, the Board urged NNSA to consider action to achieve consistent, disciplined operations. NNSA developed and began to implement corrective actions to address these issues including additional periodic training. The Board also noted that procedure use practices were inconsistent and that poor procedural compliance had been a contributor to many operational events. NNSA issued a Y-12 procedure use policy and began a campaign to review all procedures authorized for use during nuclear operations for potential improvements, including identifying the appropriate use category for each procedure.

**Continued Operations of the Enriched Uranium Operations Building.** Due to concerns over NNSA's ability to safely operate the Enriched Uranium Operations Building for an extended period of time, the Board advocated that NNSA regularly assess the physical condition of the building in a letter dated March 13, 2007. Per the Board's request, NNSA has provided the Board with two annual reports (in March 2008 and March 2009) that included specific actions NNSA has planned and taken to improve the safety posture of the Enriched Uranium Operations Building.

**Work Planning and Control at LLNL.** As part of the implementation plan for the Board's Recommendation 2004-1, *Oversight of Complex, High-Hazards Operations*, DOE promulgated a document in 2006 that provided the attributes and best practices of a successful work planning and control process. LLNL recently issued revised work planning processes for the laboratory as a whole and the Nuclear Materials Technology Program nuclear facilities. These processes were developed to meet the guidance document.

**NTS Device Assembly Facility (DAF) Fire Suppression System.** In 2008, the Board determined that DAF had significant weaknesses in the fire suppression system, weaknesses that should be corrected before beginning more hazardous operations. In response, NNSA initiated an improvement project for the fire suppression system to assess the condition of the system, analyze and prioritize needed improvements, and plan to improve the system. In FY 2009, NNSA evaluated the results of the condition assessment, developed improvement options, presented a path forward, and began improvements to the system.

**Readiness to Dispose of a Damaged Nuclear Weapon or Improvised Device at NTS.** NNSA is developing a plan for implementation of safety controls and upgrades appropriate for the scope of operations for the facility at NTS (G tunnel) that would be used in disposition of an improvised nuclear device. The Board expects the new plan to be available in 2010. As a result of the Board's interactions and discussions in FY 2009, NNSA continued to complete some facility improvements and implement the results of the cost/risk benefit analysis of proposed controls and improvements. FY 2009 improvements have focused on significant occupational safety issues, e.g., tunnel ventilation.

**Criticality Experiments in DAF.** NNSA has been preparing for Criticality Experiment Facility operations at the Device Assembly Facility. Previously the Board has reviewed and commented on the design for facility modifications and modification of the critical assembly machines. In FY 2009, the Board reviewed construction activities and the re-build and testing of the four machines. The Board will evaluate startup activities in 2010.

**Performance Goal 1**

**Nuclear Weapon Operations.** DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of health and safety of the workers and the public.

**FY 2008 Performance Accomplishments**

**Nuclear Explosive Safety.** The Board evaluated 10 Nuclear Explosive Safety (NES) studies, operational safety reviews, or change evaluations conducted at Pantex, including Master Studies of Pantex onsite transportation and staging and Special Purpose facilities. The Board noted technical and administrative areas of concern regarding the process used in conducting NES activities that if addressed will increase the value of the NES study in consistently ensuring nuclear explosive safety.

**Revised Nuclear Explosive Safety Directives.** In response to changes in operational and organizational realities and observations communicated by the Board, DOE is revising key nuclear explosive safety directives, including DOE Order 452.1C, *Nuclear Explosive and Weapon Surety Program*; DOE Order 452.2C, *Safety of Nuclear Explosive Operations*; and DOE-STD-NA-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*.

**Quality of Safety-Related Information for Nuclear Explosive Operations.** The Implementation Plan for Recommendation 98-2, *Safety Management at the Pantex Plant*, addresses the need for DOE 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 would include the needed requirements for these analyses. In FY 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 FY 2008, DOE evaluated implementation of these requirements at the laboratories and requested significant improvements. The laboratories have now revised their procedures.

**Lightning and Electrostatic Discharge Protection at Pantex.** The Board issued a letter on March 30, 2007, identifying that work remains to adequately address the hazards posed by the indirect effects of a lightning strike on Pantex facilities. DOE has responded by forming the Nuclear Weapons Complex Electromagnetics Committee to analyze both lightning and electrostatic discharge (ESD) hazards. The Committee has prepared a plan to systematically address the Board's concerns and to improve the safety of operations at Pantex relative to lightning and ESD hazards. The Board has engaged experts in the field of lightning effects to verify DOE's analyses. The Board also evaluated the modeling of ESD environments at Pantex as well as the development and implementation of effective ESD controls for tooling and facilities for nuclear explosive operations.

**Pantex Procedures.** In a letter dated April 23, 2007, the Board provided recent examples of inadequacies in technical procedures and noted that improvements are needed in the processes for development, review, validation, and configuration management for procedures at Pantex. In 2008, Board conducted two onsite reviews of procedures and provided immediate feedback to Pantex in an effort to improve nuclear explosive operating procedures.

**Pantex Safety Basis.** In a letter dated July 30, 2007, the Board identified issues with the Pantex safety basis, including the treatment of beyond design basis accidents, the level of detail in some technical safety requirements, and a systematic lack of timeliness in declaring potential inadequacies in the safety basis. The Board also noted in its letter that DOE has lost configuration control of the safety basis. In response, Pantex developed and implemented a plan to update its safety basis, incorporating outstanding changes and reestablishing configuration control. Pantex also initiated an effort to assess the risk of beyond design basis accidents and evaluate needed controls.

**W76 Restart at Pantex.** On August 8, 2008, the Board issued a letter detailing concerns with the process DOE used to authorize restarting W76 nuclear explosive operations following a safety-related work suspension. The Board was concerned with the process used to develop the technical basis for new controls and the 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.

**B53 Dismantlement Planning.** On March 20, 2008, the Board issued a letter to DOE raising the issue that the Pantex contractor's planned process for dismantlement of B53 weapons departed from the established conservative practice of performing operations involving uncased conventional high explosives only in nuclear explosive cell facilities, which provide enhanced mitigation of high explosive violent reactions. 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 determined that it was feasible to perform this work in a cell facility and evaluated the relative risks of several approaches to B53 dismantlement. The contractor's planning now involves performing operations involving uncased conventional high explosives in a cell facility.

**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 DOE program for providing weapons training units sufficient to conduct high fidelity training and with the lack of design agency training for Pantex employees on specific weapon critical skills. DOE is taking action to address these shortcomings in its weapon training.

**Degradation of 9212 Complex at Y-12.** The Board has continued its evaluation of DOE's ability to safely operate the 60-year-old 9212 Complex at Y-12. In response to the concerns raised in the Board's letter of March 13, 2007, DOE completed its first annual assessment of the safety of continued operations of the 9212 Complex, and has committed to develop a plan to accomplish essential facility improvements necessary to ensure safe operation until completion of the planned replacement facility, the Uranium Processing Facility.

**Vital Safety Systems at Y-12.** The Board reviewed the design, condition, maintenance, and functionality of a sampling of vital safety systems at Y-12. The Board found that in general the systems could meet their safety functions; however, there were some minor deficiencies in design calculations and maintenance procedures that the Board communicated to DOE.

**Y-12 Technology Development.** The Board reviewed the development of selected technologies intended for insertion into existing facilities and the planned Uranium Processing Facility. The Board did not find any major safety hazards with these technologies given their current level of development, but identified the need to include evaluation criteria related to safety earlier in the technology development process. Y-12 project personnel informed the Board that the Technology Readiness Level process used to evaluate new technologies at Y-12 would be modified to include safety explicitly at an earlier level of development.

**Conduct of Operations at Y-12.** Following several operational events, the Board urged DOE to consider action to achieve consistent, disciplined operations. DOE developed and began to implement corrective actions to address these issues including additional periodic training. The Board also noted that procedure use practices are inconsistent and that poor procedural compliance has been a contributor to many operational events. DOE committed to evaluating procedure usage and identifying areas for improvement.

**Uranium Holdup Survey Program at Y-12.** The Board continued its review of the Inadvertent Accumulation Prevention Program (IAPP) and implementation of corrective actions for the IAPP and Uranium Holdup Survey Program, which play key roles in prevention of inadvertent nuclear criticality events. Although DOE has identified actions for individual measurement points, implementation of those actions will take more time, and a completion date has not been determined.

**Special Capability Glovebox Project at Y-12.** The Board's review of the Special Capability Glovebox design in late 2007 found no major design issues but did identify questions regarding administrative controls which DOE will revisit in early 2009 as a part of prestart readiness reviews.

**Readiness to Dispose of a Damaged Nuclear Weapon or Improvised Device at NTS.** As a result of the Board's interactions and follow-up discussions in FY 2008, DOE completed some facility improvements, completed a cost/risk benefit analysis of proposed controls and improvements, and is developing a plan for implementation of safety controls and upgrades appropriate for the scope of operations for the facility at NTS (G tunnel) that would be used in disposition of an improvised nuclear device. The Board expects the new plan to be available in 2009.

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

- *Strengthening federal safety oversight*—DOE filled several critical oversight positions at the Los Alamos Site Office and is working to reestablish traditional safety oversight processes. DOE recognizes that significant challenges remain to strengthen federal oversight of nuclear safety at LANL.
- *Developing effective institutional safety programs*—Manuals and plans to strengthen key safety programs have been issued; however, progress toward implementation is slow.
- *Improving safety bases and ensuring the efficacy of safety systems*—While some nuclear facility safety bases were updated and implemented this year, many other nuclear facilities are operating with outdated safety bases up to 12 years old. The laboratory continues to struggle to put in place the configuration management and other engineering, maintenance, and operational elements necessary to assure safety systems will perform their credited safety functions.
- *Eliminating known hazards*—DOE has made some progress in disposing of high-activity transuranic waste drums as well as plutonium-238 and other actinide residues, but more work is needed to complete chemical stabilization of actinide residues and achieve timely disposition of the remaining transuranic waste inventory.
- *Increasing federal management of new projects*—DOE has enhanced federal oversight of the Chemistry and Metallurgy Research Building Replacement project. This project and several others are essential to the expanded mission that DOE envisions for LANL. More needs to be done to strengthen the federal oversight for the other projects essential to this expanded mission.

**Continued Operation of the Chemistry and Metallurgy Research Facility.** In letters dated October 23, 2007, and May 16, 2008, the Board questioned DOE's decision to operate the 55-year-old Chemistry and Metallurgy Research facility an estimated six years past the previously planned shutdown date of 2010. Continued operation of this facility in its current condition poses risks to workers and the public that have not been comprehensively evaluated since 1998. Given the age, material condition, nuclear material inventory, and seismic fragility of the facility, the Board encouraged DOE to assess these risks promptly and evaluate alternative means of accomplishing programmatic requirements. In response, DOE has committed to provide a safety rationale for continuing operations to the Board by October 2008.

**Integrated Nuclear Planning.** The Board identified that DOE had not demonstrated formal mechanisms to ensure that design requirements and interfaces for pit manufacturing at LANL were appropriately managed and controlled across the suite of projects that contribute to the future plutonium processing infrastructure. In response, DOE has developed an Integrated Nuclear Planning process to improve coordination among its projects as national security mission requirements are refined. While this process is immature, it should help ensure better integration of the projects and facilities that provide the required support infrastructure, with benefits for both safety and program success.

**Transuranic Waste Operations at LANL.** In a letter dated January 18, 2007, the Board urged NNSA to promptly develop a viable pathway for shipping high-activity transuranic waste drums 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 robust engineered controls. In response, DOE has bolstered waste disposition work at LANL by facility infrastructure upgrades, new safety basis documents, and training and qualification of operators. By April 2008, NNSA had remediated all of the high-activity drums available for processing. Preparations are underway for venting operations on the remaining drums to allow processing and disposal.

**Nuclear Criticality Safety at LANL.** The Board has provided safety oversight of the laboratory's attempt to develop a standards-based nuclear criticality safety program. During 2007, the Board assessed operations in the Plutonium Facility's vault for special nuclear materials 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. Subsequent to these questions, the laboratory determined the adequacy of some criticality safety evaluations to be in doubt. As a result, fissile material operations were paused until limits were reviewed and confirmed to be defensible.

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

**Documented Safety Analysis for the LANL Plutonium Facility.** On May 30, 2008, the Board issued a letter identifying concerns regarding the lack of pedigree for software used by LANL to develop safety basis documents at the Plutonium Facility. This issue was the result of a site-wide failure to ensure compliance with software quality provisions of 10 CFR 830 Subpart A and DOE Order 414.1C, *Quality Assurance*. LANL responded quickly to this deficiency and revised internal procedures to apply appropriate quality assurance measures to such software.

**Transition of Contract Management at LLNL.** On October 1, 2007, Lawrence Livermore National Security assumed management responsibility for operations at LLNL. 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 Standard 1098, *Radiological Control Standard*, absent from the previous contract, is contained in the current contract.

**Updated Documented Safety Analysis (DSA) for the Plutonium Facility at LLNL.** The Board reviewed the recently submitted first annual update to the DSA for the Plutonium Facility at LLNL. The first annual update for the Plutonium Facility was delayed one year to complete implementation of the DSA approved in April 2006. The Board found the updated DSA was an improvement from the previously implemented DSA.

**Work Planning and Control at LLNL.** As part of the implementation plan for the Board's Recommendation 2004-1, *Oversight of Complex, High-Hazards Operations*, DOE 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 LLNL contractor and the Livermore Site Office had little knowledge of the DOE attributes and best practices document. The Board also noted deficiencies with the work planning and control process and ongoing efforts at LLNL to improve and institutionalize the process across the site. The Board encouraged the current efforts to improve and standardize the process.

**Recommendation 2005-1.** The Board issued Recommendation 2005-1, *Nuclear Material Packaging*, to increase protection for workers involved in the storage and handling of nuclear materials. In 2007, the Board worked to ensure that DOE developed a technically justified packaging manual as part of the recommendation's implementation. In March 2008, after making improvements suggested by the Board, DOE issued DOE Manual 441.1-1, *Nuclear Material Packaging Manual*. The DOE sites are currently developing repackaging schedules in support of sending the final complex-wide implementation schedule to the Board.

**Performance Goal 1**

**Nuclear Weapon Operations.** DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of health and safety of the workers and the public.

**FY 2007 Performance Accomplishments**

**Nuclear Explosive Safety.** In response to a commitment made to the Board in 2005, DOE conducted a comprehensive “Top-Down Review” of its nuclear explosive safety directives. On November 2, 2006, DOE issued a corrective action plan to implement selected recommendations from the Top-Down Review. Since that time, many of these commitments have been completed; execution will continue in FY 2008.

**Quality of Safety-Related Information for Pantex.** The Implementation Plan for Recommendation 98-2, *Safety Management at the Pantex Plant*, addresses the need for DOE to issue further guidance on its expectations for the evaluation and documentation of weapon response to potential accident environments and stimuli. The Board issued letters on December 15, 2006, and May 10, 2007, requesting DOE’s expectations for the review, approval, and implementation of the expert elicitation, expert judgment, and peer review processes that are key to improving the quality and consistency of safety-related information provided to Pantex by the design agencies. In response to the Board’s letters, DOE held a workshop on July 16, 2007, to clarify its expectation that the design agencies develop these processes by the end of FY 2007. DOE is in the process of developing criteria for review and approval of these processes.

**Conduct of Operations at Pantex.** The Board issued a letter in May 2005 identifying deficiencies in the conduct of nuclear explosive operations at Pantex. In a March 2006 letter, the Board re-emphasized the importance of a consistently high degree of formality in the conduct of nuclear explosive operations. After a follow-up review in FY 2007, the Board noted slow but continued improvement. However, the Board observed that staffing levels for the personnel responsible for the oversight of nuclear explosive operations had dropped dramatically. The Board also observed a lack of consistency in the formality of operations. Since the review, the operating contractor has increased its oversight personnel and is continuing to seek personnel to increase its oversight staffing to an acceptable level.

**Lightning Protection at Pantex.** The Board issued a letter on March 30, 2007, identifying that work remains to adequately address the hazards posed by the indirect effects of a lightning strike on Pantex facilities. DOE has responded by forming the Nuclear Weapons Complex Lightning Committee to analyze these hazards.

**Pantex Procedures.** In a letter dated April 23, 2007, the Board provided recent examples of inadequacies in technical procedures and noted that improvements are needed in the processes for development, review, validation, and configuration management for procedures at Pantex. The Board requested that DOE identify the specific measures it plans to take to improve the quality of technical procedures at Pantex. In response, DOE is taking specific measures to improve the flowdown of safety-related requirements into procedures, the procedure validation process, and the level of detail in technical procedures.

**Pantex Safety Basis.** In a letter dated July 30, 2007, the Board identified several issues with the Pantex safety basis. Issues included the treatment of beyond design basis accidents, the level of detail in some technical safety requirements, and a systematic lack of timeliness in declaring potential inadequacies in the safety basis. The Board also noted in its letter that DOE has lost configuration control of its safety basis. DOE recognizes the loss of configuration control of its safety basis and has developed a project plan to remedy the problem. DOE is also addressing the other issues identified by the Board.

**W76-1 Start-up Activities at Pantex.** In a letter dated July 16, 2007, the Board expressed concern regarding DOE’s willingness to deviate from DOE requirements and typical good practices in response to growing production demands. Specifically, the readiness activities for W76-1 operations could not be performed with the expected level of rigor in the time frame specified by DOE. The Board identified in its letter that both the Nuclear Explosive Safety Study and the contractor readiness assessment for W76-1 assembly operations were conducted without an approved safety basis in place. DOE has responded to the concerns raised in the Board’s letter by ensuring that the contractor Readiness Assessment and the Nuclear Explosive Safety Study for upcoming W80 operations are conducted with an approved safety basis in place.

**Electrostatic Discharge at Pantex.** The Board evaluated efforts by DOE and the weapons design agencies to characterize potential electrostatic discharge effects during nuclear explosive operations and the response of sensitive components to them. To date, a generally conservative response to this threat has been maintained; however, the Board continues to evaluate whether additional measures may enhance both the understanding of the hazards and the best methods for controlling them.

**Pantex Cell Gap Analysis.** The Board evaluated calculations of leakage through gaps in cells used for nuclear explosive operations during postulated accident scenarios at the Pantex Plant. The Board determined that such leakage does not appear to be an issue for accident scenarios involving single-unit operations, but could present a concern for multi-unit operations involving certain systems in certain facilities. DOE will perform additional analyses to provide assurance that the evaluation guidelines will not be challenged for multi-unit operations.

**Degradation of 9212 Complex at Y-12.** The Board had previously evaluated DOE's ability to safely operate the 60-year-old 9212 Complex at Y-12. As a result, DOE submitted an analysis identifying facility improvements necessary to ensure safe operation until completion of the planned replacement facility, the Uranium Processing Facility. As major structural and process modifications to the 9212 Complex would be impractical, the Board advocated a regimen of increased vigilance and regular assessment of the physical condition of the 9212 Complex. In response, DOE is working to develop a detailed plan to annually assess the 9212 Complex.

**Conduct of Operations at Y-12.** The Board has noted improvement in conduct and formality of nuclear operations at Y-12 during recent years. However, following several operational errors and events, the Board urged DOE to consider action to achieve consistent, disciplined operations. DOE developed and began to implement a plan to address these issues.

**Fire Protection at Y-12.** In response to Board correspondence in 2002, DOE developed a ten-year comprehensive improvement plan for fire protection at Y-12. Significant improvements were made, but progress stalled during 2006 due to a reduction in funding. The Board queried DOE on its plans for completing the project. DOE has revised its plan and intends to complete the project in its nuclear facilities.

**Conduct of Engineering at Y-12.** In 2005, DOE discovered that a new vessel was not designed to preclude a nuclear criticality accident in a water intrusion scenario. DOE implemented a design change and planned an investigation. Later, the Board found that the investigation was not completed. DOE performed the investigation and developed corrective actions. The Board found that the corrective actions did not address the lack of an appropriate design review of the new installation. As a result, DOE is revising Y-12 engineering procedures to require appropriate design reviews of such new nuclear process installations or modifications.

**Handling of Legacy Items at Y-12.** The Board reviewed actions taken by Y-12 in response to a small fire during an operation to open and inspect a container with uranium metal items that had not been opened in more than 30 years. The Board found that Y-12 did not provide adequate restrictions and control on opening such legacy containers in air environments. In response, DOE developed additional operational controls to ensure adequate hazard analysis and review prior to opening legacy containers in an air environment.

**Readiness to Dispose of a Damaged Nuclear Weapon.** As a result of the Board's interactions and follow-up discussions in FY 2007, DOE stated that a revised safety analysis is being developed that will identify safety controls and upgrades appropriate for the scope of operations for the facility at NTS (G tunnel) that would be used in disposition of a damaged nuclear weapon or threat device. The Board expects the new analysis to be available for review in 2008.

**Device Assembly Facility at NTS.** The Board previously identified the need for a comprehensive assessment of safety systems and safety management programs at the Device Assembly Facility (DAF) in light of the new missions being undertaken there. In FY 2007, the Board evaluated the implementation of the safety basis and the conduct of readiness reviews for new operations in the facility. The Board determined that DOE had successfully implemented the assessments suggested by the Board and developed corrective actions for safety management programs and vital safety systems in DAF.

**Concrete Cracking in DAF.** The Board has identified that the extensive cracking in DAF may indicate poor construction practices that adversely affect the concrete's strength. In response, DOE began to develop plans in FY 2007 to assess the in-situ strength of the concrete.

**LANL Chemistry and Metallurgy Research Facility Life Extension.** The Chemistry and Metallurgy Research (CMR) facility suffers from age and known seismic vulnerabilities, which led DOE (a decade ago) to define 2010 as the facility's end of life. In fall 2006, the Board observed that DOE had diametrically opposed plans for CMR, which could pose safety concerns—plans were being made for reductions in engineering resources due to its approaching end of life, while at the same time, other plans relied on the facility to support increased programmatic missions, particularly pit manufacturing, until a replacement facility became available in approximately 2016. As a result of providing these observations to the DOE senior management, a formal life extension project has been initiated to determine the necessary steps to safely continue certain operations beyond 2010.

**Pit Manufacturing at LANL.** The Board evaluated the integration of safety-in-design with regard to various individual activities involving the installation of manufacturing equipment at the LANL Plutonium Facility. Ultimately, DOE intends to produce increased numbers of pits at LANL, and establish the capability to manufacture legacy pit types or, if authorized, a Reliable Replacement Warhead. The Board identified that DOE's project management efforts were narrowly focused on pit manufacturing equipment, and did not encompass the associated infrastructure and other support facilities required to safely execute an expanded pit manufacturing mission. In response, DOE is reinvigorating an Integrated Nuclear Planning effort to ensure safety is properly integrated into planning for the pit manufacturing project.

**Nuclear Criticality Safety at LANL.** The Board has followed closely the Criticality Safety Program Improvement Plan developed by LANL in response to the findings of an October 2005 DOE review that revealed non-compliances with applicable ANSI/ANS standards and DOE Orders. In a letter dated September 22, 2006, the Board observed that the Program Improvement Plan was not receiving appropriate attention and priority from DOE management. The Board questioned DOE on the need for compensatory measures until the program was brought into compliance and on how the management approach would be bolstered to ensure timely completion. In response, DOE initiated an independent team to review progress on the Program Improvement Plan, developed a performance incentive to encourage LANL accomplishment in this area, and assigned a full-time criticality safety engineer at the Los Alamos Site Office.

**Transuranic Waste Operations at LANL.** The Board urged DOE in a letter dated January 18, 2007, to expeditiously develop a viable disposition pathway for the large inventory of legacy transuranic waste at LANL, particularly for the containers with the highest radiological inventory. In response, DOE has reinvigorated waste disposition work at LANL, including accomplishing facility infrastructure upgrades, developing needed new safety bases, and training and qualifying operators to the associated new procedures.

**Safety Improvements at LANL.** The Board visited LANL in November 2006, and in a letter dated February 1, 2007, observed five key areas requiring underlying actions that would substantially improve the laboratory's safety posture. These key areas are strengthening federal safety oversight, improving safety bases and ensuring the efficacy of safety systems, eliminating known hazards, and increasing federal management of new projects. DOE subsequently made progress in some of these areas. For example, DOE detailed senior managers to the Los Alamos Site Office to fill critical oversight positions during the search for permanent staff, and completed actions to disposition some of the site's remaining inventory of legacy plutonium-238 residues.

**Confinement Ventilation at the LANL Plutonium Facility.** The safety basis for the LANL Plutonium Facility credits a passive confinement strategy instead of active confinement ventilation as a safety-class control to protect the public from postulated accidents. Under the Implementation Plan for the Board's Recommendation 2004-2, *Active Confinement Systems*, an evaluation of the facility's confinement strategy was completed this year in parallel with a separate effort to develop a new documented safety analysis for the facility. The Board assessed both efforts and observed that the draft documented safety analysis continued to rely on a safety-class passive confinement approach and did not incorporate the results of the facility analysis. As a result, DOE has developed a path forward that should improve the safety analysis and implementation of controls for the facility.

**Nuclear Criticality Safety Program at LLNL.** In an October 2006 letter to DOE, the Board noted the weak implementation of criticality safety requirements and the need for additional rigor in conduct of operations and in the verification of compliance of criticality limits at LLNL. The Board also noted a lack of quality assurance procedures for safety-related software systems that are relied upon to verify criticality and other safety limits. In response, LLNL management directed the implementation of improvements to the Nuclear Criticality Safety Program.

**Radiography Facility at LLNL.** The Board has been closely following operations involving special nuclear materials in the LLNL Radiography Facility and has noted weaknesses in the areas of material packaging, development of work permits, posting of radiological controls, and training. In response, LLNL management increased attention to these operations, which has resulted in observed improvements in work permit development, radiological postings, and discipline of operations.

**Resumption of Programmatic Operations at LLNL.** Following a standdown to address fundamental safety issues, limited operations in the LLNL Plutonium Facility were authorized to resume in FY 2006 using a formal process for achieving and verifying readiness. In April 2006, the Board observed LLNL's readiness assessment to remove the remaining compensatory measures and return to normal operations, and determined that operations could safely resume. The standup of the Plutonium Facility was completed in early FY 2007.

**LLNL Legacy Item Disposition Project.** The Board has been closely following efforts to address the unique hazards of a legacy item (referred to as Object 77) at LLNL and the unusual challenges to the facility and personnel associated with its safe disposition. The Board identified deficient safety controls, leading LLNL to develop specific administrative controls to safely disposition the item. In FY 2007, preparations to disposition the item included integrated dry runs as part of LLNL and DOE readiness assessments. In May 2007, the key phases of the project to disposition the item were safely completed, thus eliminating the unique hazards associated with it.

**Critique Process at LLNL.** In FY 2007, the Board evaluated the informal methods used at LLNL to gather information on safety-related events and identify follow up actions. The Board strongly urged the development of a more rigorous and formal process for critiquing such events. A critique procedure was developed in early FY 2007. In March 2007, a new Nuclear Material Technology Program Event Critiques procedure was employed, with observed weaknesses. Board evaluation of subsequent critiques has indicated that the formal process is improving and will significantly enhance safety at LLNL by providing a clearer understanding of events and the necessary follow up actions.

**Configuration Management at LLNL.** In a November 2004 letter, the Board identified the apparent lack of configuration management of vital safety systems at LLNL facilities. Subsequently, LLNL established procedures and processes to maintain an interim configuration management system and developed a resource-loaded schedule integrated with the documented safety analysis implementation schedule. A recent subsequent review by the Board identified a lack of quality in the interim system drawings. DOE has drafted a corrective action plan to address this plus numerous additional issues, including configuration management programs and supporting processes.

**Safety Basis at Sandia National Laboratories, New Mexico.** In late FY 2005, the Board identified fundamental weaknesses in the implementation of nuclear safety requirements and controls at a defense nuclear facility located at SNL. In 2007, SNL completed implementation of a Safety Basis Improvement Project to resolve the underlying safety-related deficiencies and implemented a Safety Basis Operations Schedule. The Board has noted continued progress during its reviews.

**Integrated Safety Management at Sandia National Laboratories, New Mexico.** In FY 2005, the Board identified multiple failures of the hazard analysis and work control process at SNL. In response, DOE developed a corrective action plan to ensure the associated weaknesses are corrected and that integrated safety management is fully implemented. Near-term corrective actions for defense nuclear facilities are now complete. Sandia corporate-level systems must be implemented to achieve site-wide ISM standards.

**Tritium Extraction Facility.** The Board identified concerns with the reliability of safety-related equipment for sustained operations at the Tritium Extraction Facility at the Savannah River Site. During readiness reviews for this new facility, the Board observed multiple failures relating to the operability of the tritium air monitors, target rod

preparation module, ventilation system, electronic procedures, and fire alarm system. Due to the Board's concerns as well as the readiness review findings, the site operating contractor commissioned an independent assessment to address the equipment reliability issues.

**Tritium Extraction Facility Conduct of Operations.** The Board evaluated conduct of operations issues at the Savannah River Site's tritium facilities, and highlighted several issues relating to a wide range of tritium operations. The number and severity of the issues indicated a potential adverse trend in facility operations. In response, DOE included tritium operations in a recent independent assessment that will address causes and corrective actions for the observed issues.

**Nuclear Material Packaging.** In FY 2006, the Board identified errors in analysis and reasoning used in two principal deliverables of DOE's implementation plan for Recommendation 2005-1, *Nuclear Material Packaging*. The Board worked with DOE to improve the repackaging prioritization methodology and the requirements contained in draft DOE Manual 441.1-1, *Nuclear Material Packaging Manual*. As a result, on March 9, 2007, DOE released the draft Manual for comment into the Review and Comment System and forwarded it, along with the repackaging prioritization methodology, to the sites for development of plans to achieve compliance.

**Performance Goal 1**

**Nuclear Weapon Operations.** DOE operations that directly support the nuclear stockpile and defense nuclear research are conducted in a manner that ensures adequate protection of health and safety of the workers and the public.

**FY 2006 Performance Accomplishments**

**Nuclear Explosive Safety Top Down Review.** DOE has made significant improvements to the Nuclear Explosive Safety process in the past several years; however, because of continuing problems, the Board and DOE agreed in May 2004 that a Top-Down Review of the process was needed to harmonize the directives, eliminate conflicts and redundancy, determine whether the requirements were adequate, and elevate key requirements to a level in the directives system commensurate with their safety significance. The Board participated in this effort, and DOE briefed the Board on the results in January 2006. Forty-three issues had been developed and considered, and action was recommended on almost half of these. Implementation of some of the recommended corrective actions was initiated promptly; however, others have been on hold pending the completion of a DOE review of production throughput at Pantex.

**Revised Nuclear Explosive Safety Directives.** In response to the Board's observations, DOE has revised and updated key nuclear explosive safety directives, including DOE Order 452.1C, *Nuclear Explosive and Weapon Surety Program*; DOE Order 452.2C, *Safety of Nuclear Explosive Operations*; and DOE-STD-NA-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*. While the new version of DOE-STD-NA-3016 improves over the previous revision in certain areas, the Board does not consider the requirements contained in the standard to be sufficiently detailed and comprehensive, particularly regarding weapon response development, and is holding the associated commitment in the Recommendation 98-2 Implementation Plan open until issues with the standard are resolved.

**Pantex Cell Gap Analysis.** The Board evaluated calculations of leakage through cell gaps performed to better understand the consequences of potential accidents at the Pantex Plant. Based on these calculations, leakage through cell gaps does not appear to be an issue for single-unit operations. However, there is still a concern that accident consequences for multi-unit operations involving certain systems in certain facilities could challenge the evaluation guidelines. Additional calculations and testing may be needed to provide assurance that the evaluation guidelines will not be challenged for multi-unit operations.

**Electrostatic Discharge (ESD).** The Board evaluated efforts by the Pantex Plant contractor and the weapon design agencies to characterize ESD insult environments and the responses of sensitive components to them. Progress has been made in defining the environments and the hazards posed by them; however, the Board has identified the need for additional clarification with respect to furniture (e.g., tooling and equipment) ESD, capacitive coupling between the insulting objects and other nearby charged objects, the assumption of electrical isolation of tools within the established standoff boundary, and resonance conditions and effects.

**Special Tooling Program at Pantex.** In a letter dated December 15, 2004, the Board expressed concern that continuing weaknesses in the Special Tooling Program could have an adverse impact on the safety of nuclear explosive operations. In response, DOE conducted a comprehensive, independent review of tooling program deficiencies and committed to implement corrective actions to improve the tooling program. The Board reviewed the program in March 2006 and determined that it had significantly improved, thereby improving the safety and efficiency of nuclear explosive operations that rely on specially designed tools to eliminate or minimize hazards.

**W56 Dismantlement at Pantex.** The Board evaluated process development and execution of the W56 dismantlement campaign at Pantex. The Board urged DOE to ensure that laboratory expertise, both active and retired, was applied to resolve technical challenges that arose to help ensure the safe and successful completion of the dismantlement campaign. Dismantlement of all W56 war reserve units was safely completed in June 2006.

**B61 and W87 Operations at Pantex.** Recommendation 98-2, *Safety Management at the Pantex Plant*, recommended that DOE expedite development and implementation of re-engineered processes for nuclear explosive operations at Pantex so that the attendant safety improvements could be achieved sooner. In FY 2006, the Board evaluated the start-up of the Seamless Safety for the 21st Century (SS-21) processes for the B61 and W87 Disassembly & Inspection and Rebuild Programs. The enhanced processes utilize upgraded procedures, redesigned tooling, and fewer handling and lifting steps. These improvements make the operations significantly safer and more

efficient than their predecessors.

**Safety of Dismantlement Operations.** The Board continued to evaluate DOE's plans to dismantle an older weapon system not protected by modern safety controls. The Board expressed concern to DOE regarding proposed disassembly activities at non-DOE facilities that did not have adequate safety programs and systems. DOE no longer plans to use such facilities; dismantlement operations are now planned for Pantex facilities.

**Conduct of Operations at Pantex.** In response to a Board letter issued in May 2005 identifying deficiencies in the conduct of nuclear explosive operations at Pantex, DOE initiated efforts to address the cause of the deficiencies and to develop both near- and long-term plans to improve the conduct of operations. After a follow-up review in FY06, the Board issued a letter to DOE in March 2006 re-emphasizing the importance of a consistently high degree of formality in the conduct of nuclear explosive operations, and favorably noting the extensive involvement of senior contractor management in developing and implementing improvements in conduct of operations at Pantex. As proposed improvements are implemented and the process matures, the Board expects to see continued improvements in the formality of nuclear explosive operations. The Board is continuing to evaluate improvements in the formality of work through daily operational oversight provided by its site representatives.

**Pantex Multi-Unit Operations.** The Board is evaluating the safety implications of the implementation of multi-unit nuclear explosive operations at Pantex, which are being pursued in support of an increasing operational tempo. In response to the Board's observations, Pantex is taking a more comprehensive approach to evaluating the implementation of multi-unit operations, including analyzing human factors considerations. In addition, the Board has urged Pantex to become more closely involved with studies being performed by the design agencies that will aid in evaluating the increase in risk associated with performing multi-unit operations.

**Laboratory Support of Pantex Nuclear Explosive Operations.** As a result of concerns over the continued erosion of technical competence and a need to re-emphasize the priority of work that directly supports nuclear safety, the Board issued Recommendation 2002-2, *Weapons Laboratory Support of the Defense Nuclear Complex*. In response, DOE established a single point of contact for each weapon system at each national laboratory, and a requirement at each site office to track and ensure closure of nuclear safety support requirements for weapon laboratories. These changes have enhanced the timely resolution of safety concerns in the nuclear weapon complex. The Board has now closed this recommendation.

**Readiness to Dispose of a Damaged Nuclear Weapon.** The Board has consistently highlighted to DOE the need to develop the programs and infrastructure at NTS necessary to safely dispose of a damaged nuclear weapon or improvised nuclear device. In FY 2006, the Board determined that DOE no longer had a clear plan for meeting this need. The Board requested that DOE explain the required state of facility readiness and its plans for safety improvements, because it did not appear the mission and hazards had changed. As a result of the Board's interactions, DOE has continued to make physical and procedural improvements at the NTS G-tunnel, provided training, and is reconsidering its plans to be prepared to safely dispose of a damaged nuclear weapon if needed.

**Subcritical Experiments.** The Board reviewed preparations for subcritical experiments at NTS, identifying inadequate nuclear safety management programs, inadequate mechanisms for verification of readiness, and inadequate safety bases. These items would also be relevant to nuclear weapons testing should such testing be resumed. In FY 2006, DOE made improvements that addressed these issues, including improvements in safety basis reviews, implementation of controls, and readiness reviews. As a result, subcritical experiments have a more complete documented safety analysis and thorough verification of readiness.

**Lightning Protection at NTS.** In 2003 and 2005, the Board noted deficiencies in lightning protection at NTS related to the protection of nuclear operations and personnel. In response, NTS implemented compensatory measures and began a study of the lightning protection needs at NTS. In FY 2006, a site-wide directive for the lightning protection program and lightning protection studies were completed. As a result, NTS now has a technical basis to identify appropriate controls for lightning protection for hazardous operations and has implemented a site-wide lightning protection program and controls.

**Device Assembly Facility at NTS.** In FY 2006, the Board evaluated the implementation of the safety basis for the Device Assembly Facility and the conduct of readiness reviews. As a result, DOE is developing plans to assess

safety management programs and vital safety systems in DAF, has improved work planning and procedures, and has improved the implementation of controls (such as the fire protection system).

**LANL Institutional Corrective Actions.** The Board spent considerable effort, including a public meeting on March 22, 2006, reviewing LANL's institutional corrective action programs and ensure their continuity through the contract transition. Corrective actions focus on key areas including safety, quality assurance, software quality management, conduct of engineering, safety basis, conduct of operations, environmental risk management, and training. The Board has also sought to encourage DOE to ensure that adequate resources are provided for implementation of these corrective action plans in a timely manner.

**Federal Oversight at LANL.** In November 2005, the Board learned of DOE's plan to execute a 3-month "strategic pause" in oversight at LANL to re-engineer oversight policies and procedures in preparation for the transition to a new prime contractor. Approximately two-thirds of the site office's workforce were planned to be devoted to the re-engineering effort during the pause, leaving the remaining third to oversee laboratory operations. The Board objected to the concept of the pause and requested information on how DOE would maintain effective safety oversight for the significant defense nuclear activities pursued during that time period. DOE provided the requested information and proceeded with the pause, which evolved into a pilot project for a new concept in oversight that is heavily reliant upon self-oversight by the contractor. The Board is closely evaluating the development of the pilot project.

**Confinement Ventilation at the LANL Plutonium Facility.** The current safety basis for the LANL Plutonium Facility credits a passive confinement strategy (i.e., no active confinement ventilation) as a safety-class control to protect the public from postulated accidents. In response to issues raised by the Board, LANL analysts performed a comprehensive set of air-flow calculations to estimate potential releases under accident conditions and concluded that this strategy was inadequate. Compensatory measures were developed and implemented while further study on the confinement strategy was performed. Under the Implementation Plan for the Board's Recommendation 2004-2, *Active Confinement Systems*, this facility is now being assessed as a high priority facility with an accelerated schedule. The Board has continued to review and provide feedback on the draft methodology for leak path factor analysis.

**Nuclear Criticality Safety Program at LANL.** In October 2005, the Board observed DOE's review of the nuclear criticality safety program at LANL. The DOE review revealed several non-compliances with applicable ANSI/ANS standards and DOE Orders. Among the most serious deficiencies were that some operations had changed without revision to the criticality safety analysis, roles and responsibilities were ill-defined and implemented, and some fissile operations did not have documented criticality safety analyses. In response, LANL developed a criticality safety improvement plan, which included a thorough assessment of all on-going fissile material operations. The Board evaluated the execution of this improvement plan in late FY06 and found that adequate progress was not being made. This issue is currently being pursued.

**Fire Protection at LANL.** On May 15, 2006, the Board received DOE's response to issues previously identified by the Board regarding the need to define a multi-year strategy for timely resolution of all fire protection deficiencies and achievement of site-wide improvements at LANL. Issues that needed to be addressed included incomplete documentation and delays in the completion of inspections, tests, and maintenance; fire hazard analyses recommendations not implemented on a timely basis; no formal plan to address the Baseline Needs Assessment for fire and emergency services; no long-term contract for fire and emergency services with Los Alamos County; and fire alarm systems in several defense nuclear facilities still requiring upgrades. The Board reviewed this plan and determined the contractor's proposed activities adequately addressed the Board's concerns; however, questions remain unresolved regarding the ability of DOE's Los Alamos Site Office to fulfill its role in this area.

**Incorporation of Safety into the Design of Research and Development at LANL.** In November 2005, the Board reviewed LANL's requirements for designing research and development processes and apparatus. The Board reviewed procedures for performing hazard analyses, developing controls, identifying applicable engineering standards and practices, and applying safety-related project management practices, such as having distinct design phases and independent design reviews. Following the transfer of responsibility for management and operation of LANL to a new prime contractor, the approach of the new LANL management was reviewed. LANL stated that its intention that all significant programmatic and facility work at LANL undergo engineering and safety reviews

during design and that each major project will have a designated chief engineer who will act as design authority. These initiatives represent a significant improvement compared to past practices at LANL.

**Safety Basis at Sandia National Laboratories, New Mexico.** In late FY 2005, the Board identified fundamental weaknesses in the implementation of nuclear safety requirements and controls at a defense nuclear facility located at SNL. At present, SNL is pursuing a Safety Basis Improvement Project to resolve the underlying safety-related deficiencies. Most tasks will be complete by the end of 2006, but some actions stretch out to the end of 2008. The SNL corporate-level safety basis group has hired several additional experienced safety basis staff members and augmented this staff with senior contractors who possess complex-wide experience. This has resulted in significant progress, with upgrades in facilities noted during recent reviews by the Board's staff.

**Integrated Safety Management at Sandia National Laboratories, New Mexico.** In an October 8, 2004 letter, the Board identified multiple failures of the hazard analysis and work control process at SNL. In response, DOE developed a corrective action plan to ensure the associated weaknesses are corrected and that integrated safety management is fully implemented. Near-term corrective actions for defense nuclear facilities are nearing completion, and longer term actions are in progress.

**Safety Basis at Y-12.** The Board reviewed a draft version of the Documented Safety Analysis for the Building 9212 Complex and identified weaknesses that resulted in improper downgrading of safety systems, including certain fire protection systems. In response to the Board's observations, key fire protection systems were upgraded to safety-class and design adequacy reviews were performed.

**Seismic Deficiencies at Y-12.** An evaluation by the Board of the Building 9212 Complex found that previously identified seismic deficiencies were not being adequately addressed and that a proposed replacement facility would not be ready to operate until late in the next decade. Based on these findings, the Board encouraged DOE to take steps to implement practical facility modifications in the near term and continue to reduce the quantity of at-risk nuclear material. As a result, DOE commenced evaluations of near-term upgrades and committed to perform a broad risk prioritization of upgrades needed to support operation of the Building 9212 Complex for the next 15 years.

**Uranium Holdup at Y-12.** The Board's staff reviewed two criticality safety issues related to uranium holdup in process equipment at Y-12. The first issue involved holdup in an air filter downstream from a uranium chip burner; the second involved holdup in a casting furnace vacuum system filter. Staff input and questions related to nondestructive assay procedures, criticality calculations, and filter cleanout procedures resulted in more rigorous treatment of the issues by DOE and its Y-12 contractor.

**Tritium Extraction Facility.** The Board continued to perform safety oversight of the Tritium Extraction Facility, which has completed construction and startup testing, and began readiness reviews in late FY06. The facility is now entering the final test phase, in which tritium will be extracted from irradiated tritium producing rods, processed through cleaning operations, and transferred to the another tritium facility at SRS. Safety improvements that were implemented based on Board observations include a seismic alert system, the addition of an oxygen monitor at the lowest elevation in the Remote Handling Building, and improvements to the battery room ventilation system. In addition, reviews of the Worker Protection Safety System suggested by the Board have been completed.

**LLNL Plutonium Facility Safety Basis.** The Board reviewed the revised Documented Safety Analysis (DSA) for the LLNL Plutonium Facility and determined that it adequately addressed deficiencies identified in the Board's letter of April 12, 2004. The Board was particularly pleased that LLNL has renewed its commitment to a control strategy that includes robust, safety-class active confinement ventilation. The Board identified several isolated weaknesses that warranted consideration in the preparation of future annual updates to the DSA.

**Configuration Management at LLNL.** In a November 2004 letter, the Board identified the apparent lack of configuration management of vital safety systems at LLNL facilities. During FY 2006, LLNL established procedures and processes to maintain an interim configuration management system. The Board reviewed this interim system and found it to be reasonably adequate to support operations while a more durable, institutionalized program is developed and implemented.

**Resumption of Programmatic Operations at LLNL.** On October 11, 2005, limited operations in the LLNL Plutonium Facility were authorized to resume using a process for achieving and verifying readiness found generally acceptable by the Board. In April 2006, the Board observed LLNL's readiness assessment to remove the remaining compensatory measures and return to normal operations, and determined that operations could safely resume. On May 23, 2006, DOE authorized LLNL to resume normal operations.

**Request for Proposal for the LLNL Management and Operating Contract.** The Board evaluated the draft and final Requests for Proposal (RFP) for the LLNL management and operating contract issued by DOE during FY06. The Board determined that DOE had applied lessons learned from the draft LANL RFP, and that there were no ill-advised limitations on DOE's ability to oversee the safety of operations at LLNL.

**Nuclear Material Packaging.** The Board reviewed two principal deliverables of DOE's implementation plan for Recommendation 2005-1, *Nuclear Material Packaging*: (1) a repackaging prioritization methodology, and (2) nuclear material packaging requirements based on technically justified criteria. The Board found that, although the basic approaches taken were sound, fundamental errors in analyses had substantially obviated the benefits of the contents of both documents. The Board identified these errors in analysis and reasoning in letters dated April 24, 2006, and May 1, 2006. DOE's responses, provided in letters dated June 8, 2006, and July 21, 2006, were not satisfactory to the Board. The Board is working with DOE to ensure that the commitments DOE has made to improve nuclear material packaging for protection of its workers are implemented.

## 6. PERFORMANCE GOAL 2: NUCLEAR MATERIAL PROCESSING AND STABILIZATION

**The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of the health and safety of the workers and the public.**

**OUTCOME:** DOE will have acknowledged, acted upon, and/or resolved the health and safety issues raised by the Board. Follow-up technical evaluation of DOE's nuclear materials management and facility disposition activities will verify necessary improvements in safety, as DOE meets its commitments to the Board to stabilize and dispose of hazardous nuclear materials.

### **SUMMARY:**

The Department of Energy continues to pursue acceleration of stabilization and cleanup work at facilities at many of its defense nuclear sites, in some cases in response to Recommendations and other formal correspondence from the Board. The level of effort of this work is increasing as a result of the American Recovery and Reinvestment Act of 2009. Examples of the most significant new and ongoing projects are summarized below:

*Nuclear Material Stabilization*—Five milestones remain open under the Implementation Plan for Recommendation 2000-1, *Prioritization for Stabilizing Nuclear Materials*: one at Hanford and four at Los Alamos National Laboratory (LANL). DOE intended to complete stabilization of all materials identified under Recommendation 2000-1 by December 2009, but DOE will not meet this schedule. DOE's commitment to establish a disposition plan and complete processing of unsheltered containers at LANL was not completed by its December 31, 2008, due date. DOE has not officially provided an update as to when this milestone will be completed, although plans for the Chemistry and Metallurgy Research building include processing these containers by 2013.

*Nuclear Material Consolidation, Storage, and Disposition*—DOE continues to store and manage 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 continues to carefully monitor the activities of DOE as it attempts to manage these materials and meet its commitments under Board Recommendations 2000-1 and 2005-1, *Nuclear Material Packaging*. The Board reviewed and commented on DOE's Draft Order 410.2, *Management of Nuclear Materials*. Implementation of this Order will be coordinated through DOE's new Office of Nuclear Materials Integration. The Board plans to review the implementation of this Order.

*High-Level Waste (HLW) Retrieval and Processing*—DOE continues to expand HLW retrieval activities, with the attendant hazards of extremely radioactive liquids and sludges, old systems and equipment, and conditions that are poorly characterized. Workers at the Hanford Site, Savannah River Site (SRS) and the Idaho Cleanup Project are continuing decades-long

projects to retrieve and treat wastes from tanks that date as far back as the World War II-era Manhattan Project. Large new facilities needed to treat and dispose of the wastes are in various states of design and construction. The Board is performing close oversight of these waste retrieval operations, as well as the development, design, and operation of planned treatment facilities. The Board continues to work closely with DOE's tank expert panel as it plans and interprets corrosion testing to understand the factors affecting tank integrity. These activities will require a substantial share of the Board's resources for the indefinite future.

*Hanford K-Basin Sludge Cleanup*—The K West Basin at the Hanford site contains highly radioactive sludge that requires careful retrieval, stabilization, and safe interim storage. DOE had planned to complete removal of the sludge from the K West Basin by November 2009. However, several project management and engineering difficulties led DOE to return the project to the conceptual design phase. DOE plans to identify a new completion date as the project progresses through the critical decision process. During 2010, the Board will review the conceptual design for the sludge stabilization and packaging systems.

*Transuranic (TRU) Waste Management*—Several sites within the DOE defense nuclear complex store large quantities of contact-handled (lower activity) TRU wastes on concrete pads and in soil-covered trenches. DOE has been retrieving these wastes for shipment to the Waste Isolation Pilot Plant (WIPP) for disposal since 1999. DOE has completed shipping most of the lower activity TRU wastes from Oak Ridge National Laboratory (ORNL) and SRS to WIPP. What remains are drums and boxes of waste containing prohibited items and other hazardous materials that pose a greater risk to the workers and considerably slow the retrieval work. Current shipments to WIPP include TRU wastes from Idaho, Hanford, and LANL. The Board will continue to provide oversight for these hazardous operations.

In addition, DOE stores significant quantities of remote-handled (higher activity) TRU waste in temporary storage at several of these same sites. DOE began shipment of the first of this remote-handled TRU waste from the Idaho Cleanup Project to WIPP in early 2007. Subsequently, remote-handled TRU waste shipments have been made from ORNL, LANL, and SRS. Shipments from SRS are continuing. The Board plans close oversight of these activities.

*American Recovery and Reinvestment Act*—On February 17, 2009, Congress passed the American Recovery and Reinvestment Act of 2009. In addition to its annual budget, DOE's Office of Environmental Management received \$6 billion through the ARRA to accelerate cleanup projects during the next two years. The Recovery Act projects range from relatively low-hazard work such as soil and groundwater remediation to the high-hazard work of decontaminating and decommissioning nuclear facilities. The Board is following closely DOE's efforts to plan and conduct work on these high-hazard projects.

**Performance Goal 2**

**Nuclear Material Processing and Stabilization.** The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2011 Performance Objectives**

The Board and its staff will conduct assessments of DOE's efforts to characterize, stabilize, process, and safely store plutonium, uranium, and other actinides, residues, spent fuel, and wastes from the nuclear weapons program to ensure that these efforts are performed safely and that the risks posed by these materials are addressed in a timely manner. These reviews will be conducted using the principles of Integrated Safety Management and will include assessments of the adequacy of current storage conditions, evaluations of proposed treatment and disposal technologies, evaluations of the design of new facilities and process lines, assessments of facility readiness to safely begin new operations (including implementation of 10 CFR 830, *Nuclear Safety Management*), the safety of ongoing operations, and the suitability of long-term storage and disposal facilities. Representative areas for review include:

- H-Canyon processing campaigns and life extension activities.
- Long-term storage of neptunium oxides at Idaho National Laboratory (INL) (Recommendation 2000-1).
- Complex-wide consolidation and disposition of special nuclear materials.
- Stabilization and disposal of plutonium-bearing residues at LANL (Recommendation 2000-1).
- Efforts to consolidate, store, and disposition spent nuclear fuel at Hanford, INL, and SRS.
- Preliminary design of systems to treat and store spent nuclear fuel sludge at the Hanford Site (Recommendation 2000-1).
- Removal and processing of salt waste from HLW tanks by the Interim Salt Disposition Project at SRS.
- Closure of HLW Tanks 5, 6, 18, and 19 at SRS.
- Design of the fluidized-bed steam reformer for processing the HLW from SRS Tank 48.
- HLW tank structural integrity at SRS and the Hanford Site and application of the results of DOE's corrosion testing program to corrosion chemistry controls.
- Operation of HLW retrieval and transfer systems at the Hanford tank farms.
- Operation of HLW retrieval and transfer systems at SRS tank farms.
- Conduct of operations and work planning at the Hanford Site.
- Design of supplemental processing and treatment of waste from Hanford tanks.
- Retrieval, characterization, and packaging of TRU waste at Hanford, LANL, ORNL, SRS, and the Idaho Cleanup Project.
- Design, acquisition and first use of new WIPP remote-handled TRU waste emplacement equipment.
- TRU waste disposal operations at WIPP.
- Operations in support of the Tank W-1A excavation and remediation efforts at ORNL.
- Deactivation and decommissioning of facilities throughout the DOE defense nuclear complex including accelerated and new activities funded by the Recovery Act (e.g., Building 235-F at SRS, the Plutonium Finishing Plant at Hanford, and remote-handled TRU waste treatment at the Idaho Cleanup Project).

**Performance Goal 2**

**Nuclear Material Processing and Stabilization.** The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2010 Performance Objectives**

The Board and its staff will conduct assessments of DOE's efforts to characterize, stabilize, process, and safely store plutonium, uranium, and other actinides, residues, spent fuel, and wastes from the nuclear weapons program to ensure that these efforts are performed safely and that the risks posed by these materials are addressed in a timely manner. These reviews will be conducted using the principles of Integrated Safety Management and will include assessments of the adequacy of current storage conditions, evaluations of proposed treatment and disposal technologies, evaluations of the design of new facilities and process lines, assessments of facility readiness to safely begin new operations (including implementation of 10 CFR 830, *Nuclear Safety Management*), the safety of ongoing operations, and the suitability of long-term storage and disposal facilities. Representative areas for review include:

- H-Canyon processing campaigns, change to irradiated fuel processing, life extension activities, and documented safety analysis upgrades and implementation.
- Long-term storage of neptunium oxides at INL (Recommendation 2000-1).
- Complex-wide consolidation and disposition of special nuclear materials.
- Stabilization and disposal of plutonium-bearing residues at LANL (Recommendation 2000-1).
- Efforts to consolidate, store, and disposition spent nuclear fuel at Hanford, INL, and SRS.
- Conceptual design of systems to treat and store spent nuclear fuel sludge at the Hanford Site (Recommendation 2000-1).
- Removal and processing of salt waste from HLW tanks by the Interim Salt Disposition Project at SRS.
- Closure of HLW Tanks 5, 6, 18, and 19 at SRS.
- Design of the fluidized-bed steam reformer for processing the HLW from SRS Tank 48.
- HLW tank structural integrity at SRS and the Hanford Site and application of the results of DOE's corrosion testing program to tank chemistry controls.
- Operation of HLW retrieval and transfer systems at the Hanford and SRS tank farms.
- Conduct of operations and work planning at the Hanford Site.
- Design of supplemental processing and treatment of waste from Hanford tanks.
- Retrieval, characterization, and packaging of TRU waste at Hanford, LANL, ORNL, SRS, and the Idaho Cleanup Project.
- Design, acquisition, and first use of new WIPP remote-handled TRU waste emplacement equipment.
- TRU waste disposal operations at WIPP.
- WIPP update of Documented Safety Analysis and associated Technical Safety Requirements.
- Design and construction of the Tank W-1A excavation and remediation efforts at ORNL.
- Startup of drum venting operations at the TRU Waste Processing Center at ORNL.
- Implementation of DOE Order 410.2, *Management of Nuclear Materials*.
- Deactivation and decommissioning of facilities throughout the DOE defense nuclear complex including accelerated and new activities funded by the Recovery Act (e.g., Building 235-F at SRS, the Plutonium Finishing Plant at Hanford, and remote-handled TRU waste treatment at the Idaho Cleanup Project).

**Performance Goal 2**

**Nuclear Material Processing and Stabilization.** The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2009 Performance Accomplishments**

**Electrical Systems at the Plutonium Finishing Plant (PFP).** In late 2008, the Board reviewed the PFP life extension program for electrical systems and assessed the condition of select safety-related electrical equipment and cables. Several deficiencies were noted. The Board is continuing to evaluate DOE's work to resolve the issues.

**Effectiveness of Corrective Actions at Hanford Tank Farms.** Following the spill of radioactive waste at Hanford's Tank Farms in July 2007, DOE completed several investigations and issued corresponding corrective action plans. The Board continued its review of the effectiveness of the corrective actions for conduct of operations, emergency management, safety oversight, and equipment maintenance. The Board provided additional feedback to DOE. DOE is working to resolve the Board's issues.

**HLW Tank Integrity at Hanford Tank Farms.** The Board encouraged DOE to continue laboratory and in-situ testing of corrosion mechanisms related to the HLW tanks. This effort is expected to lead to assurance that DOE's tanks can continue to perform for an anticipated 30 or more years. The Board reviewed the integrity of the double-shell HLW tanks, and evaluated DOE's structural and leak assessment of the older single-shell HLW tanks.

**Safety Standards at Hanford Tank Farms.** The Board reviewed the standards invoked in DOE's proposed contract for the new tank farm contractor and noted that several important safety standards were missing. In response to Board inquiries, DOE added these standards to the contract.

**Hanford Sludge Retrieval and Disposition Project.** The Board observed the contractor's alternatives analysis and the subsequent DOE external technical review of the conceptual design for sludge retrieval. The Board closely followed this project to ensure that DOE followed proper project management processes for a high-hazard nuclear operation.

**American Recovery and Reinvestment Act.** The Board began reviewing the management and work scope of the DOE activities funded by the Recovery Act. In response to the Board's inquiries, DOE improved its Recovery Act guidance regarding safety and project management requirements.

**HLW Tank Integrity Program at SRS.** The Board reviewed the HLW tank integrity program at SRS with a continued focus on ultrasonic testing. In response to a Board letter to DOE regarding tank integrity, DOE issued a revised HLW Tank Inspection Plan and completed a more thorough ultrasonic test inspection of HLW Tank 29. The inspection results showed no obvious active pitting, but revealed many small pits that had not been noted before. These data may prompt further inspections.

**Tank 48 Treatment Process at SRS.** The Board closely followed DOE's efforts to design a process for treating wastes containing organic materials in HLW Tank 48. In response to a Board letter to DOE noting several project weaknesses, DOE took action to ensure compliance with the DOE Order on project management, and to meet its commitments to perform an evaluation of the confinement ventilation system for the project. In June 2009, DOE confirmed the fluidized bed steam reforming process as the preferred treatment process for Tank 48.

**HLW Maintenance Program at SRS.** The Board found that the contractor's Maintenance Implementation Plan had not been reviewed by DOE since February 2000, which was contrary to the DOE Order requirement that DOE review and approve the contractor's plan every two years. In response, DOE reviewed and approved the current plan and performed a comparison of the DOE Maintenance Program Guide with site maintenance procedures and began implementing corrective actions.

**Tank Closure at SRS.** The Board's staff observed readiness reviews for mechanical waste removal in Tanks 18 and 19, as well as waste removal operations. The Board identified weaknesses in the performance of independent verifications, which were corrected.

**H-Canyon Electrical Systems.** The Board reviewed the safety of electrical systems within the H-Canyon and supporting facilities at SRS. The Board noted several deficiencies and highlighted these in a letter to DOE. DOE took action to immediately correct some of the weaknesses, and put in place plans to correct the remaining deficiencies.

**H-Canyon Life Extension.** A previous Board review of aging issues at H-Canyon highlighted the need to perform more inspections of aging equipment. The Board's review of the initial approach identified several flaws. The Board suggested a number of improvements to the system, and DOE took action to make improvements. The new Integrated Facility Aging Management Program produced the desired results, and DOE plans to expand the program to review safety systems across SRS.

**Fire Protection Systems at SRS.** At SRS, the Board noted aging equipment in the site's fire protection program and questioned how the aging equipment was complying with National Fire Protection Association guidance. In response, DOE developed a replacement methodology for aging fire apparatus and submitted a baseline change proposal to purchase new ladder and pump trucks. When the Board questioned the efficacy of Mutual Aid Agreements with nearby fire departments, DOE developed new plans and procedures to reduce response times.

**Radiation Protection Program at WIPP.** The Board reviewed the radiation protection program and its implementation at WIPP. The Board identified that there was no formal process for performing the triennial audits required by federal regulations. DOE acknowledged and agreed to address the identified concerns.

**TRU Waste Handling at WIPP.** The Board continued oversight of the safety of TRU waste handling operations at WIPP. After a review of conduct of operations and overall safety culture, the Board communicated several deficiencies to DOE and its contractor. A full-time conduct of operations "champion" was hired and empowered to direct efforts towards correcting the identified deficiencies.

**TRU Waste Operations at the Idaho Cleanup Project.** The Board observed TRU waste retrieval and repackaging operations at the Idaho Cleanup Project and identified deficiencies in conduct of operations and operational safety. DOE responded by assigning a full time person to address needed improvements through an emphasis on work planning and control.

**Performance Goal 2**

**Nuclear Material Processing and Stabilization.** The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2008 Performance Accomplishments**

**Nuclear Materials Stabilization and Storage at LANL.** In response to the Board's Recommendation 2000-1, DOE completed the stabilization of all non-weapons grade plutonium at LANL. DOE plans to complete the four remaining commitments in the Implementation Plan for Recommendation 2000-1 by December 2009.

**Uranium-233 Downblending at ORNL.** The Board issued a Project Letter to DOE following the Critical Decision (CD)-2/3A approval for the Uranium-233 Downblending and Disposition Project. The letter identified several safety concerns for DOE to consider as the project progresses. DOE accepted these issues and is working to address all of them.

**Hanford K-Basin Spent Fuel Disposition.** The Board verified the safety of operations at the Hanford K-West Basin by observing the DOE Operational Readiness Review for the restart of fuel cleaning and packaging. This effort will package the small amounts of fuel remaining after the main fuel retrieval effort was completed in 2004.

**Hanford Sludge Retrieval and Disposition Project.** The Board reviewed the project management processes instituted following the return of the sludge project to the conceptual design phase. The Board noted problems with DOE's planned implementation of the project management requirements such as alternatives analysis and formal project reviews. DOE took corrective actions to implement the requirements.

**Interim Salt Disposition Project at SRS.** In response to the Board's Recommendation 2001-1, *SRS Waste Management*, DOE began operation of the Actinide Removal Process and Modular Caustic Side Solvent Extraction Unit to remove and process salt waste contained in high-level waste (HLW) storage tanks at SRS. The Board monitored the performance of the DOE and contractor readiness reviews prior to the start of radioactive operations and found them to be satisfactory.

**HLW Storage in Tank 11 at SRS.** The Board reviewed DOE's plans to store additional HLW in Tank 11 at SRS. This tank is considered a non-compliant tank due to its single-shell design. To ensure safe storage of the waste, DOE and the Board agreed to a set of stringent controls and compensatory measures to be in place prior to the transfer of waste into Tank 11.

**Vital Safety Systems at SRS HLW Tank Farms.** The Board conducted a review of selected safety systems at the SRS HLW tank farms. The Board found that the contractor's system engineer program did not fully meet the requirements of DOE Order 420.1B, *Facility Safety*, and that DOE had a shortage of safety system oversight engineers in the HLW tank farms. Based on the Board's review, DOE initiated a number of corrective actions to address these deficiencies.

**HLW Tank Integrity Program at SRS.** The Board reviewed the HLW tank integrity program at SRS, focusing on the ultrasonic testing of the HLW tanks. The Board found that the ultrasonic test plan did not require the re-examination of known pitting to evaluate its extent and growth rates. In addition, the Board found that the potential for pitting at the liquid-air interface in stagnant waste was not adequately addressed. The Board issued a letter to DOE requesting a briefing on actions to be taken to address these shortcomings.

**Cleaning of HLW Tanks at SRS.** DOE continues to remove waste from various HLW tanks at SRS in preparation for final closure of the tanks. The Board reviewed the chemical cleaning of HLW Tanks 5 and 6, and found that the cleaning was being safely performed. The Board also observed the contractor readiness assessment for the mechanical cleaning of HLW Tanks 18 and 19, and found that the contractor had prematurely declared readiness to operate.

**Corrective Actions from Waste Spill at Hanford Tank Farms.** Following the spill of radioactive wastes at Hanford's Tank Farms in July 2007, DOE completed several investigations and issued corresponding corrective action plans. The Board conducted reviews of the adequacy of the corrective actions and the implementation of those actions. The Board identified several concerns and made observations regarding conduct of operations,

emergency management, oversight, and the issues management program. DOE is working to resolve the issues. The Board also monitored the spill clean-up efforts that were completed in July 2008.

**Complex-Wide HLW Tank Integrity.** The Board encouraged DOE to continue laboratory and in-situ testing of corrosion mechanisms related to the HLW tanks. This effort is expected to help ensure that DOE's tanks can continue to perform as designed for an anticipated 30 or more years. The Board continued to evaluate the overall structural and seismic integrity of the double-shell HLW tanks, and DOE continues to examine double-shell tanks for pitting and wall thinning.

**Safety Systems at the Hanford Tank Farms.** As part of evaluating the infrastructure and life extension of the HLW tanks at Hanford, the Board conducted several reviews that focused on certain vital safety systems. The Board reviewed the maintenance management program, the electrical distribution system, and the digital instrumentation and controls of safety-related systems at the Tank Farms. The Board noted several deficiencies and continued to work with DOE to resolve these issues.

**Electrical Cables at the Plutonium Finishing Plant.** The Board reviewed electrical safety at the Plutonium Finishing Plant at Hanford and found that DOE had not evaluated electrical cables for extended life. The Board pointed out the requirements for such an evaluation and suggested some example programs for DOE to follow.

**Oak Ridge National Laboratory Shielded Transfer Tanks.** The Board reviewed the storage conditions of highly radioactive wastes stored in five Shielded Transfer Tanks at Oak Ridge National Laboratory. The Board found the tanks to be sufficiently robust to contain any generated gases and to remain safely in storage for an extended period of time.

**Transuranic (TRU) Waste Remediation at SRS.** The Board provided oversight of TRU waste operations at SRS's Solid Waste Management Facility and F-Canyon, ensuring that the proper safety controls were in place for both planned operations and during the recovery from anomalous events. The Board also observed the venting of bulged TRU waste drums and provided feedback to the site management for reducing risk to workers during these operations. Site workers have subsequently vented all of the legacy TRU waste drums.

**Retrieval, Characterization, and Packaging of TRU Waste.** The Board verified the safety of TRU retrieval, characterization, and packaging activities for TRU waste drums and other containers at the Hanford Site and the Idaho Cleanup Project. The Board also assessed the interface between WIPP's Central Characterization Project and Idaho's operating contractors for the Accelerated Retrieval Project and the Advanced Mixed Waste Treatment Project, providing suggested improvements to DOE.

**Remote-Handled TRU Waste at Oak Ridge National Laboratory.** The Board verified the safety of characterization and packaging of remote-handled TRU waste at Oak Ridge National Laboratory. The verification included a review of the safety basis documents and observation of the DOE operational readiness review.

**National TRU Waste Program.** The Board assessed the overall progress of DOE efforts to eliminate the long-term safety hazard inherent in TRU waste storage at various sites across the complex. The Board evaluated the progress reported by the DOE TRU Waste Corporate Board and made suggestions where appropriate.

**Performance Goal 2**

**Nuclear Material Processing and Stabilization.** The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2007 Performance Accomplishments**

**Waste Leak at Hanford Tank Farms.** In August 2007, operators backflushing a high-level waste transfer pump in the Hanford tank farms caused a leak of high-level waste to the environment. The Board responded quickly by assigning one of the Board's Site Representatives to continuously follow all emergency response actions and recovery actions. The Board noted the potential for a common-cause failure in other areas of the Hanford site, and DOE took appropriate corrective action to prevent a similar event, as well as validate that other sites in the complex were not susceptible to a similar incident. DOE has chartered a formal Type A investigation team to review the incident.

**Neptunium-237 at Savannah River Site.** As part of its commitment under the Board's Recommendations 94-1 and 2000-1, DOE completed stabilization, packaging, and storage of pre-existing neptunium-237 solutions at SRS.

**Nuclear Material Stabilization and Storage at LANL.** In response to the Board's Recommendation 2000-1, contractors at LANL reached and exceeded several milestones of their Implementation Plan (IP) for the stabilization and storage of nuclear materials. LANL's contractor stabilized more than 50 percent of the site's weapons grade and non-weapons grade plutonium. Additionally, the contractor stabilized more than of 50 percent of 248 kg of materials designated for the Recovery Evaluation Process.

**Uranium-233 Downblending at ORNL.** The Board communicated weakness in the development of the Preliminary Documented Safety Analysis for the Uranium-233 Downblending Project. DOE has been receptive to these comments and plans to integrate them into future revisions of the Preliminary Documented Safety Analysis.

**Hanford Sludge Retrieval and Disposition Project.** At Hanford, DOE completed the retrieval and transfer of K-East basin sludge to K-West Basin holding tanks and the retrieval of K-West Basin sludges into the same holding tanks. The Board reviewed the Sludge Treatment Project at Hanford and noted that portions of the Preliminary Documented Safety Analysis were based on the conceptual and preliminary design instead of the final design. The Board also identified that the final design information for safety systems was not sufficiently mature to meet the required criteria. DOE halted design efforts, re-established the project at the conceptual design stage, and implemented formal project management processes.

**Use of Divers at the Hanford K-Basins.** At the Hanford K-Basins, DOE's contractor planned to use divers to assist in basin cleanout. The Board thoroughly reviewed these plans and discussed with DOE several concerns regarding work planning, work procedures, and safety controls. In response, DOE conducted additional mockups of the diving effort and determined that the divers would not be ready in time to assist in near-term work at the K-East Basin. The plan was shelved, but may be used in the future during the cleanup of the K-West Basin.

**Tank 48 Disposition at SRS.** In response to the Board's Recommendation 2001-1, DOE began planning and design for removal of organic wastes from Tank 48 at SRS. This will allow Tank 48 to be returned to high-level waste service, adding 1.3 million gallons of space. DOE conducted three independent reviews of several organic destruction methods and determined that fluidized-bed steam reforming is a leading treatment candidate. DOE plans to select a preferred alternative in the Fall of 2007 and return Tank 48 to service by 2013.

**Integrated High-Level Waste Salt Processing at SRS.** Also in response to Board Recommendation 2001-1, DOE completed construction and began startup testing of the Actinide Removal Process and the Modular Caustic Side Solvent Extraction Unit. DOE planned to integrate the two projects and initiate radiological operations in early fiscal year 2008. Startup of this project is an important milestone for the High-Level Waste System as it will remove salt waste from the tanks and serve as a pilot plant for the Salt Waste Processing Facility.

**Hanford Tank Farms Fill Height Increase.** DOE increased the fill height of Tank AP-108 in April 2007. Prior to the increase, the Board reviewed operator readiness, the safety basis, and tank integrity analysis, and expressed concerns about the structural and seismic methodologies used in the analyses. In response, DOE re-engaged outside experts to review the structural calculations, and discovered potential new safety concerns to be resolved

prior to increasing the fill height of the next tank.

**High Level Waste Tank Corrosion Control.** The Board encouraged DOE to continue laboratory testing of corrosion mechanisms related to High Level Waste tanks. This effort will lead to assurances that DOE's High Level Waste tanks can continue to perform as designed for an anticipated 30 more years. DOE continues this testing at CC Technologies in Ohio. Based on the test results for Tank AN-107 at Hanford, DOE imposed a change in sludge chemistry limits for this tank. Tests for corrosion propensity of nitrate and nitrite chemistry in Tank AP-101 and carbonate-based chemistry in Tank AY-102 showed less aggressive corrosion than that in Tank AN-107. Hence, DOE plans to implement less-restrictive chemistry limits for Tanks AP-101 and AY-102.

**Waste Storage in Tank 11 at SRS.** In the Implementation Plan for Recommendation 2001-1, *High-Level Waste Management at the Savannah River Site*, DOE stated that no waste would be stored in old, non-compliant waste tanks. However, further delays in salt waste processing at SRS have exacerbated the tank space situation there. In response, DOE again proposed the use of an old tank, Tank 11, for waste storage. The Board reviewed this proposal and agreed that waste can be safely stored in Tank 11, given that DOE follows eleven specific safety precautions.

**Decommissioning Activities at Hanford's Plutonium Finishing Plant.** Due to delays in its ability to consolidate nuclear materials, decommissioning of the Plutonium Finishing Plant has been extended from 2009 to 2016. The Board reviewed the results of contractor life extension evaluations to determine if upgrades or replacements of vital safety systems are required during this extended decommissioning period. The Board agreed with planned upgrades to certain safety systems, but is continuing to evaluate the adequacy of aged cables and electrical equipment necessary to operate the vital safety systems.

**Air Filters at Hanford's Plutonium Finishing Plant.** In response to a positive Unreviewed Safety Question report on the adequacy of High Efficiency Particulate Air (HEPA) filter, the Board requested information regarding the test method used in conjunction with the HEPA filters. The Board found that the test method did not satisfy the requirements in the American Society of Mechanical Engineer's standards, but that the contractor's compensatory measures and planned facility modifications to meet the standard were adequate.

**Retrieval of Buried Radioactive Waste at Hanford.** DOE continues to remove radioactive and hazardous wastes from several old burial grounds at Hanford. Dispersal of radioactive materials is possible during remediation of these burial grounds. The Board questioned the adequacy of work planning and the level of controls called for in the safety analyses. In response, DOE is working to develop improved controls to protect the workers and the public.

**Idaho Facility Startup Process.** DOE's contractor at the Idaho Cleanup Project authorized the startup of remote-handled TRU waste drum venting after completing a contractor management self-assessment (MSA). The Board commented to DOE that an MSA reflects a level of rigor far less than that required for the startup of a Hazard Category 2 nuclear activity. In response, DOE performed an independent review of the Idaho startup processes and found that the site was not in compliance with their own procedures. DOE managers at Idaho committed to making changes to improve the startup readiness process.

**TRU Waste Drum Retrieval and Characterization.** The Board noted inconsistent, and in some cases unsafe, activities during the retrieval, characterization, and handling of TRU waste drums at several sites. In response, DOE's TRU Waste Corporate Board formed a working group to develop a consistent approach for handling TRU waste drums, and for controlling the hazards associated with the drums. This effort culminated in the issuance of DOE-STD-5506-2007, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*. The Board continued to follow the subsequent effort by TRU waste generator sites to come into conformance with the standard.

**TRU Waste Shipment at SRS.** DOE planned a "non-routine" shipment of TRU waste between facilities on-site at SRS. These planned shipments included large quantities of radioactive materials and presented a significant risk to workers. The Board reviewed the plans for this effort and found an inadequate safety analysis for the shipments and a lack of DOE oversight. After discussion between the Board and DOE, the DOE site manager directed the contractor to submit appropriate safety documents to DOE for approval prior to commencing shipment.

**Performance Goal 2**

**Nuclear Material Processing and Stabilization.** The processing, stabilization, and disposition of DOE defense nuclear materials and facilities are performed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2006 Performance Accomplishments**

**Hanford Sludge Retrieval and Disposition Project.** The Board noted that the fabrication of sludge transfer equipment was not in accordance with the documented safety analysis (DSA) assumptions for the equipment and also noted the lack of a systematic engineering approach to verify the DSA assumptions. The project corrected the discrepancy and initiated a tracking mechanism for future design efforts. The Board also identified a problem with the integration of safety into the design for the sludge treatment project. DOE investigated the extent of the condition and suspended the procurement authorization pending DOE approval of the preliminary DSA.

**High Level Waste (HLW) Tank Integrity—Vapor Space Corrosion.** In response to a Board letter regarding corrosion in the vapor space of HLW tanks, DOE sponsored an expert panel at Hanford July 10-12, 2006, to evaluate the mechanisms of this type of corrosion. The expert panel identified several mechanisms by which corrosive species could concentrate on tank walls and plans to propose a series of laboratory experiments to evaluate these mechanisms. This should allow DOE to identify additional measures to protect the integrity of HLW tanks.

**Tank AN-107 Chemistry Control at Hanford.** The DSA for Hanford’s HLW tanks requires the liquid waste to have a minimum pH of 13 to prevent corrosion. However, the liquid in the sludge of Tank AN-107 was at pH 11 and decreasing to pH 10. The Board questioned DOE’s approval of a waiver to accept this lower pH without adequate technical justification. DOE responded by establishing a test program to determine optimum waste chemistry limits for maintaining tank integrity. The first phase of this program studied the effect of pH on corrosion. The results showed the pH could as be as low as 10 without significantly increasing the corrosion rate. To confirm the laboratory results, DOE plans to install a corrosion probe in tank AN-107 to continuously monitor corrosion.

**Decommissioning Activities at Hanford’s Plutonium Finishing Plant (PFP).** Because of delays in DOE’s ability to consolidate nuclear materials, decommissioning activities at PFP have slowed, and the date for completing decommissioning has been extended from 2009 to 2016. The Board continues to evaluate the transition of PFP from a near-term decommissioning mission to an extended layup period. Through a number of walk downs of the PFP facilities, the Board identified deficient areas (e.g., structure and fire protection piping deterioration) that will require additional attention from DOE if the safety systems and features are to remain operational during the extended layup period.

**Soil Remediation at Hanford.** The Board reviewed the safety basis and work planning for the 118-K Burial Ground remediation activity to determine if nuclear criticality concerns had been adequately addressed and if the DSA was compliant with guidance from DOE. The initial version of the DSA contained numerous criticality controls that did not comply with DOE criteria. The Board provided feedback to DOE, resulting in a revision to the DSA such that the DOE criteria were met and unnecessary criticality safety controls were removed.

**Hanford Site Conduct of Operations.** The Board routinely observed operations at the Hanford Site’s Tank Farms, the K Basin Closure Project, and the Plutonium Finishing Plant and commented on deficiencies in conduct of operations. In response, DOE implemented improvement plans for conduct of operations. The Board has recently noted improvements in the safety of these operations.

**Waste Drums Containing Plutonium-238 at Hanford.** Since 2002, the Board has noted the potential hazards associated with the retrieval, handling, and disposition of 12 drums containing plutonium oxides with a high plutonium-238 content. The drums were located in a burial ground at the Hanford Site. In October 2005, DOE safely retrieved the 12 drums and placed them in interim safe storage.

**Transuranic (TRU) Waste Drum Handling at Hanford.** The Board reviewed hydrogen controls for vented TRU waste drums at Hanford and found the controls to be non-conservative. DOE was using a control level of 15% hydrogen, while the safe and commonly accepted control level is 4% (the lower flammability limit for hydrogen). After this concern was communicated, DOE reduced the control level for hydrogen concentration in vented drums.

This represented a significant improvement in safety margin for these operations.

**Safe storage of neptunium oxides at Idaho National Laboratory (INL).** Operators at the Material and Fuels Complex at the INL have received and stored neptunium oxide materials shipped from SRS. The Board reviewed the neptunium storage plans and provided feedback to DOE regarding the adequacy of the storage plans. As a result, DOE is working to develop a new surveillance and maintenance plan for this activity.

**Decommissioning at the Fernald Closure Project.** The Board reviewed and provided comments to DOE on the safety of final decommissioning and closure work at the site. In response, DOE made changes to improve safety during the demolition of the Silos waste treatment facilities and during placement of contaminated soil and debris in the On-Site Disposal Cells. DOE completed all site closure work in FY 2006.

**Tank 48 Disposition at SRS.** In response to Board Recommendation 2001-1, DOE submitted a letter report assessing alternatives for treatment of organic compounds and HLW contained in Tank 48. Also, in response to Board concerns, DOE made a new commitment in the Implementation Plan for Recommendation 2001-1 to return Tank 48 to waste processing service by 2010, utilizing organic destruction in a newly designed treatment facility.

**Trapped Hydrogen in Process Systems.** Based on information from the Waste Treatment Plant at Hanford, the SRS contractor identified all components (e.g., piping) in the Defense Waste Processing Facility (DWPF) that could be capable of trapping hydrogen, which could lead to pressure loads during an explosion. In response to Board observations, additional validation of the hydrogen explosion model was performed to ensure it could generate accurate predictions for DWPF piping configurations. Furthermore, to address Board concerns regarding hydrogen buildup in failed tank cooling coils, the contractor formed a team to incorporate consideration of this hazard into the work planning process, and issued a report listing equipment of concern, along with corresponding recommended controls.

**Startup Readiness Reviews at SRS.** The Board observed the readiness review performed by the contractor for the retrieval of waste from an older-style HLW tank, using a new mixer pump and equipment, and found that the rigor and scope of the readiness review was inadequate. In response, DOE required the contractor to perform additional reviews to demonstrate readiness to begin waste retrieval operations. Furthermore, the procedure for performing readiness assessments was significantly revised to incorporate lessons learned and good practices. Observations from the Board's extensive oversight of readiness reviews during the year resulted in a number of weaknesses being corrected and subsequently, a noticeable improvement in the planning, conduct, and thoroughness of contractor readiness reviews.

**DOE Technical Oversight at SRS.** On March 3, 2006, the Board issued a letter informing the DOE Savannah River Operations Office (DOE-SR) that it was not aggressively pursuing the new oversight requirements contained in DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*, and that DOE-SR must fill a substantial gap if it is to fully implement the new oversight directives by the required date. Included in the letter was a 90-day reporting requirement to the Secretary of Energy requesting implementation plans for DOE Order 226.1 across the defense nuclear complex. The Board is continuing to provide extensive oversight of site office corrective actions to ensure they have the desired effect.

**Conduct of Operations at SRS.** The Board pointed out several deficiencies in the conduct of nuclear operations at SRS. These observations resulted in further DOE and contractor reviews of radiological protection, increased senior management watches, the addition of safety prerequisites to procedures, the performance of mockups, and improved critiques. Formal conduct of operations is now improving, leading to safer nuclear operations.

**TRU Waste Drum Retrieval and Characterization.** During visits to several DOE sites, the Board noted inconsistent, and in some cases unsafe, approaches from site to site during the retrieval, characterization, and handling of unvented and newly vented TRU waste drums. In response, DOE's TRU Waste Corporate Board is addressing the need for a consistent approach for dealing with unvented TRU drums, the hydrogen gas hazard, and other hazards associated with handling TRU waste. DOE's effort is expected to culminate in the issuance of a new DOE Standard for TRU waste handling activities.

**Soil Sampling at Tank W-1A, Oak Ridge National Laboratory.** The Board pointed out deficiencies in work planning for the sampling and characterization of soils near Tank W-1A at the Oak Ridge National Laboratory. Areas of weakness included hazard analyses, work instructions, and preparation of radiation work permits. In response, DOE revisited and completed thorough radiological work planning efforts that culminated in a safe and efficient sampling and characterization effort.

## 7. PERFORMANCE GOAL 3: NUCLEAR FACILITIES DESIGN AND INFRASTRUCTURE

**New DOE defense nuclear facilities, and major modifications to existing facilities, are designed and constructed in a manner that ensures adequate protection of the health and safety of the workers and the public.**

**OUTCOME:** DOE will have acknowledged, acted upon, and/or resolved the health and safety issues raised by the Board. Follow-up technical evaluation will verify necessary improvements in the design and construction of DOE's new nuclear facilities and major modifications to existing facilities. New nuclear facilities will meet acceptable safety standards.

### **SUMMARY:**

For the next ten years, DOE is undertaking significant development of new capability to process legacy special nuclear materials, and is replacing aging facilities needed to maintain the nuclear weapons complex. Much of this activity is well underway for several major projects with construction of the Waste Treatment Plant, the Highly Enriched Uranium Materials Facility, the Salt Waste Processing Facility and the Waste Solidification Building; and design of the Chemistry and Metallurgy Research Replacement Project and Uranium Processing Facility. DOE design and construction activity in FY 2011 will continue to require the Board to expend significant resources in exercising its oversight in this area to ensure that new facilities will be adequate to perform their intended functions safely. The key performance objectives for FY 2011 in this strategic area of concentration are:

- Ensure adequate design and construction of the Waste Treatment Plant at the Hanford Site.
- Ensure adequate construction, startup testing, and development of Technical Safety Requirements for the Integrated Waste Treatment Unit to treat sodium-bearing waste at Idaho National Laboratory.
- Ensure adequate design of the Chemistry and Metallurgy Research Replacement Project at Los Alamos National Laboratory.
- Ensure adequate design of the Radioactive Liquid Waste Treatment Facility Upgrade Project to treat liquid waste at Los Alamos National Laboratory.
- Ensure adequate construction, startup testing, and development of Technical Safety Requirements for the Salt Waste Processing Facility for treatment of high-level waste liquids and salts at the Savannah River Site.

- Ensure the adequate design of the recently chartered Pit Disassembly and Conversion Project. This project is a consolidation of two separate efforts, the Pit Disassembly and Conversion Facility and the Plutonium Preparation Project, intended to dispose of plutonium-bearing materials at the Savannah River Site.
- Ensure adequate construction and startup testing of the Waste Solidification Building at the Savannah River Site.
- Ensure adequate design of the Uranium Processing Facility at the Y-12 National Security Complex.

### **Challenges for the Board's Safety Oversight:**

**Design and Construction of Nuclear Facilities.** One of the Board's statutory responsibilities is the review of design and construction projects for DOE's defense nuclear facilities to ensure that adequate health and safety requirements are identified and implemented. These facilities must be designed and constructed in a way that will support safe and efficient operations for 20 to 50 years. This requires an exacting design process that will ensure appropriate safety controls are identified and properly implemented early in the process. Integrated Safety Management (ISM) provides the framework for this process. The Board's expectation is that the design and construction phases will identify the set of risks for each project and demonstrate clear and deliberate implementation of ISM principles and core functions.

The Board has become more proactive in identifying safety issues early in the design process to avoid significant cost and schedule impacts later in design and construction. The Board's involvement during the later detailed design stages has also increased as pressure to complete projects on cost and schedule has occurred. The Board's involvement is needed to ensure that the safety aspects of the design are not compromised as a means of cost or schedule recovery. The Board has expended considerable resources in evaluating proposed design changes to reduce the need for safety-related systems for the Waste Treatment Plant at Hanford. The Board intends to continue issuing a periodic report to Congress that identifies the Board's issues with new nuclear facilities. This report forms the basis for periodic discussions between the Board and DOE to help ensure DOE senior managers, project personnel, and the Board share a common understanding of the Board's issues and actions needed to resolve the issues.

The Board has noted many problems occurring in the DOE complex with construction practices and procurement of safety equipment that has led the Board to become more involved early in construction, as well as in ensuring adequate quality assurance for procurement and installation of the materials and equipment used in facility construction. Additionally, as facilities near completion, the Board is reviewing the testing of safety systems and the development of Technical Safety Requirements as facilities transition to operation, thereby ensuring the proper operation of safety systems. The Board expects such activities to be required for the foreseeable future.

The Board's reviews of the design and construction of major facilities and projects are resource intensive and time consuming but result in significant safety improvements. The Board's early involvement in the design effort requires multiple reviews of safety systems to assess whether they meet design expectations. The Board has demonstrated the value of rigorous technical oversight to ensure that safety is addressed early in the design process. The Board's reviews of construction and functional testing of safety equipment as it is installed have helped ensure adequate quality and performance of required safety systems.

The following list provides a brief description of major DOE projects currently underway, or planned for the near future, that will require significant Board resources to review. It provides an informal rating of three characteristics: Significance (overall importance of the facility to the mission of the complex); Complexity (relative assessment of the difficulty in successfully implementing the design); and Risk (assessment of programmatic risk and safety risk for the facility):

- **Hanford Site (Office of River Protection) - Waste Treatment Plant:** a project consisting of four major nuclear facilities to pretreat and vitrify waste from the Hanford high-level waste tank farms. HIGH SIGNIFICANCE, HIGH COMPLEXITY, HIGH RISK.
- **Hanford Site (Office of River Protection) - Interim Pretreatment System:** a project to provide pretreatment of low-level waste from the Hanford high-level waste tank farms. MODERATE SIGNIFICANCE, MODERATE COMPLEXITY, HIGH RISK.
- **Hanford Site (Office of River Protection) - Tank Retrieval and Waste Feed Delivery System:** long-term project to provide feed to the proposed Hanford Waste Treatment Plant. HIGH SIGNIFICANCE, MODERATE COMPLEXITY, MODERATE RISK.
- **Hanford Site (Richland Operations Office) - Large Package and Remote Handled TRU and Mixed Waste Facility:** a new facility or major facility modification to provide the capability to repackage transuranic, mixed transuranic, and low-level wastes for disposal. HIGH SIGNIFICANCE, LOW COMPLEXITY, MODERATE RISK.
- **Idaho National Laboratory - Integrated Waste Treatment Unit:** a new facility being planned to treat about one million gallons of sodium-bearing wastes. MODERATE SIGNIFICANCE, LOW COMPLEXITY, MODERATE RISK.
- **Los Alamos National Laboratory - TA-54 Waste Management Mitigation:** to mitigate fire-related vulnerabilities in TA-50 (radioactive liquid waste operations) and TA-54 (solid waste) operations. MODERATE SIGNIFICANCE, LOW COMPLEXITY, LOW RISK.
- **Los Alamos National Laboratory - Radioactive Liquid Waste Treatment Facility Replacement Project:** to replace the current aging and deteriorating facility with a modern facility. HIGH SIGNIFICANCE, MODERATE COMPLEXITY, MODERATE RISK.

- **Los Alamos National Laboratory - Chemistry and Metallurgy Research Replacement Facility:** to replace the current aging and deteriorating facility with a modern facility. HIGH SIGNIFICANCE, HIGH COMPLEXITY, HIGH RISK.
- **Nevada Test Site - Criticality Experiments Facility:** a facility within the Device Assembly Facility to which the criticality experiment and complex-wide criticality training capabilities from TA-18 at Los Alamos National Laboratory are being transferred. HIGH SIGNIFICANCE, HIGH COMPLEXITY, MODERATE RISK.
- **Oak Ridge National Laboratory - Building 3019, Uranium-233 Downblending and Disposition Project:** the project will give DOE the capability to process the inventory of uranium-233 stored in Building 3019 at Oak Ridge National Laboratory into a disposable form without safeguard requirements. MODERATE SIGNIFICANCE, LOW COMPLEXITY, MODERATE RISK.
- **Pantex Plant - Weapon Surveillance Facility:** new bay complex that will increase the Pantex Plant's existing capacity and provide new capabilities for the surveillance and requalification of weapons and weapon components. MODERATE SIGNIFICANCE, LOW COMPLEXITY, MODERATE RISK.
- **Savannah River Site - Salt Waste Processing Facility:** to be used to remove cesium, strontium, and actinides from high-level waste. The high-activity stream would go to the Defense Waste Processing Facility for vitrification in glass logs. The low-activity stream would go to the Saltstone Production Facility for disposal in grout. HIGH SIGNIFICANCE, HIGH COMPLEXITY, MODERATE RISK.
- **Savannah River Site - Pit Disassembly and Conversion Project:** to convert surplus weapons-grade plutonium metal into oxide for subsequent feed to the Mixed Oxide (MOX) Fuel Fabrication Facility. This project represents a combination of the Pit Disassembly and Conversion Facility and the Plutonium Preparation Project as one project in the K-Area Complex. HIGH SIGNIFICANCE, HIGH COMPLEXITY, HIGH RISK.
- **Savannah River Site - Waste Solidification Building:** to process waste streams generated in the Pit Disassembly and Conversion Facility and MOX Fuel Fabrication Facility. MODERATE SIGNIFICANCE, LOW COMPLEXITY, LOW RISK.
- **Y-12 National Security Complex - Uranium Processing Facility:** a new facility to replace aging facilities and consolidate current capability to process uranium materials at Y-12. HIGH SIGNIFICANCE, HIGH COMPLEXITY, MODERATE RISK.
- **Y-12 National Security Complex - Highly Enriched Uranium Materials Facility:** to provide long-term consolidated storage for all highly enriched uranium material forms at the Y-12 Site. HIGH SIGNIFICANCE, MODERATE COMPLEXITY, MODERATE RISK.

- **Y-12 National Security Complex - Uranium Processing Facility:** a new facility to replace aging facilities and consolidate current capability to process uranium materials at the Y-12 Site. HIGH SIGNIFICANCE, HIGH COMPLEXITY, MODERATE RISK.

**Performance Goal 3**

**Nuclear Facilities Design and Infrastructure.** New DOE defense nuclear facilities, and modifications to existing facilities, are designed and constructed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2011 Performance Objectives**

The Board and its staff will continue reviews of DOE's implementation of integrated safety management (ISM) in design and construction activities. At least five reviews will be completed. In general, the reviews will evaluate the adequacy of geotechnical specifications and hazards analyses; the design of safety-related structures, systems, and components (SSCs); and the adequacy of SSC installation, startup, and operational readiness. Candidates for review include:

- Continue design and construction reviews, and initiate review of testing and turnover of safety systems for the Waste Treatment Plant at the Hanford Site.
- Review construction and preparations for startup of the Integrated Waste Treatment Unit at Idaho National Laboratory.
- Review the final design of the Chemistry and Metallurgy Research Replacement facility at Los Alamos National Laboratory.
- Review the construction of the Radioactive Liquid Waste Treatment Facility Replacement Project at Los Alamos National Laboratory.
- Review the design of the Pit Disassembly and Conversion Project at Savannah River Site.
- Review the design of the Plutonium Preparation Project at Savannah River Site.
- Review construction and development of Technical Safety Requirements for the Salt Waste Processing Facility at Savannah River Site.
- Review construction of the Waste Solidification Building at Savannah River Site.
- Review startup activities for modification to Building 3019 at Oak Ridge National Laboratory in preparation for processing of uranium-233.
- Complete review of the preliminary design of the Uranium Processing Facility at the Y-12 National Security Complex.

As a result of these reviews, DOE will have acknowledged, acted upon, and/or resolved the health and safety issues raised by the Board. Follow-up technical evaluation will verify necessary safety improvement in the design and construction of DOE's new nuclear facilities and major modification to existing facilities. New nuclear facilities will meet acceptable safety standards.

**Performance Goal 3**

**Nuclear Facilities Design and Infrastructure.** New DOE defense nuclear facilities, and modifications to existing facilities, are designed and constructed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2010 Performance Objectives**

The Board and its staff will continue reviews of DOE's implementation of integrated safety management (ISM) in design and construction activities. At least five reviews will be completed. In general, the reviews will evaluate the adequacy of geotechnical specifications and hazards analyses; the design of safety-related structures, systems and components (SSC); and the adequacy of SSC installation, startup, and operational readiness. The Board will also review proposed changes in the safety control strategy as facilities are constructed. Candidates for review include:

- Continue design and construction reviews of the Waste Treatment Plant at the Hanford Site.
- Review construction and preparations for startup of the Integrated Waste Treatment Unit at Idaho National Laboratory.
- Review the enhanced preliminary design and final design of the Chemistry and Metallurgy Research Replacement facility at Los Alamos National Laboratory.
- Review the final design of the Radioactive Liquid Waste Treatment Facility Replacement Project at Los Alamos National Laboratory.
- Continue construction operational reviews of the Criticality Experiments Facility at the Device Assembly Facility at Nevada Test Site.
- Review the design of the Pit Disassembly and Conversion Project at Savannah River Site.
- Review the preliminary design of the Plutonium Preparation Project at Savannah River Site.
- Review construction of the Waste Solidification Building at Savannah River Site.
- Review construction and development of Technical Safety Requirements for the Salt Waste Processing Facility at Savannah River Site.
- Review the final design, construction, and preliminary startup activities for modifications to Building 3019 at Oak Ridge National Laboratory in preparation for processing of uranium-233.
- Continue review of preparations for operation of the Highly Enriched Uranium Materials Facility at the Y-12 National Security Complex.
- Complete review of the preliminary design of the Uranium Processing Facility at the Y-12 National Security Complex. Review the final design supporting site preparation work and long-lead procurement of equipment.
- Continue to review the quality improvements in the manufacture and qualification testing of safety-related HEPA filters.

As a result of these reviews, DOE will have acknowledged, acted upon, and/or resolved the health and safety issues raised by the Board. Follow-up technical evaluation will verify necessary safety improvement in the design and construction of DOE's new nuclear facilities and major modification to existing facilities. New nuclear facility designs will meet acceptable safety standards.

**Performance Goal 3**

**Nuclear Facilities Design and Infrastructure.** New DOE defense nuclear facilities, and modifications to existing facilities, are designed and constructed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2009 Performance Accomplishments**

**Congressional Mandate: Chemistry and Metallurgy Research Replacement Facility at Los Alamos National Laboratory.** Pursuant to the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, the Board has conducted extensive reviews of the preliminary design of the CMRR Nuclear Facility as part of certifying that design concerns reported by the Board have been resolved. During the past year considerable resources have been dedicated to the CMRR certification review. The Board identified seven topical areas for the certification review, which were the five open Board concerns identified in its quarterly reports to Congress plus two additional areas the Board considered important for the CMRR design process. The Board developed a systematic approach to completing the certification review, identifying concerns with NNSA's resolution of the topic area, and formally transmitting these concerns to NNSA for resolution. Based on NNSA responses and commitments each of these concerns were resolved. On September 4, 2009, the board met the Congressional mandate by issuing *Chemistry and Metallurgy Research Replacement Facility Project, Los Alamos National Laboratory, Certification Review, Report to Congressional Defense Committees*. NNSA has committed to implement detailed designs consistent with specific design requirements to which NNSA had agreed as part of the certification process. The Board intends to review additional design material as it becomes available, and to review the final design and Documented Safety Analysis once the CMRR project is given approval to proceed to final design.

**Safety-in-Design:** With significant Board involvement, DOE developed a change to DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, developed sixteen guidance documents to implement this order, and developed a proposed change to DOE Order 420.1B, *Facility Safety*, incorporating changes required to address safety-in-design issues. The Board reviewed and commented on these orders and guides.

**Waste Treatment Plant (WTP) at the Hanford Site.** The Board has continued its review of the design and construction of important-to-safety structures, systems, and components in the Waste Treatment Plant facilities. The Board's activities primarily consisted of evaluating the resolution of previously identified issues. Specifically:

- Following resolution of Board comments, the final summary structural reports for the Pretreatment and High Level Waste Facilities have been prepared. DOE is continuing to work on the final structural design for these facilities. The Board expects that DOE will satisfactorily complete the structural design for the Pretreatment and High Level Waste Facilities and submit final summary structural reports that fully demonstrate that the WTP facilities meet all structural design requirements.
- The Board resolved issues described in its letter dated June 24, 2008, regarding concerns with the contractor's proposed implementation of DOE Standard 1066, *Fire Protection Design Criteria*. The current WTP design for the confinement ventilation systems ensures they perform as expected and are adequately protected from the effects of a fire.
- In a letter dated January 9, 2009, the Board resolved a long-standing issue with fire protection coating of structural steel in WTP facilities. The Board evaluated the adequacy of fire protection coatings to protect facilities containing radiological and chemical hazards, and reviewed the chemical hazards in each of the WTP facilities. The Board's review revealed that the fire coatings applied in each facility are adequate to prevent structural collapse in a design-basis fire.
- The Board initiated review of proposed changes to the safety strategy in the Pretreatment Facility that would have reduced the safety classification of all the safety systems in the facility. The Board did not find the bases for the proposed changes to be technically defensible. DOE has revised its strategy and is maintaining some safety-class controls but has not yet provided an adequate justification for the entire safety strategy. The Board is continuing its evaluation.

**Integrated Waste Treatment Unit at Idaho National Laboratory.** The Board continued its review of the design and construction of the Integrated Waste Treatment Unit. The Board's activities focused on evaluating the resolution of previously identified issues. In a safety-in-design project letter dated January 24, 2007, the Board had identified several issues that required resolution during final design. Based upon the root-cause analysis of an over-temperature event in the pilot plant's charcoal bed, DOE modified the design to prevent and mitigate the event. Analysis of the waste characterization was completed which verified the control strategy was adequate for the worst-case inventory. The safety-related instrumentation and control system design was revised to separate its safety-related functions and power supply from the rest of the network, and an appropriate design standard was adopted to ensure its reliability. These actions resolved all outstanding Board issues with the project.

**New Solid Transuranic Waste Facility Project at Los Alamos National Laboratory (LANL).** Following the Board's review in November 2008, NNSA decided to place construction plans on hold pending completion of an engineering needs assessment. The Board's review identified problems with the facility safety strategy, e.g. the use of personal protective equipment in lieu of engineered safeguards to provide worker protection, and poor integration of safety into the design. This project remains on hold.

**Radioactive Liquid Waste Treatment Facility Replacement Project at LANL.** The Board had previously raised concerns with the preliminary design of the facility, and concluded there was weak integration of the safety and design processes and weak federal oversight. The Board continued to pursue the resolution of these concerns. NNSA has made some progress in addressing some of the concerns. For example:

- Federal oversight has been enhanced through the addition of more personnel dedicated to the project. It is premature to assess whether this action will be effective in improving federal oversight.
- The design was changed to require stainless steel process equipment in lieu of plastic processing equipment to provide confinement for the liquid radioactive waste.

**Criticality Experiments Facility and Device Assembly Facility at the Nevada Test Site.** The criticality testing capability from TA-18 at LANL is being relocated to the Criticality Experiments Facility, which will be housed in the Device Assembly Facility at the Nevada Test Site. In a letter dated January 18, 2008, the Board highlighted the lack of progress in addressing ongoing operational problems and design deficiencies in the water supply for the safety-related fire suppression systems. DOE subsequently conducted several studies culminating in long-term line item requests to replace the water tank and lead-in pipes. In the interim, short-term projects are being pursued to modify sprinkler systems to correct design deficiencies, replace strainers, refurbish the existing water tank, and investigate using standalone fire suppression systems to supplement the existing deficient fire sprinkler systems. A July 29, 2009, Board letter encouraged NNSA to complete the planned work and not allow administrative compensatory measures (e.g., posting a fire watch) to serve as a long-term substitute for reliable engineered safety systems.

**Device Assembly Facility Structure.** In a letter dated August 16, 2006, the Board noted concerns with extensive cracking and water leaks in the Device Assembly Facility. After further Board urging, DOE conducted concrete strength testing to determine whether the facility structure can function as designed. The Board reviewed the test results and concluded that the concrete meets strength requirements. This long-standing concern is now considered closed.

**Flammable Gas Generation at the Savannah River Site (SRS) Salt Waste Processing Facility.** The Board previously identified the need to evaluate the impact of thermolysis on the generation of flammable gases in the process vessels. The flammable gas generation rate assumed in the project analysis was not technically defensible. As a result of the Board's review, DOE initiated testing to validate the assumptions made in the safety basis regarding generation of flammable gases. The Board reviewed the test results and concluded that the flammable gas generation rate assumed in the design analysis adequately bounded the rate determined in the experimental testing. This concern is now considered closed.

**Structural Design of the SRS Salt Waste Processing Facility.** The Board previously 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, structural design, and summary structural report for the facility, and determined that all concerns were resolved.

**Final Design Review of the SRS Salt Waste Processing Facility.** The Board reviewed the final design of the Salt Waste Processing Facility. As a result of this review, the Board issued a safety-in-design project letter concurrent with Critical Decision (CD)-3 that stated the safety strategy was sound and identified no significant safety issues that would preclude the start of construction. The Board identified several new issues that require resolution as the design process continues: (1) the structural analysis of the ability of process piping to withstand potential explosions (deflagrations or detonations) did not include several considerations, (2) flammable gas generation rates assumed by the facility did not consider all potential sources of heat input into process vessels, (3) the design of the confinement ventilation system does not implement all features or demonstrate the equivalency of the design to those features specified in Section 14 of DOE Standard 1066, *Fire Protection Design Criteria*, for the protection of the final stage of high-efficiency particulate air filters, (4) the design of the facility does not ensure that all operator actions deemed necessary in the Preliminary Documented Safety Analysis following a seismic event can be readily accomplished, and (5) additional actions beyond those identified in the Preliminary Documented Safety Analysis may be required. The project is in the process of revising its design and performing additional analyses to address these concerns.

**Instrumentation and Control System for the SRS Salt Waste Processing Facility.** The Board reviewed the design of the safety-related portion of the instrumentation and control system for the Salt Waste Processing Facility. This review identified that (1) the isolation of the safety-related portion of the distributed control system from other portions of the system requires better description and understanding by the project to ensure this functional requirement is met, (2) the safety integrity level specified in the Preliminary Documented Safety Analysis may not be achievable, and (3) the project lacked a clear plan to ensure adequate quality of the software to be used in the system. The project is taking action to address the concerns raised during this review.

**Quality Assurance for SRS Salt Waste Processing Facility.** The Board initiated reviews of the construction practices being utilized for the placement of concrete for the facility. The Board identified numerous quality problems with the control of the materials used to form the concrete that could have affected the as-placed concrete strength. The project took actions to correct the problems identified. The Board also initiated review of the procurement of safety-related equipment. The project is using a commercial grade dedication process for most procurements. The Board's review concluded that the methodology would not ensure the requisite quality of the safety-related components. The Board reviewed configuration management procedures for the project, and found weaknesses that resulted in discrepancies in design and procurement documentation. The project is in the process of rewriting procedures to correct its configuration management and procurement practices. The Board will continue to review this area.

**Waste Solidification Building at SRS.** The Board completed a final design review for the Waste Solidification Building, as documented in a letter dated January 12, 2009. The Board closed all final design issues related to structural design, red oil, and hydrogen deflagration/detonation prior to the project receiving CD 2/3 on December 10, 2008. The issues related to red oil and hydrogen deflagration/detonation will continue to be followed by the Board as safety controls are being finalized and implemented.

**Uranium-233 Downblending at Oak Ridge National Laboratory.** In a September 14, 2007, safety-in-design project letter, the Board identified safety-related concerns with the Uranium-233 Downblending and Disposition Project. The Board and DOE reached agreement on the path forward to address these issues. The Board initiated review of the Preliminary Documented Safety Analysis.

**Startup Testing for the Highly Enriched Uranium Materials Facility at the Y-12 National Security Complex.** The Board reviewed the startup testing of safety-related systems at the Highly Enriched Uranium Materials Facility. The Board concluded that the testing generally ensured that the safety-related systems would meet their functional requirements, although two gaps were noted. The Board also noted problems with the configuration management of the software used for the safety-related confinement ventilation system. The project is taking action to address the Board's concerns.

**Quality Assurance for the Y-12 Highly Enriched Uranium Materials Facility.** As the Highly Enriched Uranium Materials Facility was being constructed, the project identified quality assurance concerns with thousands of fasteners used in safety-class storage racks. The Board ensured that corrective actions that included sample testing of fasteners would provide a technically defensible rationale for acceptance of the fasteners. The project's initial plans were inadequate; additional actions identified by the Board were subsequently incorporated into the corrective action plan. The Board reviewed the testing results and concluded that the fasteners could be reasonably accepted as-is. This concern is considered closed. The Board is now encouraging DOE to provide detailed lessons learned to help preclude recurrence of this and other quality problems experienced by the project.

**Uranium Processing Facility at the Y-12 National Security Complex.** The Uranium Processing Facility project continued with its preliminary design phase in FY 2009. The Board has continued to conduct reviews of the project management, DOE oversight, geotechnical and structural design, development of safety systems design, design criteria development, and technology development. These reviews have served to resolve open items from the Board's August 9, 2007, safety-in-design project letter, have provided timely input to improve the project design inputs, and kept the Board up to date on revision to design strategies to prevent new issues from developing and support future reviews at the completion of preliminary design.

**Filter Test Facility.** Nuclear-grade high-efficiency particulate air (HEPA) filters used in essentially all new nuclear facilities are tested in the Filter Test Facility to ensure the filters meet performance requirements. In a letter dated March 17, 2008, the Board expressed concerns with degradation in quality of the nuclear filters as reported by the Filter Test Facility. In the past year, DOE has improved the acquisition and transmittal of data from testing to responsible procurement personnel, allowing formal corrective action processes to be initiated for testing failures. DOE is continuing to work with the contractors to address quality improvement and verification testing for HEPA filters purchased by DOE.

**Performance Goal 3**

**Nuclear Facilities Design and Infrastructure.** New DOE defense nuclear facilities, and modifications to existing facilities, are designed and constructed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2008 Performance Accomplishments**

**Safety-in-Design:** As a result of the Board's three public meetings on safety-in-design, the DOE concluded new guidance was needed. With significant Board involvement, DOE developed and published DOE Standard 1189, *Integration of Safety into the Design Process*, in March 2008. This standard establishes the Department's expectations for identifying and resolving safety issues earlier in the design process and clarifies expectations associated with seismic design criteria, protection of co-located workers, and the significance of developing a safety design strategy early in the project life cycle.

The Board expects that as this standard is fully implemented, consistent with the strategy outlined in the Joint Report to Congress dated July 19, 2007, the important safety aspects of the design will be addressed earlier and if issues arise, they will be addressed and resolved earlier and without the significant cost or schedule impacts that have been historically observed.

**Board Recommendation 2008-1, Classification of Fire Protection Systems.** During reviews of the design of new nuclear facilities, it was apparent that consistent design criteria and operational requirements needed to be developed for safety-related fire protection systems. In this Recommendation, the Board identified the need for standards applicable to the design and operation of fire protection systems relied upon to protect the public and workers in defense nuclear facilities. DOE accepted this Recommendation and is the process of developing the needed criteria. As a compensatory measure, DOE will quickly develop interim design criteria for the type of fire suppression system most commonly in use.

**Waste Treatment Plant (WTP) at the Hanford Site.** The Board has continued its review of the design and construction of important-to-safety structures, systems, and components in the Waste Treatment Plant facilities. The Board's activities primarily consisted of evaluating the resolution of previously identified issues.

- Following resolution of issues related to seismic design criteria, DOE submitted for Board review technical reports supporting the final summary structural reports for the Pretreatment and High Level Waste Facilities. DOE is incorporating Board comments and continues to prepare final reports. DOE is continuing to work on the final structural design for these facilities. The Board expects that DOE will satisfactorily complete the structural design for the Pretreatment and High Level Waste Facilities and submit summary structural reports that fully demonstrate that the WTP facilities meet all structural design requirements.
- In a letter dated June 24, 2008, the Board noted concerns with the contractor's proposed implementation of DOE Standard 1066, *Fire Protection Design Criteria*, for protection of confinement ventilation systems from the effects of a fire. The exhaust high-efficiency particulate air filters in the ventilation systems provide a safety function and need to be protected from fires to ensure they perform as expected. DOE rejected the contractor's proposal and directed the contractor to resubmit the safety strategy for protecting the filters with adequate technical justification.
- The Board's June 24, 2008, letter noted that the issues with the contractor's implementation of DOE Standard 1066 provided an example of concerns with the project's Decision to Deviate process; specifically, the delay in resolution of safety concerns resulting in cost and schedule risks.

**Demonstration Bulk Vitrification Facility at the Hanford Site.** The Board had identified concerns with the confinement strategy being developed for the nuclear wastes that would be processed in the Demonstration Bulk Vitrification Facility at the Hanford Site. DOE and project personnel revised the confinement strategy, leading to improvements in the confinement design for the facility. In December 2007, project personnel presented technical analyses and discussions supporting the adequacy of this strategy. The Board is now satisfied that the project's strategy for confinement is adequate. In 2008, the project was put on hold and placed in a condition to support either restart or termination in FY 2010. The final design was completed and submitted to DOE in May 2008.

**Waste Feed Delivery Transfer System at the Hanford Site.** The Waste Feed Delivery transfer system will deliver high-level waste slurries from the Tank Farms to the Waste Treatment Plant. DOE performed analyses to determine the minimum design pressure rating of the system. In earlier reviews, the Board found that larger or denser particles could lead to plugging the transfer system. In response to Board concerns, DOE formed an expert panel on slurry transfer that evaluated the uncertainties and noted the need for an improved understanding of process variations, additional testing, and model revisions. DOE completed several reports that addressed the technical issues associated with the waste transfer. The Board believes its concerns have been adequately addressed and has no outstanding issues with this facility.

**Integrated Waste Treatment Unit at Idaho National Laboratory.** The Board identified issues with the structural design and design basis ground motion used for the facility. The Board reviewed the resolution of concerns with the structural design, particularly the development of the design basis ground motion, inputs into the soil-structure interaction analysis, and the use of mechanically anchored reinforcing bar, and concluded these issues had been satisfactorily addressed by DOE. The Board also reviewed the resolution of several concerns identified by the Board in a project letter issued at the beginning of 2007; progress has been made on several issues. DOE determined the root cause of an over-temperature event in the pilot plant's charcoal bed, and the subsequent design modifications to address the issue were assessed by the Board to be satisfactory. DOE is still addressing concerns with the design of a small portion of a safety system and validation of some assumptions made in the safety basis.

**Radioactive Liquid Waste Treatment Facility Replacement Project at Los Alamos National Laboratory.** The Board reviewed the preliminary design of the facility, and concluded 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. The Board continued to pursue the resolution of these concerns.

**Chemistry and Metallurgy Research Replacement Facility at Los Alamos National Laboratory.** 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. 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. The Board intends to review the final preliminary design and Preliminary Documented Safety Analysis and subsequently issue a project letter documenting any remaining issues that would need to be addressed during final design.

**Criticality Experiments Facility and Device Assembly Facility at the Nevada Test Site.** The criticality testing capability from TA-18 at Los Alamos National Laboratory is being relocated to the Criticality Experiments Facility, which will be housed in the Device Assembly Facility at the Nevada Test Site. In a letter dated August 16, 2006, the Board noted concerns with extensive cracking and water leaks in the Device Assembly Facility. After further Board urging, DOE has now conducted concrete strength testing and is evaluating the results to ensure the facility can perform its design function. In a letter dated January 18, 2008, the Board also highlighted the lack of progress in addressing ongoing operational problems and design deficiencies in the water supply to the safety-related fire suppression systems. DOE is now conducting several studies to culminate in a recommendation in FY 2009 for correcting the vulnerabilities with the water supply.

**Salt Waste Processing Facility at the Savannah River Site.** The Board reviewed the final design, structural calculations, and chemical processes for the facility. The review of the structural design focused on the resolution of previously identified deficiencies in the analysis of the facility's ability to resist natural phenomena hazards; the Board concluded that the structural design was adequate. The review of the chemical processes identified the need to evaluate the impact of thermolysis on the generation of flammable gases in the process vessels. As a result of the Board's review, the DOE initiated testing to validate the assumptions made in the safety basis regarding generation of flammable gases.

**Waste Solidification Building at the Savannah River Site.** In a letter dated June 25, 2008, the Board identified structural issues related to the roof design and the analytical approach to differential settlement. The Board has worked closely with the project to bring the issues identified in the letter to resolution. Additionally, the Board

identified safety basis issues in a letter dated July 15, 2008, related to the application of DOE Standard 1189 to the design process and the analytical approach to evaluating hydrogen explosions in unvented pipes. The Board will continue to bring open issues to resolution and complete a final design review of the Critical Decision-2/3 design package prior to its approval.

**Pit Disassembly and Conversion Facility at the Savannah River Site.** Despite the slowdown in the Pit Disassembly and Conversion Facility project, the Board continued to review selected aspects of the safety of the design of the Pit Disassembly and Conversion Facility. As a result of the Board questioning the basis for fire loading assumptions in the Documented Safety Analysis for the facility, DOE performed fire testing of gloveboxes typical of those planned for the facility. The results showed that a potential fire could be much more vigorous than expected. The Board's staff provided a list of concerns to DOE regarding the assumptions on combustible loadings in the facility in the event of a facility fire. Further work must be performed by DOE and its contractor.

**Highly Enriched Uranium Materials Facility at the Y-12 National Security Complex.** In a letter dated February 6, 2008, the Board identified that the water supply for the safety-significant fire suppression system in the facility was not classified as safety-significant consistent with design basis requirements. This safety classification would help ensure that the water supply system was reliable through more rigorous design, construction, maintenance, and configuration control. Subsequently, DOE developed actions to increase the reliability of the fire protection water supply system for the facility. These actions include: a commitment to connect to the Uranium Processing Facility safety-significant water supply tanks when completed, to provide a safety-significant water supply pressure monitor, and to incorporate safety-related configuration controls to assure availability of a dedicated flow path in the current supply system. The Board believes these actions address the Board's concern with the water supply system and considers this item closed.

**Highly Enriched Uranium Materials Facility at the Y-12 National Security Complex.** As the Highly Enriched Uranium Materials Facility was being constructed, numerous quality problems with concrete placements became evident. The Board ensured that evaluations of defects were technically appropriate and reviewed the corrective actions proposed by the project. The Board believed additional actions were necessary. These actions were subsequently incorporated into the corrective action plan. These actions helped ensure that the building met its functional design requirements.

**Uranium Processing Facility at the Y-12 National Security Complex.** The project entered the preliminary design phase in FY 2008. The Board has also conducted reviews of the project management, DOE oversight, geotechnical and structural design, design criteria development, subcontract requirements, and technology development. These reviews have served to address other open items from the Board's August 9, 2007, project letter and have provided timely input to improve the project design inputs. In a letter dated January 17, 2008, the Board identified issues with the radiological dose consequence methodology to be used for the project. Discussions with DOE following this letter resulted in DOE instituting an acceptable methodology, closing a significant issue identified in the Board's project letter and Quarterly Report to Congress.

**Filter Test Facility.** Nuclear-grade high-efficiency particulate air (HEPA) filters are used in essentially all new nuclear facilities and are tested in the Filter Test Facility to ensure the filters meet performance requirements. In a letter dated March 17, 2008, the Board expressed concerns with degradation in quality of the nuclear filters as reported by the Filter Test Facility. At the time, little DOE action was underway to try to resolve these quality concerns. In response to the Board's letter, DOE developed a plan of action to: (1) investigate and correct the root cause of increased rejection rates of HEPA filters, (2) assess the potential degradation of critical quality manufacturing attributes that are not explicitly tested, and (3) reassess the adequacy of filters considered non-safety-related that are not tested at the facility. The Board considers these actions appropriate.

**Performance Goal 3**

**Nuclear Facilities Design and Infrastructure.** New DOE defense nuclear facilities, and modifications to existing facilities, are designed and constructed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2007 Performance Accomplishments**

The Board and its staff continued providing technical evaluations of numerous design and construction projects throughout the DOE complex. These evaluations have led to DOE improving its design process, enhancing the design of new facilities, correcting construction deficiencies noted, as well as starting actions to correct identified issues. Some of these actions are:

**Safety-in-Design Public Meetings.** The Board held its third public meeting delving into the DOE design process for new defense nuclear facilities. This public meeting, held on March 22, 2007, was a continuation of previous public meetings concerning the Board's interest in integrating safety earlier into the design process. During the Board's first two public meetings, the Board focused on the adequacy of DOE's existing directives related to the design of new facilities and further explored integration of safety in design and the progress being made in implementing DOE's safety-in-design initiatives. The Board's third public meeting considered early issue identification, communication of the Board's issues to DOE, issue management, and timely closure or resolution of the issues. DOE outlined many of the improvements that have occurred as a result of its safety-in-design initiatives. DOE noted that resolving safety issues early in the design process is central to mitigating cost and schedule risks. DOE also identified the need for strong and persistent federal oversight of new design and construction projects. The results of this meeting assisted the Board and DOE in evaluating potential improvements in the timeliness of issue resolution. The information gained was used by the Board and DOE to develop its Joint Report to Congress, *Improving the Identification and Resolution of Safety Issues During the Design and Construction of DOE Defense Nuclear Facilities*, issued in July 2007.

Overall, the public meetings have led to:

- new expectations for identifying and resolving safety issues earlier in the design process,
- revision of the existing DOE Order for project management,
- commitments to revise the existing DOE Manual for project management and develop a new standard to implement a more rigorous approach to safety-in-design, and
- action by DOE and the Board that will provide for more timely identification of and resolution of technical issues.

The Board expects that these actions, when fully implemented, should lead to significant improvements in the design of new defense nuclear facilities.

**Quarterly Report(s) on the Status of Significant Unresolved Issues with the Department of Energy's Design and Construction Projects.** In response to a Congressional reporting requirement, the Board initiated actions to prepare quarterly reports to identify and report the status of significant unresolved issues to the Congressional defense committees. During FY 2007, the Board has issued three of these reports. Per the language in the authorization committees' Conference Report, quarterly reporting was to continue until the Board and DOE issued their joint report on a process for more timely identification and resolution of technical differences between the two agencies. The first quarterly report was widely hailed by Congress as being very beneficial in assisting their understanding of the issues. Congress subsequently requested that these reports continue to be prepared and issued by the Board through FY 2008.

**Development of Geotechnical Probabilistic Seismic Hazard Curves for the SRS, LANL and Idaho Sites.** The Board continued its review of DOE efforts to update probabilistic seismic hazard curves at several DOE sites. An update of the probabilistic seismic hazard analysis and development of seismic design ground motions was completed for the LANL site. The LANL probabilistic seismic hazard analysis benefited from a rigorous participatory peer review as the work was being accomplished. Results from the LANL probabilistic seismic hazard analysis indicate that the seismic hazard at LANL is greater than previously believed. LANL is in the process of evaluating the safety impact of this increase in the seismic hazard for each nuclear facility that is operating. Design basis earthquake ground motions have increased by about 50% at LANL. The Board is

following DOE efforts to update probabilistic seismic hazard curves at SRS and the Nevada Test Site.

**Waste Treatment Plant at the Hanford Site.** The Board has continued its review of the design and construction of important-to-safety structures, systems, and components in the Waste Treatment Plant facilities. The design and construction of these facilities slowed significantly during this past year while DOE addressed technical and project management issues. The Board's activities primarily consisted of considering the resolution of previously identified issues.

- DOE significantly underestimated the impact of hydrogen hazards on pipes and small process vessels and components. At the urging of the Board, DOE has continued to evaluate design solutions to address the issue. DOE has now developed new design criteria that ensure the design remains fully protective of the public's health and safety.
- The Board continued to follow the status of the design and installation of fire-protective coatings on structural steel. DOE has now developed an adequate technical basis to justify not coating some structural steel. The technical basis and criteria developed should ensure that a fire will not adversely impact the structural integrity of the facilities. The Board will evaluate the implementation of the criteria to help ensure protection of the public's health and safety.

**Integrated Waste Treatment Unit at the Idaho National Laboratory.** The Board reviewed the design of the Integrated Waste Treatment Unit. Engineering disciplines used include: process safety, seismic and structural, electrical, fire protection, mechanical equipment, confinement ventilation, and instrumentation and control. In addition, the Board reviewed the final preliminary documented safety analysis, as well as software quality assurance for both engineering design and safety analysis codes, and software supporting the control of the waste treatment process. DOE is currently resolving several concerns identified. The Board issued a project letter at the beginning of 2007 documenting several items that would need to be addressed during final design to ensure safety. As a result, DOE is taking several actions including additional waste sampling to ensure radionuclide inventories supporting the safety analysis are conservative, and completion and documentation of the investigative effort into the root cause of an over-temperature event in the DOE pilot plant's charcoal bed.

**Special Nuclear Material Component Requalification Facility at the Pantex Plant.** The Board completed its final reviews and observed the operational readiness review of the Special Nuclear Material Component Requalification Facility. The Board has no outstanding issues with this facility and it is now operational.

**Chemistry and Metallurgy Research Replacement Facility at the Los Alamos National Laboratory.** The Board's review of the Chemistry and Metallurgy Research Replacement Facility identified weaknesses in the overall approach for selecting safety-related systems, and the establishment of conservative design criteria for these safety-related systems. The draft Preliminary Documented Safety Analysis does not establish an adequate facility safety strategy. The early identification of safety-related structures, systems and components to prevent and mitigate potential accidents is vital to the successful design of the project. The Board continues to review the preliminary design and at the end of preliminary design will undertake a detailed review of the overall safety strategy, as well as, assess the adequacy of design criteria and the design of safety-related systems.

**Criticality Experiments Facility at the Nevada Test Site.** The criticality testing capability from TA-18 at Los Alamos National Laboratory is being relocated to the Criticality Experiments Facility, which will be housed in the Device Assembly Facility at the Nevada Test Site. The Board noted DOE deficiencies in the seismic analysis and potential structural issues associated with extensive cracking and water leaks in the Device Assembly Facility. The Board informed DOE that further testing of the concrete strength was prudent to fully evaluate the impact of the extensive cracking. As a result, DOE has now agreed to conduct further testing of the concrete strength to adequately evaluate the impact of the extensive cracking and ensure the facility can perform its design function. The Board also reviewed the preliminary documented safety analysis for the Criticality Experiments Facility and developed a significant number of comments and concerns. Many of these concerns were shared by DOE's Safety Basis Review Team, but were not being acted upon. As a result of Board interaction, the preliminary documented safety analysis was revised and improved.

**Salt Waste Processing Facility at the Savannah River Site.** The Board's review of the preliminary design of the Salt Waste Processing Facility identified deficiencies in the analysis of the facility's structural design to resist natural phenomena hazards. Further, the supporting geotechnical engineering report had not been issued. Completion of an adequate preliminary design is expected to provide a technically sound basis for establishing the project performance baseline and for initiating the final design. The Board was concerned that a significant redesign of the facility might be warranted. DOE commissioned an independent review team of subject matter experts to validate the Board's issues. This independent review team agreed with the Board and made recommendations to improve the preliminary design of the structure, as well as the analysis for the facility in the geotechnical and structural areas. As a result, DOE has redesigned the facility to ensure it will adequately confine hazardous materials.

**Container Surveillance and Storage Capability Project and K-Area Interim Surveillance Project at the Savannah River Site.** These two projects provide Savannah River Site additional long-term plutonium storage capacity and the ability to perform surveillance, stabilization, and packaging, capabilities that are required by DOE's long-term plutonium packaging standard. The Board completed its final reviews of the K Area Interim Surveillance Project, focusing on the documented safety analysis, criticality safety evaluation, and vault integrity testing to support a gaseous fire suppression system. No significant issues were identified and the K Area Interim Surveillance Project is now operational. The Board continued reviews of the preliminary design of the Container Surveillance and Storage Capability project, focusing on hazards analysis, criticality safety, fire protection, and an evaluation of the ability of existing and new structures to meet seismic performance requirements. The Board issued a letter in January 2007 communicating several concerns to DOE, including deficiencies in the hazards analysis and an inadequate basis for excluding nuclear incident monitors from the facility. As a result, DOE has revised the hazards analysis to address the Board's concerns and incorporated nuclear incident monitors into the design.

**Uranium Processing Facility at the Y-12 National Security Complex.** The Board reviewed the conceptual design and safety documentation for the project. The Board concluded that the conceptual design and safety documentation did not meet the expectations of the draft standard for incorporating safety in design. DOE conducted additional design work and elaborated on the project risks to address the Board comments. The Board believes the conceptual design is now adequate to proceed into preliminary design. The project is awaiting formal approval by DOE to proceed with preliminary design.

**Plutonium Storage at the Savannah River Site.** In 2003, Congress tasked the Board to conduct a study of the adequacy of the K-Area Materials Storage (KAMS) facility and related support facilities, such as Building 235-F (235-F), at the Savannah River Site. A report documenting this study was issued in December 2003. The Board proposed nine actions it considered necessary to enhance safety, reliability, and functionality of the plutonium storage facilities at Savannah River Site. Congress also requested an annual report on the status of the proposals in this report. In June 2007, the Board issued its annual update to Congress. Based in part on extensive proposals, DOE decided against using 235-F and will only store plutonium in the KAMS facility. The Board agreed with this decision. DOE agreed with the Board's proposals to upgrade the KAMS facility. In 2007, DOE completed the last remaining upgrade to the fire protection system in the facility. The addition of a fire detection system permits plutonium to be stored safely in the KAMS facility until dispositioned by DOE.

**Performance Goal 3**

**Nuclear Facilities Design and Infrastructure.** New DOE defense nuclear facilities, and modifications to existing facilities, are designed and constructed in a manner that ensures adequate protection of the health and safety of the workers and the public.

**FY 2006 Performance Accomplishments**

The Board and its staff continued providing technical evaluations of numerous design and construction projects throughout the DOE complex. These evaluations have led to DOE improving its design process, enhancing the design of new facilities, correcting construction deficiencies noted, as well as starting actions to correct identified issues. Some of these actions are:

**Safety-in-Design Public Meetings.** As a result of reviews conducted by the Board during the past several years, it became apparent to the Board that safety was not being integrated into the design of new facilities early in the design process. The Board held two public meetings to delve into how safety could be better integrated into the DOE design process. As a result, DOE acknowledged that improvements were needed to better incorporate safety into the design of nuclear facilities and reported undertaking a number of initiatives to address the identified shortcomings. DOE has now established new expectations for identifying and resolving safety issues earlier in the design process; revised the existing DOE Order for project management; and is working to revise the existing DOE Manual for project management. Further, DOE is developing a new standard to implement a more rigorous approach to safety-in-design. The Board expects that these actions, when fully implemented, should lead to significant improvements in the design of new defense nuclear facilities.

**Waste Treatment Plant at the Hanford Site.** The Board has continued its review of the design and construction of important-to-safety structures, systems, and components in the Waste Treatment Plant facilities. The design and construction of these facilities slowed significantly during this past year while DOE addressed budget issues. The Board's activities primarily consisted of considering the resolution of previously identified issues. Subsequent deficiencies and concerns have been identified during these reviews, for example:

- The Board had earlier identified that the DOE-specified seismic requirements may not have been sufficiently conservative. DOE evaluation of this concern identified that the seismic requirements were underestimated by about 40 percent. DOE is now evaluating the impact this increase will have on the design of the structure and equipment and using state-of-the-art techniques to develop new data to resolve some uncertainty in the modeling used to predict the seismic hazard. The Board is evaluating the techniques being used to collect these data.
- DOE significantly underestimated the impact of hydrogen hazards on pipes and small process vessels and components. At the urging of the Board, DOE has continued to evaluate design solutions to address the issue and re-evaluated and issued new design criteria to ensure the design remains fully protective of the public's health and safety.
- The Board continues to follow the status of the design and installation of fire-protective coating on structural steel subsequent to DOE directing the contractor to comply with code requirements. Questions on the basis for not coating some steel have resulted in DOE developing criteria and a methodology to justify the decisions. The Board has questioned the basis for much of the criteria in an attempt to improve its technical adequacy.

**Demonstration Bulk Vitrification Facility at the Hanford Site.** In September 2005, the Board identified potential weaknesses in areas such as the design, safety analysis, and the safety of workers that needed to be considered in finalizing the design of the Demonstration Bulk Vitrification Facility. Design of the facility continued in FY 2006 including an independent expert review arranged by DOE. Additionally, a more formal approach to project management was implemented. As a result, the design has continued to evolve and improvements in radioactive material confinement and worker safety features have been developed.

**Integrated Waste Treatment Unit at the Idaho National Laboratory.** The Board reviewed major aspects of the project organization, preliminary design, and safety basis development for the Integrated Waste Treatment Unit (IWTU). Primary areas of focus included: process design and confinement strategy, safety strategy as

detailed in the preliminary documented safety analysis, and pilot plant testing. In response to Board concerns, the DOE directed the project to use a more conservative and commonly used computer code for estimating radiological consequences for co-located workers and the public from postulated accidents. Further, the project directed a review of key safety analysis inputs and subsequently changed its inputs for many of the postulated accidents. The Board is continuing to review concerns including: control strategy for hydrogen deflagration prevention in process equipment, rapid shutdown system design, and waste characterization/radionuclide inventory controls.

**Los Alamos National Laboratory Chemistry and Metallurgy Research Replacement Facility.** The Board performed a series of reviews on the conceptual design and initial portions of the preliminary design. A number of significant concerns were identified, including an inadequate suite of safety controls that would not provide confinement under all accident scenarios. NNSA is currently working to address the concerns raised by the Board.

**Device Assembly Facility at the Nevada Test Site.** The Board noted to DOE deficiencies in the seismic analysis and potential structural issues associated with extensive cracking and water leaks in the Device Assembly Facility (DAF) at the Nevada Test Site. The criticality testing capability from TA-18 at Los Alamos National Laboratory is being relocated to the Criticality Experiments Facility, which will be housed in DAF. The Board had previously reviewed the plans for the Criticality Experiments Facility (including design reviews and preliminary documented safety analysis) and took issue with the lack of design criteria and an inadequate safety analysis. In FY 2006, the Board provided additional feedback to DOE regarding the progress on the safety analysis, ongoing seismic analysis, and evaluation of the cracking concerns. As a result, DOE now plans to perform a new structural and seismic analysis, has plans to address water leaks, and is preparing a new safety analysis. The Board informed DOE that further testing of the concrete strength was prudent to fully evaluate the impact of the extensive cracking in DAF.

**Pit Disassembly and Conversion Facility at the Savannah River Site.** The Board continued to review the safety of the design of the Pit Disassembly and Conversion Facility (PDCF). The Board reviewed the surface settlement profiles at the building foundation as a result of soft zones unique to the Savannah River Site (SRS). Based on this review, the Board found that although the final predicted surface settlement is deemed adequate, the methods used need to be improved. The Board will address this concern with SRS separately. The Board also suggested several improvements in the electrical design of PDCF. The Board observed that the design rating of the diesel generator may not be adequate to handle the necessary loads during startup following a loss of offsite power.

**Salt Waste Processing Facility at the Savannah River Site.** The Board's review of the conceptual design of the Salt Waste Processing Facility at SRS identified weaknesses in the facility's design criteria for natural phenomena hazards. As a result, DOE has now directed its contractor to pursue a more robust structure, which will provide the confinement required by the DOE safety basis. The Board continues to review the new enhanced design as well as site geotechnical investigations.

**Highly Enriched Uranium Manufacturing Facility.** The Board initiated its review of construction activities for the Highly Enriched Uranium Materials Facility (HEUMF) at the Y-12 National Security Complex. The initial assessment focused on implementation of the construction quality program for reinforced concrete installation. Several fundamental concerns were noted and discussed with DOE. However, shortly after DOE initiated corrective actions, a significant number of quality related deficiencies became evident. Short term compensatory actions were initiated on the project while long-term corrective actions are being developed and implemented.

## 8. PERFORMANCE GOAL 4: NUCLEAR SAFETY PROGRAMS AND ANALYSIS

**DOE regulations, requirements, and guidance are developed, implemented, and maintained; and safety programs at defense nuclear facilities are established and implemented; as necessary to protect adequately the health and safety of the workers and the public.**

**OUTCOME:** DOE will have acknowledged, acted upon, and/or resolved the health and safety issues raised by the Board. In addition, follow-up technical evaluation of DOE's safety programs at defense nuclear facilities will verify necessary improvements in safety, and effective implementation of Integrated Safety Management principles.

### **SUMMARY:**

For FY 2011, the key performance goals and initiatives of the Board in this area are intended to resolve continuing problems and ensure safety is improved at the level of the workers. If safety of the workers at DOE defense nuclear facilities can be improved, then the safety of the public more distant from the hazards will be substantially improved. Major efforts to achieve this goal in FY 2011 include:

- Ensure that DOE and its contractors apply the principles of integrated safety management at the activity level (i.e., that work scope is properly identified, that workers know the hazards and controls for their work, that work is performed in accordance with those controls, and that feedback and improvement are used to reduce further the risks of future work).
- Ensure directives that inform DOE personnel and contractors how to fulfill their responsibilities safely are evaluated and strengthened where necessary, including the development of new safety directives to provide guidance in areas for which none is currently available.
- Strengthen the application of quality assurance principles at defense nuclear facilities to improve the reliability and effectiveness of controls used to prevent or mitigate potential radiological accidents.
- Ensure that verifications of integrated safety management implementation are conducted at sites where new operating contractors are in place and where new integrated safety management systems are invoked, and ensure that such verifications are conducted in a manner that assures the public and worker safety and the protection of the environment.

**Performance Goal 4**

**Nuclear Safety Programs and Analysis.** DOE regulations, requirements, and guidance are developed, implemented, and maintained; and safety programs at defense nuclear facilities are established and implemented; as necessary to protect adequately the health and safety of the workers and the public.

**FY 2011 Performance Objectives**

**DOE Directives.** The Board will continue to assess the adequacy of proposed changes to DOE directives to ensure that any revisions are appropriate. The results of the directives reviews completed by the Board will be provided to DOE. The Board anticipates that approximately 30 DOE directives that may impact public and worker health and safety will require review, of which five to ten are likely to require significant Board and staff interaction to ensure satisfactory resolution of potential safety issues. In 2009, the Board issued a recommendation that DOE establish a policy on the use of quantitative risk assessment for nuclear safety applications and establish the necessary requirements and guidance for quantitative risk assessment in a directive or directives. The Board will work with DOE to ensure that the applicable documents are appropriately developed. The Board also expects to continue its involvement in the efforts of the National Nuclear Security Administration (NNSA) to establish its own directives system. It is estimated that ten NNSA directives will also require review. As a result of these reviews, new or modified health and safety directives will be issued, resulting in improved safety through standardized requirements and guidance that provide for adequate protection of the workers and the public as well as the protection of the environment.

**Integrated Safety Management.** The Board will continue its reviews of DOE's implementation of integrated safety management (ISM) and associated nuclear safety programs. In addition, while the Board has noted that considerable progress has been made in the implementation of ISM, continued DOE efforts are necessary to maintain ISM systems and ensure continuous improvement across the complex. Specific functional areas will be sampled to a greater depth. In addition, during FY 2010–2011, the Board will conduct a series of public hearings that will assess progress made in response to Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*, and will be devoted to specific aspects of the implementation plan such as the role of the Central Technical Authority; feedback and improvement mechanisms; and the integration and support of research, analysis, and testing in nuclear safety technologies.

**Safety Management Programs.** Safety management programs are designed to ensure defense nuclear facilities are operated in a manner that adequately protects workers, the public, and the environment. At least five reviews will be completed in areas such as training and qualification, quality assurance, nuclear criticality safety, software quality assurance, conduct of operations, configuration management, maintenance management, and readiness preparations. As a result of these reviews, it is anticipated that DOE will provide an acceptable approach and schedule for resolution of any identified issues to support the safe operation of defense nuclear facilities.

**Performance Goal 4**

**Nuclear Safety Programs and Analysis.** DOE regulations, requirements, and guidance are developed, implemented, and maintained; and safety programs at defense nuclear facilities are established and implemented; as necessary to protect adequately the health and safety of the workers and the public.

**FY 2010 Performance Objectives**

**DOE Directives.** The Board will continue to assess the adequacy of proposed changes to DOE directives to ensure that any revisions are appropriate. The results of the directives reviews completed by the Board will be provided to DOE for action. The Board anticipates that approximately 20 DOE directives that may impact public and worker health and safety will require review, of which two or three are likely to require significant Board and staff interaction to ensure satisfactory resolution of potential issues. In 2009, the Board issued a recommendation that DOE establish a policy on the use of quantitative risk assessment for nuclear safety applications and establish the necessary requirements and guidance for quantitative risk assessment in a directive or directives. The Board will work with DOE to ensure that the applicable documents are appropriately developed. The Board also expects to continue its involvement in the efforts of the National Nuclear Security Administration (NNSA) to establish its own directives system. It is estimated that 15 NNSA directives will also require review. As a result of these reviews, new or modified health and safety directives will be issued, resulting in improved safety through standardized requirements and guidance that provide for adequate protection of the workers and the public as well as the protection of the environment.

**Integrated Safety Management.** The Board will continue its reviews of DOE’s implementation of integrated safety management (ISM) and associated nuclear safety programs. In addition, while the Board has noted that considerable progress has been made in the implementation of ISM, continued DOE efforts are necessary to maintain ISM systems and ensure continuous improvement across the complex. Specific functional areas will be sampled to a greater depth. In addition, during FY 2010–2011, the Board will conduct a series of public hearings that will assess progress made in response to Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*, and will be devoted to specific aspects of the implementation plan such as the role of the Central Technical Authority; feedback and improvement mechanisms; and the integration and support of research, analysis, and testing in nuclear safety technologies.

**Safety Management Programs.** Safety management programs are designed to ensure defense nuclear facilities are operated in a manner that adequately protects workers, the public, and the environment. At least five reviews will be completed in areas such as training and qualification, quality assurance, nuclear criticality safety, software quality assurance, conduct of operations, configuration management, maintenance management, and readiness preparations. As a result of these reviews, it is anticipated that DOE will provide an acceptable approach and schedule for resolution of any identified issues to support the safe operation of defense nuclear facilities.

**Performance Goal 4**

**Nuclear Safety Programs and Analysis.** DOE regulations, requirements, and guidance are developed, implemented, and maintained; and safety programs at defense nuclear facilities are established and implemented; as necessary to protect adequately the health and safety of the workers and the public.

**FY 2009 Performance Accomplishments**

**DOE Directives.** As part of its continuing review of new and revised DOE directives, the Board and its staff evaluated and provided constructive critiques of over 40 directives associated with, but not limited to nuclear design criteria, radiological protection, maintenance management, worker protection, and project management. At year's end, the staff was in the process of resolving issues regarding revisions or drafts of 10 pending directives to improve the content, clarity, and consistency of safety requirements and guidance. Examples of DOE directive reviews completed in 2009 include:

- DOE Order 425.1D, *Verification of Readiness to Start Up or Restart Nuclear Facilities*
- DOE Order 426.X, *Federal Technical Capability*
- DOE Order 410.2, *Management of Nuclear Materials*
- DOE Order 452.2D, *Nuclear Explosive Safety*
- DOE Order 452.1D, *Nuclear Explosive and Weapon Surety Program*
- Title 10, Code of Federal Regulations Part 712, *Human Reliability Program*
- DOE Guide 413.3-4, *U.S. Department of Energy Technology Readiness Assessment Guide*
- DOE Order 414.4.IX, *Quality Assurance*
- DOE Standard 1172, *Safety Software Quality Assurance Functional Area Qualification Standard*
- DOE Standard XXXX, *Application of Safety Instrumented Systems used in Non-Reactor Nuclear Facilities*
- DOE Standard 1173-2009, *Criticality Safety Functional Area Qualification Standard*
- DOE Standard 1083-2009, *Processing Exemptions to Nuclear Safety Rules and Approval of Alternative Methods for Documented Safety Analyses*
- DOE Handbook 1028-2009, *Human Performance Improvement Handbook, Volume 1: Concepts and Principles, and Volume 2: Human Performance Tools for Individuals, Work Teams, and Management*

**Use of Quantitative Risk Assessment Methodologies.** The Board identified the timely need for adequate policies and associated standards and guidance on the use of quantitative risk assessment methodologies at DOE defense nuclear facilities and issued Recommendation 2009-1, *Risk Assessment Methodologies at Defense Nuclear Facilities*. The Board recommended that DOE:

1. Establish a policy on the use of quantitative risk assessment for nuclear safety applications.
2. Consistent with this policy, establish requirements and guidance in a DOE directive or directives that prescribe controls over the quality, use, implementation, and applicability of quantitative risk assessment in the design and operation of defense nuclear facilities.
3. Evaluate current ongoing uses of quantitative risk assessment methodologies at defense nuclear facilities to determine if interim guidance or special oversight is warranted pending the development of formal policy and guidance.
4. Establish a requirement to identify deficiencies and gaps in ongoing applications of quantitative risk assessment along with the additional research necessary to fill those gaps in support of the development and implementation of the final policy and guidance.

DOE's Implementation Plan for this Recommendation is expected in late calendar year 2009.

**Recommendation 2007-1, Safety-Related In Situ Nondestructive Assay of Radioactive Materials.** The Board evaluated DOE's progress in implementing the Recommendation issued in October 2007. The Technical Support Group, defined in the Implementation Plan and comprised of senior DOE and contractor personnel with significant experience in nondestructive assay, developed lines of inquiry to be used during site reviews starting in calendar year 2009. Lines of inquiry included criteria for reviews of training and qualification, design requirements for new facilities and equipment, standards for conducting holdup measurements, implementation of standards, research and development, quality assurance, and oversight. The Board's staff observed the Technical Support Group's benchmarking efforts at key defense nuclear facilities.

**Nuclear Criticality Safety.** The Board conducted reviews in 2009 related to nuclear criticality safety issues highlighted in Board correspondence with DOE in January 2008 that expressed concerns that DOE reviews of criticality safety may not be of sufficient depth to accurately assess the health of nuclear criticality safety programs at defense nuclear facilities. The Board issued a letter in January 2009 underscoring issues with Nuclear Criticality Safety Evaluations conducted by Y-12. In addition, the Board's staff conducted a review of nuclear criticality safety at Los Alamos National Laboratory to assess progress in resolving previously identified issues. The Board continued to evaluate complex-wide activities as described in DOE's annual report on criticality safety.

**Justifications for Continued Operations.** The Board continued its review and oversight of DOE's processes and practices associated with the use of justifications for continued operations (JCO) at defense nuclear facilities. Previously the Board found a number of weaknesses in the JCO process and its implementation at defense nuclear facilities. In response to the Board's concerns, DOE is making progress in developing revised guidance for use in the field in the development and implementation of JCOs. Formal review of this guidance is expected to be completed by late calendar year 2009.

**Safety System Design, Functionality, and Maintenance Reviews.** 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 related to ensuring that credited safety systems can adequately perform their required functions in all operating regimes. Throughout FY 2009 the Board interacted with DOE and NNSA to properly disposition these findings. In particular, the Board has taken definitive action to fully characterize and drive the corrective actions for significant safety issues at Los Alamos National Laboratory at both the plutonium and tritium facilities.

A previous Board review of aging issues at H-Canyon highlighted the need to perform more inspections of aging equipment. The Board's review of the initial proposed approach identified many major flaws, and the Board strongly encouraged DOE to pursue a different approach. The new Integrated Facility Aging Management Program is producing the desired results in a timely manner and is now being expanded to review safety systems across SRS.

**Readiness Reviews.** The Board reviewed updates to directives related to startup and restart of nuclear facilities, as well as their implementation at defense nuclear facilities. Revisions to these directives are expected to provide much needed clarity. The Board actively monitors Startup Notification Reports for defense nuclear facilities under its cognizance and reviews startup and restart activities accordingly.

**Conduct of Operations.** The Board conducted conduct of operations reviews at Y-12 and Hanford in 2009. These reviews assessed the adequacy of DOE directives and standards implementation in the flow down to site-specific policies, procedures and instructions. Although the Board noted areas where opportunities for improvement in conduct of operations existed, overall these two sites had properly implemented conduct of operations programs.

**Recommendation 2002-1, Quality Assurance for Safety Related Software.** On December 22, 2008, the DOE Chief Health, Safety and Security Officer proposed an approach for managing the safety software central registry, a task of the remaining commitment of DOE's Implementation Plan for Recommendation 2002-1. Based on progress throughout this fiscal year, the Board expects DOE to formally request closure of this recommendation late this calendar year, 2009. The Board continues to evaluate quality assurance practices for safety-related software throughout the complex.

**DOE Technical Capability.** The Board continues to follow the state of technical competency throughout the DOE defense nuclear facilities complex. The Board's staff observed the activities of DOE's Federal Technical Capabilities Panel (FTCP) throughout the fiscal year and reviewed directives governing the FTCP as well as technical qualification standards for several areas of technical specialization.

After the Board identified several deficiencies with qualification cards for Facility Representatives, DOE conducted an assessment, revised the qualification cards and standards, and disqualified a Facility Representative

who had been improperly granted interim qualifications. After the Board identified the lack of training opportunities for Facility Representative candidates, DOE set up a two-week course for Facility Representative candidates and Safety System Oversight candidates.

**Activity-Level Work Planning.** During 2009, the Board reviewed work planning processes at three sites. The reviews of work planning and control processes at Idaho National Laboratory, Y-12, and Los Alamos National Laboratory indicate that their programs have not been fully implemented and weaknesses still remain. DOE has made efforts to address these weaknesses, but to date these efforts have been inadequate.

**Implementation of Safety Basis Controls.** Independent validation of implementation of safety basis controls is important to nuclear safety, as discussed in a Board letter to DOE in 2008. Some DOE sites have protocols for performing such validations, but DOE continues to lack complex-wide requirements and guidance for independent reviews of the implementation of nuclear safety basis controls. In a brief to the Board on March 26, 2009, DOE provided the Board with information on a new Guide that has been drafted, *Guide for Performance of Independent Verification Reviews (IVRs) of Safety Basis Controls*. This draft Guide was issued to the field on March 19, 2009, in a 6 month pilot effort. The memo states that, "It is expected that each site will compare the practices outlined in this guide to your current site processes and adjust them, if appropriate." This direction is a positive step in compelling independent verification reviews at defense nuclear facilities.

**Safety Culture Improvement Project.** Starting in FY 2008 with DOE and its contractors establishing a jointly sponsored task team to develop tools for assessing and improving the safety culture of the federal and contractor workforces, progress continues to be made in refining these tools. As evidenced by the Deputy Secretary of Energy's memorandum dated January 16, 2009, support for strengthening safety culture now has strong leadership support. The Board has been closely observing the team's efforts and will continue to evaluate and encourage this effort as it continues to mature.

**Recommendation 2004-1, Oversight of Complex, Hazardous Nuclear Operations.** All 22 commitments made in the DOE Implementation Plan responding to Recommendation 2004-1 were due to be complete by 2009. Concerns remain with several commitments that are late or have no discernable response from the DOE. The Board issued a letter to the Secretary of Energy on March 23, 2009, highlighting particular commitments needing attention from senior management and organizational support to meet the intent of the recommendation. The specific troubled commitments highlighted to the Secretary of Energy are:

- Commitment 7, develop process to identify research and development needs across DOE/NNSA and identify the extent that these needs are being met by existing programs; and Commitment 8, develop method to ensure nuclear safety research. These commitments are more than two years late. Efforts made by the office of primary responsibility have fragmented and fall far short of a complex-wide assessment.
- Commitment 2, provide adequate technical support for the Central Technical Authorities (CTAs); and Commitment 3, fully implement the CTA function. The DOE CTA function supporting the Under Secretary of Energy underwent turmoil during the transition of Presidential administrations, and the technical support of the NNSA CTA has been degraded as result of staff reorganization at NNSA. It appears that the DOE CTA issue was resolved following the confirmation of the Under Secretary of Energy.

The Board also remains engaged in two other areas that have been problematic:

- Commitment 5, issue DOE Safety Oversight Guide. This is intended to be a key document to improve the consistency and completeness of implementation of Integrated Safety Management.
- Commitment 10, Deliverable A, develop and implement Quality Assurance Plans required by DOE Order 414.1C, *Quality Assurance*. NNSA's inadequate performance in this area indicates that implementation has not been effective.

**Performance Goal 4**

**Nuclear Safety Programs and Analysis.** DOE regulations, requirements, and guidance are developed, implemented, and maintained; and safety programs at defense nuclear facilities are established and implemented; as necessary to protect adequately the health and safety of the workers and the public.

**FY 2008 Performance Accomplishments**

**DOE Directives.** As part of its continuing review of new and revised DOE directives, the Board and its staff evaluated and provided constructive critiques of over 50 directives associated with, but not limited to nuclear design criteria, radiological protection, maintenance management, worker protection, and project management. At year's end, the staff was in the process of resolving issues regarding revisions or drafts of 17 pending directives to improve the content, clarity, and consistency of safety requirements and guidance. Examples of directives completed in 2008 include:

- DOE Order 450.1A, *Environmental Protection Program*
- DOE Manual 460.2-1A, *Radioactive Material Transportation Practices Manual for Use with DOE Order 460.2A*
- DOE Guide 441.1-1C, *Radiation Protection Programs Guide for Use with Title 10, CFR, Part 835, Occupational Radiation Protection*
- DOE-Handbook-1113-2008, *Radiological Safety Training for the Uranium Facilities*
- DOE Manual 441.1-1, *Nuclear Material Packaging Manual*
- DOE-Standard-1189-2008, *Integration of Safety Into the Design Process*
- DOE-Standard-1185-2007, *Nuclear Explosive Safety Study Functional Area Qualification Standard*

**Use of Quantitative Risk Assessment Methodologies.** The Board continued to follow DOE's activities associated with the use of quantitative risk assessment at defense nuclear facilities. Previously, the Board conducted a comprehensive assessment of DOE's policies, programs, processes, and procedures with respect to the use of quantitative risk assessment and related methodologies and found that additional guidance was warranted. DOE developed a number of draft policies and implementation guides to address the use of risk methodologies in the defense nuclear complex. The Board provided numerous comments on the documents and continues to aid DOE in refining and revising these documents with a goal of issuing a draft Policy and Guide to the complex for formal comment and review.

**Recommendation 2007-1, Safety-Related In Situ Nondestructive Assay of Radioactive Materials.** DOE issued an Implementation Plan addressing the actions from the Recommendation in October 2007. After DOE made several changes including additional DOE commitments, the Board accepted the plan in April 2008. DOE has accomplished the first milestones under the plan, including establishment and funding of the Technical Support Group, which is comprised of senior DOE and contractor personnel with significant experience in nondestructive assay. The Technical Support Group is currently developing lines of inquiry to be used during site reviews, which are planned to start in early calendar year 2009.

**Nuclear Criticality Safety (NCS).** In a letter to DOE in January 2008, the Board expressed concerns that DOE reviews of criticality safety may not be of sufficient depth to accurately assess the health of NCS programs. NCS problems discovered by the Board at Los Alamos National Laboratory in late FY 2007 underscore the need for an effective review strategy, since these problems had been missed during earlier reviews by DOE. The Board modified the annual reporting requirements from the closure of Recommendation 97-2, *Continuation of Criticality Safety at Defense Nuclear Facilities in the Department of Energy*, 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 NCS programs, metrics used to monitor contractor NCS performance, and NCS engineer staffing for contractors and site offices. DOE submitted the 2007 annual report on nuclear criticality safety in July 2008, and briefed the Board in September 2008. The Board is currently evaluating the activities described in DOE's report.

**Justifications for Continuing Operations.** The Board continued its review and oversight of DOE's processes and practices associated with the use of justifications for continuing operations (JCO) at defense nuclear facilities. Previously the Board found a number of weaknesses in the JCO process and its implementation at defense nuclear facilities. In response to the Board's concerns, DOE is developing revised guidance for use in

the field in the development and implementation of JCOs.

**Safety System Design, Functionality, and Maintenance Reviews.** 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 related to ensuring that credited safety systems can adequately perform their required functions in all operating regimes. DOE will be working throughout FY 2009 to properly disposition these findings.

**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. 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 directives concerning the startup and restart of nuclear facilities and has proposed revisions to the DOE Order 425.1C and DOE Standard 3006, *Planning and Conduct of Operational Readiness Reviews*. The Board observed many of the discussions concerning the proposed revisions to understand the basis for any changes that were proposed. The Board is evaluating the revisions and working with the authors to ensure the specific tenets of Recommendation 92-6, *Operational Readiness Reviews*, are not minimized in the updated directives.

**Recommendation 2002-1, Quality Assurance for Safety Related Software.** On February 7, 2008, the Chief Health, Safety and Security Officer for DOE proposed a path forward for closure of the one remaining open action of DOE's Implementation Plan for the Board's Recommendation 2002-1. This action item required DOE to perform a gap analysis on the six original toolbox codes to determine the actions needed to bring the codes into compliance with Software Quality Assurance criteria. Although the gap analyses were completed, follow-up actions needed to resolve the gaps for each code have yet to be completed. DOE has now developed a plan and schedule along with the approach that will be used to resolve the gaps identified in the toolbox code gap analysis reports to allow closure of Recommendation 2002-1 by the end of 2008.

**Recommendation 2004-2, Active Confinement Systems.** During 2008, all the candidate Environmental Management (EM) facilities were reviewed against the confinement ventilation system evaluation criteria, and many gaps were identified. DOE-EM 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, the National Nuclear Security Administration 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 also reviewed the DOE design and construction projects to ensure that the proposed design would meet the intent of the Recommendation and DOE expectations as documented in the Implementation Plan. Resolution of the identified design improvements will significantly enhance the safety posture of these facilities.

**DOE Technical Capability.** The Board continues to follow the state of technical competency throughout the complex. The Board conducted a review of contractor training and qualification programs at Pantex and provided comments to DOE in a July 8, 2008, letter. The review identified a number of improvements that could enhance the training and qualification program. DOE is currently working to properly disposition these improvement areas.

**Activity-Level Work Planning.** During 2008, the Board reviewed work planning processes at four sites. The reviews of LANL and LLNL work planning and control processes indicate that their programs have not been fully implemented and weaknesses still remain. DOE efforts to address these weaknesses to date have been inadequate.

**Implementation of Safety Basis Controls.** Independent validation of implementation of safety basis controls is important to nuclear safety. Some DOE sites have protocols for performing such validations, but DOE lacks complex-wide requirements and guidance for independent reviews of the implementation of nuclear safety basis controls. The Board issued a letter on February 5, 2008, identifying this deficiency and requesting DOE to evaluate the need for such requirements/guidance.

**Safety Culture Improvement Project.** During FY 2008, DOE and its contractors established a jointly sponsored task team to develop tools for assessing and improving the safety culture of the federal and contractor workforces. The initial effort is intended to focus on improving leadership, workforce engagement, and organizational learning. Improvements in these areas will significantly contribute to improving the implementation of integrated safety management as well as other functional areas related to safety at defense nuclear facilities. The Board has been closely observing the team's efforts and will continue to evaluate and encourage this effort as it continues to mature.

**Performance Goal 4**

**Nuclear Safety Programs and Analysis.** DOE regulations, requirements, and guidance are developed, implemented, and maintained; and safety programs at defense nuclear facilities are established and implemented; as necessary to protect adequately the health and safety of the workers and the public.

**FY 2007 Performance Accomplishments**

**DOE Directives.** As part of its ongoing review of new and revised DOE directives, the Board and its staff evaluated and provided constructive critiques of 30 directives associated with, but not limited to nuclear design criteria, maintenance management, worker protection, emergency management, and project management. At year's end, both staffs were in the process of resolving issues on 15 pending directives to improve the content, clarity, and consistency in safety requirements and guidance. Examples of completed directives include:

- DOE-Standard-1183, *Nuclear Safety Specialist Functional Area Qualification Standard*
- DOE-Standard-1185, *Nuclear Explosives Safety Study Functional Area Qualification Standard*
- DOE Manual 460.2-1A, *Radioactive Material Transportation Practices Manual*
- DOE Order 410.1, *Baseline Nuclear Safety Requirements*
- DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*
- DOE-Standard-SAFT-0113, *Preparation of Safety Basis Documents for Transuranic Waste Facilities*

**Administrative Controls.** In Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*, the Board identified the need for DOE to improve its guidance and expectations with respect to important administrative controls at defense nuclear facilities. As a result of the Board's Recommendation, the Department developed and implemented a plan to improve the reliability and effectiveness of administrative controls that serve safety functions. DOE developed a new standard governing the development and implementation of specific administrative controls in the defense nuclear complex. Further, DOE made significant revisions to the "safe harbor" methodologies used to comply with 10 CFR 830, *Nuclear Safety Management*, to codify and incorporate the provisions of the Recommendation. In early 2007, DOE indicated that all the commitments associated with this issue had been met and requested closure of the Recommendation. However, following a series of effectiveness reviews, the Board identified a number of weaknesses that indicated that the Department's implementation of the Recommendation had not been fully effective. The Board will work to further evaluate the effectiveness and implementation of DOE's efforts to satisfy these commitments in 2008.

**Use of Quantitative Risk Assessment Methodologies.** The Board continues to follow DOE's activities associated with the use of quantitative risk assessment at defense nuclear facilities. Previously, the Board conducted a comprehensive assessment of DOE's policies, programs, processes, and procedures with respect to the use of quantitative risk assessment and related methodologies. The Board's review suggested that DOE and its contractors have employed quantitative risk assessment in a number of activities, including the development of documented safety analyses and other facility-level decision making activities. The precise use, as well as the level of formality of these assessments, varied over a wide range. As a result of the Board's observations and concerns, DOE has recently developed a new draft policy and implementation guide to address the use of risk methodologies in the defense nuclear complex. The Board will continue to oversee DOE's progress in fully developing an effective policy, along with useful implementing guidance, to govern the use of risk assessment methodologies at DOE facilities.

**Justifications for Continuing Operations.** The Board reviewed DOE's processes and practices associated with the use of justifications for continuing operations (JCO) at defense nuclear facilities. This review encompassed the guidance and requirements associated with JCO requests, review, and approval, along with a survey of actual JCOs in effect at selected facilities. The Board compared DOE's use of JCOs with approaches used elsewhere in the nuclear industry. The Board found a number of weaknesses in the JCO process and its implementation at defense nuclear facilities. In particular, it was noted that DOE has not established adequate requirements, expectations, and guidance for the use of JCOs. In general, DOE's processes and practices with respect to JCOs are not in conformance with generally accepted nuclear industry processes, and a number of facilities appear to be in violation of even these deficient processes and practices. The Board will continue to work with DOE to develop and implement a satisfactory approach for the use of JCOs in the defense nuclear complex.

**DOE Standard 1027, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports, Change Notice 1.** In June 2006, the Board issued a letter identifying numerous deficiencies with DOE-Standard-1027-92, and requested that DOE issue a report addressing these and other potential issues associated with the standard. As a result of this letter, DOE closely examined issues associated with DOE-Standard-1027 and its implementation in an effort that involved contractors from across the complex as well as headquarters site personnel. The working group issued supplemental guidance to address the majority of the issues raised in the June 2006 Board letter, including exclusion of sealed sources from facility inventory for hazard categorization purposes. DOE has further committed to the Board to pursue a revision to the standard to catalyze clear and consistent implementation expectations in the document.

**Recommendation 2004-2.** The Board issued Recommendation 2004-2, *Active Confinement Systems*, in December 2004, to ensure that a reliable and effective control would be available to mitigate the consequences of potential accidents at defense nuclear facilities. During the past year, DOE completed detailed reviews of about a dozen high priority hazard category 2 facilities using the performance criteria provided in the ventilation system evaluation guidance document that was issued in February 2006. These facilities included the Container Surveillance and Storage Capability, Plutonium Disposition Project, Actinide Removal Process, and Pit Disassembly and Conversion Facility at Savannah River Site; New Waste Calcine Facility and Advanced Mixed Waste Treatment Facility at Idaho National Laboratory; Depleted Uranium Hexafluoride Conversion Facilities at Paducah and Portsmouth; Waste Treatment and Immobilization Plant at Hanford; Technical Area-55 Plutonium Facility at Los Alamos National Laboratory; and Uranium Processing Facility and Building 9212 at the Y-12 National Security Complex. These evaluations compared certain functional performance capabilities of the ventilation systems for these facilities against the identified safety related performance criteria of the guidance document. As a result, weaknesses or gaps were identified, and system modifications were proposed to meet the expectations of the Recommendation. Several of these facilities have already committed to making the necessary modifications to improve the reliability and performance of their active confinement ventilation systems. The remainder awaits the Program Secretarial Officer's review and approval of the necessary modifications.

**Recommendation 2000-2.** Recommendation 2000-2, *Configuration Management, Vital Safety Systems*, was issued to DOE on March 8, 2000, and an Implementation Plan was accepted on December 14, 2000. The plan called for an initial assessment and inventory of the vital safety systems throughout the defense nuclear complex, followed by the development of a process to ensure that those assessments would be repeated periodically. The Implementation Plan also required the establishment (at each site) of qualified federal and contractor employees cognizant of the site's vital safety systems. Because of the great importance of the vital safety systems in achieving and maintaining a high level of safety on the DOE sites, the Board's staff made frequent visits to evaluate DOE's progress in implementing the Recommendation. As a result of the progress made in response to the Recommendation, the Board agreed with DOE, in a letter date August 8, 2007, that the recommendation could be closed. Because of the importance of these systems to safety in the defense nuclear facilities, however, the Board will request, separately and as appropriate, that relevant DOE programs provide periodic reports or briefings on the implementation and maintenance of their supporting configuration management programs.

**Readiness Reviews.** As a result of concerns expressed by the Board regarding the proper implementation of DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*, DOE conducted a comprehensive review of startup and restart procedures, as well as their implementation at defense nuclear facilities. To ensure a more rigorous and conservative implementation of DOE Order 425.1C, and to address other complex-wide startup and restart issues, DOE formed a readiness review working group. Specific and ongoing working group actions include revising and reinvigorating readiness review training for DOE and contractors; clarifying certain aspects of the Order including definitions, conduct of a readiness review, and the process for readiness review notification; and updating pertinent readiness review examples in associated directives. The Board continues to monitor the working group's efforts to improve the quality of the directives related to startup of new and substantially modified facilities.

**Recommendation 2007-1.** In April 2007, the Board issued Recommendation 2007-1, *Safety-Related In-Situ Nondestructive Assay of Radioactive Materials*. The Recommendation was developed to ensure that in-situ measurements, when used to determine compliance with safety limits, would be done in accordance with recognized industry standards and contain appropriate quality assurance elements. The Recommendation also

required DOE to establish other requirements via the directives system for proper execution of such measurements within site-level programs, including: personnel training and qualification, standard techniques for addressing measurement uncertainty, and periodic assessments of the need for new technology. DOE accepted the Recommendation in June 2007, and is currently working on an implementation plan to address the concerns identified by the Board.

**Criticality Safety.** Concerns expressed by the Board regarding the lack of Nuclear Criticality Safety (NCS) site reviews led DOE to establish a formal program to monitor contractor and federal NCS programs across the complex. The baseline reviews, which used senior contractor and federal NCS personnel, are now complete. The results of these reviews have been or will be examined by the Board as the reports are finalized. The Board also provided input to the latest revision of DOE-Standard-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Nonreactor Nuclear Facilities*, which was issued in early 2007, and to supplemental guidance issued for DOE-Standard-1027, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Report*. The Board conducted reviews of NCS evaluations, contractor NCS programs, and federal oversight at Hanford, the Savannah River Site, and Los Alamos National Laboratory. The Board continues to monitor DOE's progress in assuring criticality safety at defense nuclear facilities.

**Recommendation 2004-1.** In response to Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*, DOE completed the following actions in 2007: 1) fully implemented the Central Technical Authorities function, with associated technical support staff managed by the Chief of Defense Nuclear Safety for NNSA and the Chief of Nuclear Safety for the remainder of DOE; 2) issued a new DOE manual on integrated safety management; 3) created an ISM Champions Council, reporting to the Deputy Secretary, and responsible for reinvigorating ISM in the Complex; 4) performed program office self-assessments of safety function assignments at the program office level and defined criteria for the delegation of authority; and 5) issued an integrated safety management system description for each of the program offices. DOE also completed several milestones associated with the corrective action plan for Federal Technical Capabilities, as delineated in the discussion of Technical Competence below. Based on a reevaluation of commitments, DOE revised the 2004-1 Implementation Plan and moved responsibility for the Office of Nuclear Safety Research from the Office of Environment, Safety and Health to NNSA. NNSA also continues to work on a modified line oversight contractor assurance system, which is intended to focus more NNSA oversight on the facilities where a low-probability-high-hazard accident is credible, while relying on the contractor to oversee the remainder of the facilities. The Board will expend significant effort in the oversight of this transformation to ensure that safety of defense nuclear facilities is not jeopardized.

**Implementation of ISM: Activity-Level Work Planning.** In 2006, NNSA completed work on its expectations for contractors' work planning and control processes, as well as criteria and review approach documents to comprehensively assess these processes. Based upon these documents and similar criteria and review approach documents developed by DOE's Office of Environmental Management, reviews were conducted at each of the sites to determine the baseline state of the work planning and control process. From this baseline, DOE has committed to take actions that will improve work planning and control at the sites as a part of the Recommendation 2004-1 Implementation Plan. During 2007, the Board staff reviewed work planning processes at three DOE sites. The results of these reviews indicate that the oversight actions that were to be taken may not have been fully institutionalized. Oversight of this area will require significant effort during 2008 in order to improve performance.

**DOE Technical Capability.** In response to the Board's Recommendation 2004-1, DOE is making progress in a number of areas:

- DOE has completed a total of 16 of the 28 actions from the original Corrective Action Plan to improve DOE's federal technical capability, as noted in the implementation plan for Recommendation 2004-1.
- DOE used the lessons learned from a February 2006 Senior Technical Safety Manager (STSM) pilot course to improve the course held in November 2006, and then instituted a Department-wide, formal and rigorous final testing program to validate STSM qualification. DOE also strengthened its qualification criteria with mandatory performance activities through a significant revision to DOE-STD-1075, *Senior Technical Safety*

*Manager Functional Area Qualification Standard*, re-issued in November 2006.

- DOE has incorporated former facility representatives into its integrated project teams, with noticeable success for the Highly Enriched Uranium Materials Facility at Y-12 National Security Complex and the Waste Treatment and Immobilization Plant at Hanford.

**Performance Goal 4**

**Nuclear Safety Programs and Analysis.** DOE regulations, requirements, and guidance are developed, implemented, and maintained; and safety programs at defense nuclear facilities are established and implemented; as necessary to protect adequately the health and safety of the workers and the public.

**FY 2006 Performance Accomplishments**

**DOE Directives.** As part of its ongoing review of new and revised DOE directives, the Board and its staff evaluated and provided constructive critiques of 32 directives associated with, but not limited to nuclear design criteria, maintenance management, worker protection, emergency management, and project management. At year's end, both staffs were in the process of resolving issues on 12 pending directives to improve the content, clarity, and consistency in safety requirements and guidance. Examples of completed directives include:

- DOE Order 151.1X, *Comprehensive Emergency Management System*
- DOE Order 251.1X, *Directives Program*
- DOE Order 420.1B, *Facility Safety*
- DOE Guide 424.1-1A, *Implementation Guide for use in Addressing Unreviewed Safety Question Requirements*
- DOE Order 452.1C, *Nuclear Explosive and Weapon Surety Program*
- DOE Order 452.2C, *Safety of Nuclear Explosive Operations*
- DOE Standard 1104, *Review and Approval of Nuclear Facility Safety Basis Documents*

**Recommendation 2004-2.** The Board issued Recommendation 2004-2, *Active Confinement Systems*, in December 2004, to ensure that a reliable and effective control would be available to mitigate the consequences of potential accidents at defense nuclear facilities. DOE has now screened all hazard category 2 and 3 defense nuclear facilities against criteria designed to identify those with the potential for benefiting from the intent of the Recommendation. DOE also completed another major milestone in February 2006, developing and issuing its Ventilation System Evaluation Guidance document. This document identifies a set of design and performance attributes that ventilation systems can be evaluated against for identification of potential upgrades. Several pilot facilities have been identified by DOE to which these attributes will be applied, in order to identify potential improvements, before the guidance document is applied to the rest of hazard category 2 and 3 facilities that were screened and identified earlier in the year. The evaluation process will be completed over the next two years, resulting in significant improvement in the safety posture of defense nuclear facilities across the complex

**DOE Technical Capability.** In response to the Board's Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*, DOE is making progress in a number of areas:

- In May 2006, DOE conducted the initial accreditation review of the Technical Qualification Program (TQP) at the site office for the Y-12 National Security Complex. The Y-12 Site Office had a solid program and served as a good benchmark for this accreditation process.
- DOE budgeted \$2M for FY08 to re-establish the Corporate Technical Intern Program, which would fund ten interns.
- DOE developed and executed a Senior Technical Safety Manager (STSM) overview course in Albuquerque in February 2006 for qualified STSMs in the process of requalification and for new STSM candidates to assess gaps in their knowledge level. DOE will use lessons learned from this course to improve its next scheduled course. Additionally, DOE is strengthening its STSM qualification criteria with mandatory performance activities through a significant revision to DOE-STD-1075, *Senior Technical Safety Manager Functional Area Qualification Standard*. DOE expects to issue this standard later this year.

**Recommendation 2004-1.** In 2006, the Board issued technical report, DNFSB/TECH-36, *Integrated Safety Management: The Foundation for an Effective Safety Culture*. The report examines the current status of the effectiveness of integrated safety management (ISM) systems at the seven NNSA weapons sites, summarizes failures and good practices, and proposes changes to enhance the effectiveness of ISM. In response to

Recommendation 2004-1, DOE completed the following actions in 2006: DOE designated an ISM Champion to chair an ISM Champions Council, which will assist in developing and sustaining vital, mature ISM systems throughout the Department; established two Central Technical Authorities (CTAs) with associated technical support staff; issued a new DOE policy and order on DOE oversight; implemented a nuclear safety research function; strengthened the technical qualification program for Federal safety assurance personnel; implemented a formal safety delegation and assignment process; and took steps to improve the implementation of the ISM “feedback and improvement” function, including issuance of a new DOE Order describing the Operating Experience Program. However, DOE has recently begun to take actions to withdraw from several of these commitments and is in the process of revising the implementation plan for the recommendation, which will require significant Board oversight in 2007.

**Administrative Controls.** In Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*, the Board identified the need for DOE to improve its guidance and expectations with respect to important administrative controls at defense nuclear facilities. As a result of the Board’s Recommendation, the Department developed and implemented a plan to improve the reliability and effectiveness of administrative controls that serve in safety functions. DOE developed a new standard governing the development and implementation of specific administrative controls in the defense nuclear complex. Additionally, DOE has developed a set of training materials to introduce the new and revised requirements to its field elements and has taken actions to verify the adequacy and implementation of the revised guidance and expectations throughout the complex. Further, DOE has made significant revisions to the “safe harbor” methodologies used to comply with 10 CFR 830, *Nuclear Safety Management*, to codify and incorporate the provisions of the Recommendation. With the exception of the completion of several annual updates, DOE has indicated that it believes that all of the commitments associated with the Recommendation have been met. The Board will work to evaluate the effectiveness and implementation of DOE’s efforts in satisfying these commitments in 2007.

**Use of Quantitative Risk Assessment Methodologies.** The Board continues to follow DOE’s activities associated with the use of quantitative risk assessment at defense nuclear facilities. Previously, the Board conducted a comprehensive assessment of DOE’s policies, programs, processes, and procedures with respect to the use of quantitative risk assessment and related methodologies. The Board’s review suggested that DOE and its contractors have employed quantitative risk assessment in a number of activities, including the development of documented safety analyses and other facility-level decision making activities. The precise use, as well as the level of formality of these assessments, varied over a wide range. As a result of the Board’s observations and concerns, DOE has 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 has worked to develop a draft policy, along with draft implementation guidance, which is scheduled to be released for general comment later this year. The Board will continue to oversee DOE’s progress in developing an effective policy, along with useful implementing guidance, to govern the use of risk assessment methodologies at DOE facilities.

**Nuclear Criticality Safety.** Concerns expressed by the Board regarding the lack of Nuclear Criticality Safety (NCS) site reviews led to the establishment of a formal program to monitor contractor and federal NCS programs across the complex. The reviews are performed using senior contractor and federal NCS personnel; results of these reviews will be a component of subsequent DOE NCS Annual Reports. In response to the DOE FY 2005 NCS Annual Report, the Board requested additional information from DOE for three items: an updated schedule for relocation of critical experimental capability from Los Alamos National Laboratory (LANL) to the Nevada Test Site; an analysis of DOE site office staffing needs for effective federal NCS oversight and plans to fill those positions; and the latest status and schedule for conducting NCS engineer training classes, which had been discontinued at LANL in 2004. DOE is preparing its response.

**Implementation of ISM: Activity-Level Work Planning.** In 2006, the National Nuclear Security Administration completed work on its expectations of the contractors’ work planning and control processes, as well as criteria and review approach documents to comprehensively assess these processes for the first time. These documents will assist the sites in their goal of continuously improving worker safety. Based upon these documents and similar criteria and review approach documents developed by DOE’s Office of Environmental Management, reviews were conducted at each of the sites to determine the baseline state of the work planning

and control process. From this baseline, DOE has committed to take actions that will improve work planning and control at the sites as a part of the Recommendation 2004-1 Implementation Plan. Since that time, DOE has identified that the specific commitments will not be met as identified in the recommendation 2004-1 Implementation Plan, but that other actions will be taken as a part of the normal oversight of the sites. The Board will continue to work with them throughout FY 2006 to improve performance in this key area.

**Recommendation 2002-1, *Quality Assurance for Safety-Related Software.*** This recommendation was issued to correct problems caused by inadequate design, implementation, testing, and configuration management of safety-significant computer software. During the past year, DOE has completed identification, selection, and assessments of safety system software and firmware at its defense nuclear facilities. In addition, DOE has made some progress in properly training and qualifying personnel assigned to software quality assurance (SQA) positions to the requirements of DOE-STD-1172-2003, *Safety SQA Functional Area Qualification Standard*. Finally, DOE has issued three SQA-related directives and has revised DOE Manual 411.1C, *Safety Management Functions, Responsibilities and Authorities Manual* to reflect software-related organizational changes and responsibilities. Overall, DOE's ability to assure the validity of safety information developed by use of software is improving.

## 9. FINANCIAL TABLES

### OBJECT CLASS SUMMARY

Actual obligations for FY 2009, projected obligations for FY 2010 and the Board's Budget Request for FY 2011 are presented by object class accounts in Exhibit C. The Board proposes to utilize the budget resources requested in the following manner:

#### **Salaries and Benefits (Object Class 10)**

The FY 2011 request includes funding of \$21,387,669 to support the projected salary and benefit costs for 117.5 FTEs. The rationale and justification for the additional salaries and benefits costs are explained in detail on pages 7 through 12. The funding for salaries and benefits represents 71 percent of the Board's FY 2011 estimated obligations. In calculating the projected salary and benefits needs of the Board, the following federal pay adjustment and benefits factors for Executive Branch employees are used:

- Pay increase of 2.0 percent beginning in January 2010.
- Pay increase of 1.4 percent beginning in January 2011.
- Employee benefits of 26.5 percent of salaries, or \$35,243 per FTE in FY 2011.

Note personnel benefit (Object Class 12) costs also include other costs such as change of station, public transit subsidies, etc.

In establishing the Board, Congress sought to bring the best talent available to focus on health and safety oversight questions associated with the design, construction, operation, and decommissioning of DOE defense nuclear facilities. The recruitment and retention of scientific and technical staff with outstanding qualifications are the key components in the Board's human capital strategy if we are to be successful in accomplishing the Board's mission. The Board has assembled a small and highly talented technical staff with extensive backgrounds in science and engineering disciplines such as nuclear-chemical processing, conduct of operations, general nuclear safety analysis, conventional and nuclear explosive technology and safety, nuclear weapon safety, storage of nuclear materials and nuclear criticality safety, and waste management. Virtually all of the technical staff hold technical master's degrees, and approximately 22 percent hold doctoral degrees. Almost all technical staff members possess practical nuclear experience gained from duty in the U.S. Navy's nuclear propulsion program, the nuclear weapons field, or the civilian reactor industry. In order to accomplish the Board's highly technical mission, it is of paramount importance that the Board receives sufficient funds to meet the salary and benefit requirements of the staff.

The Board enhances its on-site safety oversight of defense nuclear facilities by assigning experienced technical staff members to fulltime duty at priority DOE sites. Currently eleven full-time site representatives are stationed at six DOE sites: 1) Pantex Plant to oversee nuclear weapons activities, including the weapons stockpile stewardship and weapons disassembly programs; 2) Hanford Site to monitor waste characterization and stabilization and facility deactivation; 3) Savannah River Site to monitor DOE's efforts to deactivate facilities, stabilize

waste materials, and store and process tritium; 4) Oak Ridge's Y-12 National Security Complex to monitor safety and health conditions at Y-12 and other defense nuclear facilities in the area; 5) Los Alamos National Laboratory (LANL) to advise the Board on overall safety and health conditions at LANL, and to participate in Board reviews and evaluations related to the design, construction, operation, and decommissioning of LANL defense nuclear facilities; and 6) to perform similar advisory and review efforts at Lawrence Livermore National Laboratory (LLNL).

The Site Representatives Program provides a cost-effective means for the Board to closely monitor DOE activities, and to identify health and safety concerns promptly by having on-site staff conducting first hand assessments of nuclear safety management at the priority sites to which they have been assigned. Site representatives regularly interact with the public, union members, congressional staff members, and public officials from federal, state, and local agencies.

### **Travel (Object Class 21)**

The Board requests \$1,090,000 to support the official travel of the Board Members and staff. This amount is consistent with the amount requested in the FY 2010 President's Budget adjusted for inflation and additional FTEs, less \$50,000 for anticipated savings. Extensive travel is necessary to the various DOE defense nuclear facilities located throughout the United States in order for Board Members and staff to conduct first-hand assessments of operations and associated health and safety issues. The Board is required to react to incidents at the DOE defense nuclear facilities that may affect public health and safety, requiring unplanned travel expenditures to support its work at these sites. During FY 2009, Board Members, technical staff, and the Board's outside technical experts made 133 team visits to major defense nuclear sites in support of its high priority public health and safety oversight mission.

The Board is also authorized to station staff members at DOE sites or facilities to assist in carrying out its functions. The Board has assigned technical staff teams to round-the-clock monitoring of major startup, testing, or restart activities at various DOE sites. The presence of its technical staff has proved to be invaluable in providing the Board with firsthand information on the demonstrated readiness, capabilities, and performance of DOE and its contractors for ensuring safety in the conduct of such activities. During the coming fiscal years, the Board anticipates a continued need for Board technical staff teams to monitor construction and startup of new DOE defense nuclear facilities, such as the Waste Treatment Facility in Richland, Washington, and the Highly Enriched Uranium Materials Facility in Oak Ridge, Tennessee.

Travel funds are also used to pay for Board expenses associated with public hearings and meetings at or near DOE sites, where any interested persons or groups may present comments, technical information, or data concerning health and safety issues under Board.

### **Transportation of Things (Object Class 22)**

The Board has included \$280,000 in its FY 2011 Budget Request for the shipment of household goods for employees relocating to the Washington, DC area and/or to become site representatives at DOE, the same amount as included in the President's FY 2010 Budget.

### **Rental Payments to GSA (Object Class 23.1)**

The Board requests funds totaling \$2,504,811 to reimburse the General Services Administration (GSA) for projected office rental costs. This overhead expense represents approximately 8 percent of the Board's FY 2011 Budget Request. GSA negotiated a ten-year lease for the Board effective in March 2006. GSA has estimated that the Board's rental payment to GSA under the lease will be \$2.505 million for FY 2011.

### **Communications and Utilities (Object Class 23.3)**

The budget request includes \$225,000 for projected communications support costs. Funds in this account will be used for telephone (local, long distance, and cellular) services, Internet access charges, postage and overnight delivery costs, and special messenger services. Contracts for emergency communications services for the Board Headquarters, site representatives, and the Board's alternate Continuity of Operations Facility (COOP) are also included in this account.

### **Printing and Reproduction (Object Class 24)**

The budget request includes \$48,500 for reimbursing the U.S. Government Printing Office for publication of required legal notices in the *Federal Register*. Routine printing and copying charges for Budget Requests, the Board's *Annual Report to Congress, Performance Accountability Report (PAR)*, and technical reports, are also included in this account.

### **Consulting Services (Object Class 25.1)**

The Board maintains a highly skilled staff, but it is not economically feasible to maintain multiple permanent staff in very specialized technical disciplines. Therefore, it is necessary to have the funds available to immediately contract for this expertise when needed. For example, extensive use of technical consultants has been necessary to review the complex design and construction of the Waste Treatment Plant at Hanford. This includes the review of seismic analysis, structural loading, and construction plans to ensure the safety of this more than \$12 billion project. The Board obtains specialized contractor expertise in a variety of technical disciplines to augment its internal review capability and avoid any unnecessary impact on DOE's construction schedule.

The Board plans to continue contracting for technical expert services in highly specialized disciplines such as lightning protection, geotechnical investigation, and seismic/structural engineering. Should an unexpected imminent or severe threat to public health and safety be identified, this expertise may be required for short durations. Each technical expert that the Board employs will continue to be carefully screened for possible conflict of interest.

A list of major technical support contracts with a brief description of each contractor's area of expertise, and a chart that reflects funding levels for this support are included on pages 96 through 100. The FY 2011 Budget Request includes \$1,000,000 in this account for technical support contracts to assist the Board in its health and safety reviews. This amount is \$100,000 less than the amount included in the President's FY 2010 Budget and reflects anticipated savings through more effective contracting.

### **Other Services (Object Class 25.2)**

The budget request includes \$1,940,000 to fund a wide range of recurring administrative support needs of the Board in FY 2011 such as the independent audit of the Board's financial statements, physical and cyber security, employee training, recruitment, information technology support, court reporting, records storage and retrieval, and drug-free workplace testing and support. This amount is consistent with the amount requested in the President's FY 2010 Budget adjusted for inflation and additional FTEs.

### **Government Services (Object Class 25.3)**

The Board's budget request includes \$800,000 for reimbursable support agreements with other federal agencies, \$15,000 less than the amount included in the President's FY 2010 Budget. The Board utilizes cross-service providers for accounting and payroll processing services consistent with government-wide lines of business objectives, and also utilizes cross-servicing arrangements for services such as physical security, health unit, employee background investigations for security clearances, Employee Assistance Program services, the Library of Congress FedLink for legal and legislative research, and Defense Contract Auditing Agency (DCAA) services to assist in determination of fair and reasonable contracting costs.

### **Operation and Maintenance of Equipment (Object Class 25.7)**

The Board requests \$65,000 for maintaining and repairing Board equipment (e.g., copier maintenance agreements, repair of office equipment, etc.), the same amount included in the President's FY 2010 Budget.

### **Supplies and Materials (Object Class 26)**

The Board requests \$270,000 for continued access to numerous technical standards databases, legal research services, maintenance of the technical reference information for its library, and for general office supplies and materials.

### **Acquisition of Assets (Object Class 31)**

The Board requests \$450,000 for recurring software licenses/maintenance agreements supporting the Board's operations, to replace outdated office equipment such as printers and copiers, and make minor enhancements to existing software systems, less \$22,500 for anticipated administrative savings. In addition, the Board requests \$235,000 in non-recurring obligations for a planned telephone system replacement, for a total of \$662,500.

The Board's CENTREX telephone system and its voice mail system are more than 10 years old, and in fact, the patch panel hardware that provides the circuit-switched connectivity is no longer eligible for service. This hardware is no longer manufactured and therefore there are no available replacement parts in the event of a hardware failure. After transitioning its long distance services from FTS2001 to Networx in FY 2009, the Board plans to replace/upgrade its telephone system hardware and related equipment in FY 2011. As part of the upgrade, the Board will also evaluate the feasibility of switching from its POTS (plain old telephone service)

telephone system to a VoIP (voice over internet protocol). VoIP (which is an offered service under the Networx contracts) would provide unified communication that will tie together all types of available voice communications. VoIP technology could also potentially decrease the Board's monthly telephone cost by reducing the need to lease POTS lines and reducing charges for calling features. The initial start-up cost is estimated at \$235,000 for cabling (\$60,000), switches, handsets, and miscellaneous hardware (\$130,000), software (\$30,000), and installation (\$15,000).

The Board's budget request for assets does not otherwise include funding for any new systems. It does include a small amount (less than \$100,000) for potential enhancements to existing systems. The priority for system enhancements will be to ensure that existing security requirements are maintained and/or addressed as part of the enhancement (e.g., no funds will be spend on systems enhancement without first ensuring systems meet existing security requirements or will meet them as a result of the enhancement). The Board's life-cycle replacement policy for IT equipment is every three years, with the next replacement scheduled for FY 2010.

**DEFENSE NUCLEAR FACILITIES SAFETY BOARD**

**FY 2011 CONGRESSIONAL BUDGET REQUEST**

BUDGET ACCOUNT -- (OC)	2009 OBLIGATIONS (Actual)	FY 2010 FINANCIAL PLAN	FY 2011 BUDGET REQUEST
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PERSONNEL SALARIES -- (11)	\$ 13,390,630	\$ 15,044,570	\$ 16,315,603
PERSONNEL BENEFITS -- (12)	\$ 3,696,145	\$ 4,619,510	\$ 5,072,066
TRAVEL -- (21)	\$ 979,182	\$ 1,045,000	\$ 1,090,000
TRANSPORTATION OF THINGS -- (22)	\$ 157,953	\$ 280,000	\$ 280,000
RENTAL PAYMENTS TO GSA -- (23.1)	\$ 2,190,192	\$ 2,272,920	\$ 2,504,811
COMMUNICATIONS & UTILITIES (23.3)	\$ 207,531	\$ 220,000	\$ 225,000
PRINTING & REPRODUCTION -- (24)	\$ 37,757	\$ 51,000	\$ 48,500
ADVISORY & ASSISTANCE SERVICES -- (25.1)	\$ 893,958	\$ 1,000,000	\$ 1,000,000
OTHER SERVICES -- (25.2)	\$ 1,957,059	\$ 1,900,000	\$ 1,940,000
GOVERNMENT SERVICES -- (25.3)	\$ 732,085	\$ 785,000	\$ 800,000
OPERATION & MAINT. OF EQUIPMENT -- (25.7)	\$ 52,801	\$ 65,000	\$ 65,000
SUPPLIES & MATERIALS -- (26)	\$ 263,156	\$ 255,000	\$ 270,000
ACQUISITION OF ASSETS -- (31)	\$ 304,215	\$ 665,000	\$ 662,500
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*** TOTAL OBLIGATIONS ***	\$ 24,862,664	\$ 28,203,000	\$ 30,273,480
NEW BUDGET AUTHORITY	\$ 25,000,000	\$ 26,086,000	\$ 28,640,000
UNOBLIGATED BALANCE - PREV. FY	\$ 3,250,056	\$ 3,851,686	\$ 1,734,686
RECOVERY OF PRIOR YR OBLIGATIONS	\$ 464,294	\$ -	\$ -
TOTAL BUDGETARY RESOURCES	\$ 28,714,350	\$ 29,937,686	\$ 30,374,686
EST. UNOBLIGATED BAL. - CUR. FY	\$ 3,851,686	\$ 1,734,686	\$ 101,206
OUTLAYS	\$ 24,043,034	\$ 27,638,940	\$ 29,668,010

**Exhibit C**

## TECHNICAL SUPPORT CONTRACTS SUMMARY

A list of major (> \$25,000 in estimated annual expenditures) technical support contracts, with a brief description of each contractor's areas of expertise, follows. The FY 2011 Budget Request includes \$1,000,000 in this account for technical support contracts to assist the Board in its health and safety reviews.

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

### TECHNICAL SUPPORT CONTRACTS

(Status as of January 31, 2010)

<b>Contractor</b>	<b>Contract Expiration Date</b>	<b>Description of Work</b>
Boeing Corporation	12/31/10	Provide expertise related to lightning safety issues at DOE's defense nuclear facilities. These services include assisting the Board in review, analysis, and modeling of lightning protection systems. Examples of work include analysis of the risk presented by lightning in explosive areas in and around large structures.
Bruce Mathews, LLC	10/31/10	Provide technical support to the Board involving the review, evaluation, and analysis of the safety bases for selected defense nuclear facilities (e.g., the completeness of the identification of hazards, the adequacy of documented analyses, the appropriateness and application of identified controls, the availability of potential alternatives controls), as well as the quality of Federal and contractor assessments and reviews of safety systems, conduct of operations, and readiness for operations at the facilities.
David S. Boyd, Inc.	3/31/10	Provide technical support to the Board, specifically involving the evaluation of directives and procedures governing operation and maintenance of defense nuclear facilities. In addition, provides technical support evaluating the implementation of Integrated Safety Management (ISM) for ongoing operations and maintenance, and also preparations for startup or restart of defense nuclear facilities. Example of work includes supporting review of readiness preparations for restart of at the Pantex Plant.
Mr. Joseph King	3/31/10	Provide technical support to the Board, specifically involving the evaluation of directives and procedures governing operation and maintenance of defense nuclear facilities. In particular, provide technical support evaluating preparations for startup or restart of defense nuclear facilities.

<b>Contractor</b>	<b>Contract Expiration Date</b>	<b>Description of Work</b>
Mr. Robert Lewis	3/31/10	Provide technical support to the Board, specifically involving the evaluation of directives and procedures governing operation and maintenance of defense nuclear facilities. In addition, provide technical support evaluating the implementation of ISM for ongoing operations and maintenance, and for preparations for startup or restart of defense nuclear facilities.
Dr. James L. Liverman	6/30/10	Provide technical support to the Board in the general subject area of ISM, quality assurance and radiation protection, specifically involving review and evaluation of amendments to 10 CFR 835 Rule, radiological protection standards, other radiological and environmental health and safety issues, and review of the development of DOE's quality assurance improvement plan.
Mr. Lew Miller	9/30/10	Provide technical support to the Board in the general subject area of defense nuclear facility design, including design basis accident analysis, safety system classification, application of national consensus codes and standards, application of DOE directives, and the review of technical documents supporting the DOE Critical Decision Process.
Mr. Kenneth Pusateri	10/31/10	Support the review, evaluation, and analysis of various internal processes and control activities used by the Office of the Technical Director and prepare draft directives, procedures, and/or policies relating these processes.
Paul C. Rizzo & Assoc., Inc.	12/31/10	Provide technical support to the Board, specifically in the review and evaluation of systems and seismic engineering of structures, systems and components with particular emphasis on geotechnical investigation and soil mechanics, systems engineering, adequacy of analyses performed by DOE contractors, seismological hazards, safety analysis, hydrology, and environmental related issues.
J.D. Stevenson Consulting	12/31/10	Provide technical support to the Board, specifically in the review and evaluation of systems and seismic engineering of structures, systems and components with particular emphasis on applicability and content of orders and standards developed by DOE and its contractors as well as existing codes and standards used at DOE utilities, applicability of commercial nuclear industry standards as they apply to DOE facilities, quality assurance related matters, adequacy of various types of analysis performed by DOE contractors, and hazard and systems classification.

<b>Contractor</b>	<b>Contract Expiration Date</b>	<b>Description of Work</b>
Stevenson and Associates	12/31/10	Provide support to the Board involving the review, evaluation, and analysis of facility-specific engineering processes as well as products, primarily for natural and man-made extreme loading events such as seismic, high wind, tornadoes, floods, and missile impacts (e.g., the review of structural modal analyses , parameter sensitivities, capacity versus demand calculations, seismic performance of distribution and other systems), and the facility-specific use of DOE orders and standards, as well as relevant national consensus codes and standards.
D. Volgenau Associates, Inc.	12/31/10	Provide technical support to the Board, specifically involving the evaluation of directives and procedures governing operation and maintenance of defense nuclear facilities. In addition, provides technical support evaluating ongoing operations and maintenance and for preparations for startup or restart of defense nuclear facilities. Examples of work include supporting the review of programs and activities at Los Alamos National Laboratory and supporting design review at the Savannah River Site.
Mr. William Yeniscavich	4/13/10	Provide technical support to the Board, specifically involving the area of materials performance (e.g., national safety codes/specifications, stress and temperatures, corrosion and welding fundamentals, inspection and testing techniques.)

Defense Nuclear Facilities Safety Board Technical Contracts  
Obligations By Fiscal Year

