

February 28, 2003

The President  
The White House  
Washington, DC 20500

Dear Mr. President:

The Defense Nuclear Facilities Safety Board (Board) is pleased to submit its Performance Report for fiscal year 2002. As required by the Government Performance and Results Act, this report compares the actual performance of the Board with the goals established in our Annual Performance Plan for fiscal year 2002.

A copy of this report is being provided to the Director of the Office of Management and Budget (OMB) as required by OMB Circular No. A-11.

Respectfully Submitted,

John T. Conway  
Chairman

Enclosure



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## Fiscal Year 2002 Performance Report

**Submitted Under Provisions of the  
Government Performance and Results Act**

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**Defense Nuclear Facilities  
Safety Board**

**February 2003**

## INTRODUCTION

The Defense Nuclear Facilities Safety Board (Board) is an independent federal agency established by Congress in 1989. Broadly speaking, the Board's mandate under the Atomic Energy Act is to provide health and safety oversight of the nuclear weapons complex operated by the Department of Energy (DOE). The nation's nuclear weapons program continues to be a complex and hazardous activity, under which DOE must maintain readiness of the nuclear arsenal, dismantle surplus weapons, dispose of excess radioactive materials, and clean up surplus facilities. These operations require the use of existing facilities, as well as the design and construction of new facilities of sophisticated design and function. All of these activities must be carried out in a manner that protects the public, workers, and the environment.

The Board uses its Strategic Plan and Annual Performance Plan to ensure that its limited resources remain focused on the most significant health and safety challenges, keeping pace with shifts in those challenges from year to year. All of the Board's health and safety activities are closely tied to goals and objectives embodied in these plans. This approach gives the Board confidence that its small staff (fewer than 100, including Board Members) and budget (less than \$20 million per year) are dedicated to the highest-risk activities under the Board's jurisdiction. The Board's Strategic Plan may be viewed in its entirety on the Board's internet website: [www.dnfsb.gov](http://www.dnfsb.gov).

The information in this Government Performance and Results Act (GPRA) report is also provided directly to Congress in the Board's statutorily required Annual Report, also available on the Board's website. There are slight differences between the two reports because the Annual Report covers calendar year 2002 rather than fiscal year (FY) 2002.

**Overall Outcome: The Board met its performance goals for FY 2002. In a few cases noted in the report, the safety improvements sought by the Board have not yet been fully achieved by DOE. The Board is vigorously pursuing those goals in FY 2003.**

## **GOAL 1. COMPLEX-WIDE HEALTH AND SAFETY ISSUES**

*Integrated Safety Management (ISM) (including comprehensive health and safety requirements, technically competent personnel, and effective implementing mechanisms) continues to evolve through feedback and improvement, and is implemented in all life-cycle phases—design and construction, startup, operation, and decommissioning.*

### **OBJECTIVE 1-A: IMPROVEMENT AND INTEGRATION OF HEALTH AND SAFETY DIRECTIVES**

The Board will verify that new and revised DOE directives contain adequate requirements for the protection of the health and safety of workers and the public. During the strategic planning period, the Board will review and assess proposed new DOE health and safety directives and safety-significant modifications to existing directives. When DOE issues new or modified health and safety directives after addressing the Board's comments, the directives will be in an enhanced form, resulting in improved safety through standardized requirements and guidance that provide for adequate protection of the health and safety of workers and the public.

#### **FY 2002 Performance Goal**

The Board will continue to review and assess the adequacy of health and safety requirements in new directives and rules, as well as in specific DOE directives that may be revised as a result of DOE's two-year review cycle. The Board will communicate results to DOE for incorporation or resolution, as appropriate.

It is estimated that DOE will issue a minimum of 36 directives for review by the Board in FY 2002. Approximately three of these reviews are expected to be of major significance, requiring substantial Board interaction with DOE to satisfactorily resolve identified issues prior to finalization.

The Board will continue to encourage DOE to develop necessary new directives and to improve, consolidate, and integrate existing requirements and guidance related to health and safety, especially those directives and rules aimed at the integration of safety management throughout the entire life cycle of major projects. In this regard, the Board intends to pay particular attention to how DOE articulates its requirements and guidance applicable to new capital acquisitions and complex-wide programs involving multiple program offices, especially in the following areas:

- ! Effective conduct of hazardous facility, site, and complex-wide projects and programs, including roles, responsibilities, competencies, mechanisms, and training; and
- ! Safety and hazard analyses.

As a result of these reviews, new or modified health and safety directives will be issued in an enhanced form, resulting in improved safety through standardized requirements and guidance that provide for adequate protection of workers and the public.

## **FY 2002 Performance**

The Board evaluated and provided constructive critiques of the 31 safety-related directives that DOE issued in FY 2002. These directives covered topics such as natural phenomena hazards, quality assurance, and DOE's facility representative and emergency management programs. At year's end, 19 directives remained under review by the Board for the purpose of improving their content, clarity, and consistency. Examples of the Board's achievements are described below.

**Natural Phenomena Hazards.** The Board's oversight led DOE to revise design and evaluation criteria to ensure that nuclear facilities can withstand the effects of earthquakes, severe storms, and floods. **Outcome:** **DOE issued an updated standard, DOE-STD-1020-2002, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*, to meet current industry safety requirements and standards.**

**Integration of Hazard Analyses.** DOE uses unintegrated processes and techniques to evaluate hazards and establish safety controls. This approach can result in hazards being overlooked or poorly controlled. In 2002, the Board urged DOE to integrate hazard and safety analyses more effectively. **Outcome:** **DOE published a new handbook—*Integration of Multiple Hazard Analysis Requirements and Activities*—that will help ensure consistent and effective control of all hazards.**

**Facility Representative Program.** The Board reviewed the qualification standard for DOE facility representatives (TRNG-0019, *Facility Representative Functional Area Qualification Standard*) and provided suggested changes that helped DOE to strengthen the document. **Outcome:** **This key standard was improved and re-issued in April 2002, setting appropriate standards for the training and qualification of federal personnel in key positions with safety responsibilities.**

## **OBJECTIVE 1-B: TECHNICAL COMPETENCE**

The Board will verify that roles, responsibilities, experience, and competencies required to protect workers and the public are explicitly defined and implemented for both DOE and its contractor personnel.

### **FY 2002 Performance Goal**

The Board will conduct the following types of assessments:

- ! Review and evaluate the effectiveness of the system engineering programs in the federal and contractor work force in accordance with DOE's Implementation Plan for the Board's Recommendation 2000-2, *Configuration Management, Vital Safety Systems*;
- ! Assess whether competence is commensurate with assigned responsibilities for key safety management personnel at defense nuclear contractor organizations as part of scheduled DOE and contractor readiness determinations;
- ! Assess the degree to which DOE and its contractors have implemented measures to ensure a viable criticality safety infrastructure, including progress toward qualification of contractor criticality safety engineers, through DOE site reviews; and
- ! Assess the effectiveness of DOE's project manager qualification program at DOE-Headquarters and DOE sites, including its depth and level of technical rigor.

Results of these assessments will be communicated to DOE to enhance understanding of safety-related roles and responsibilities in support of DOE's execution of functions associated with protecting workers and the public, and to be used by DOE to upgrade the quality of its technical workforce.

### **FY 2002 Performance**

**Contractor System Engineers.** Trained and qualified system engineers are critical to maintaining vital safety systems in a reliable state of readiness. In response to Board actions, including Recommendation 2000-2, *Configuration Management, Vital Safety Systems*, DOE developed formal training and qualification requirements for contractor system engineers. **Outcome: DOE revised its directives to require its contractors to implement formal system engineer training programs; contractors have begun to implement such programs.**

**Federal Technical Oversight of Safety Systems.** The Board urged DOE to identify the federal expertise needed to ensure effective oversight of contractor safety systems. This action was needed to achieve the safety improvements called for in Recommendation 2000-2, *Configuration*

*Management, Vital Safety Systems.* **Outcome:** DOE determined that 31 additional key personnel were needed, and that gaps in critical technical skills existed in mechanical engineering, fire protection, electrical engineering, instrumentation and control, and nuclear criticality. DOE is now working to fill these gaps.

**Nuclear Criticality Safety Program.** The Board continued to stress the need for stable funding for future criticality safety program elements, for dedicated emphasis on maintenance of criticality safety engineering training, and for minimizing the gap in criticality safety services during the relocation of the TA-18 mission from Los Alamos National Laboratory (LANL). **Outcome:** DOE provided a stable funding source for the criticality safety program, and committed to minimizing the length of time criticality safety services may be unavailable while the TA-18 mission is relocated.

**Functions, Responsibilities, and Authorities (FRA) Documents.** The Board continued to review DOE's efforts to achieve closure of Recommendation 98-1, *Resolution of Safety Issues Identified by DOE Internal Oversight*. The Board noted that while many constructive steps had been taken to establish a disciplined process for responding to the findings resulting from DOE's independent oversight, more effort was needed to establish FRA documents for a number of DOE organizational elements. **Outcome:** DOE's program offices have revised or are revising their FRA documents to ensure that safety roles and responsibilities are clearly defined.

**Human Factors Engineering.** The Board reviewed the use of human factors engineering principles during its evaluation of administrative safety controls. Reviews conducted at the Pantex Plant, Lawrence Livermore National Laboratory (LLNL), and the Y-12 National Security Complex (Y-12) focused on the development, implementation, and verification of selected administrative controls. The Board found that at Y-12, DOE placed a high reliance on administrative controls in lieu of engineered fire protection features. The Board communicated to DOE a number of specific safety issues raised by the inappropriate use of administrative controls. **Outcome:** DOE now recognizes and is working on the safety problem created by inappropriate use of administrative controls.

**Contractor Training and Qualification.** The Board reviewed the safety basis and supporting programs for the Waste Examination Facility at the Nevada Test Site (NTS), and assessed its readiness to begin operations as a Hazard Category 3 nuclear facility. The Board noted that many administrative support programs, such as the training and qualification, were not adequate to meet the requirements for nuclear facilities in DOE's nuclear safety management rule, 10 CFR Part 830. Training was not adequate for facility operators or outside maintenance support personnel to perform surveillance requirements or preoperational checks on vital safety systems. The Board's letter of March 7, 2002, transmitted these observations to DOE. **Outcome:** DOE acknowledged and is working to solve the safety problem identified by the Board.

## **OBJECTIVE 1-C: COMPLEX-WIDE IMPLEMENTATION OF INTEGRATED SAFETY MANAGEMENT IN FACILITY DESIGN, OPERATION, AND POST-OPERATION**

The Board will verify the effective and expeditious development and implementation of DOE's ISM program. During the strategic planning period, the Board will review the development and implementation of DOE's ISM program, including the effectiveness of the feedback and improvement function. Needed improvements will be communicated to DOE, and this information will be used to continually upgrade the quality of the safety management program. The Board will also review design and construction activities, including technical project management, criteria development, design preparation, and construction, and identify any issues that require resolution to provide adequate protection of workers and the public. Candidates for review will be based on relative hazards and on DOE's schedule for and progress on the candidate facilities. An adequate approach and schedule for the resolution of issues identified by the Board will be established to support safe startup and operation of new or modified defense nuclear facilities.

### **FY 2002 Performance Goal**

The Board will conduct reviews of DOE's efforts to implement ISM throughout all facility life-cycle phases, as well as efforts to make ISM more effective. Candidates for review include the following:

- ! Tritium Extraction Facility at the Savannah River Site (SRS)—Assess the implementation of quality assurance requirements during facility construction and the procurement of safety-significant facility equipment;
- ! Pit Disassembly and Conversion Facility at SRS—Evaluate the adequacy of DOE's review of the Title I/II design and resolution of significant design safety issues;
- ! Hanford Spent Nuclear Fuel Project—Assess DOE's reviews of operations for removal and storage of fuel from K-West Basin and review of safety analyses, construction, and operational testing in preparation for fuel removal from K-East Basin in December 2002;
- ! Other DOE design/construction activities—Reviews will be based on relative hazards, and on DOE's schedule for and progress on candidate facilities (e.g., Tritium Consolidation Project, Highly Enriched Uranium Materials Facility, and Waste Treatment Plant);
- ! The quality and effectiveness of at least one ISM review by DOE's Office of Oversight, and the implementation of line oversight of ISM per DOE P 450.5 at one Environmental Management site and one National Nuclear Security Administration (NNSA) site;

- ! Activity-level ISM implementation at sites with higher-than-expected rates of occurrences related to worker protection; and
- ! The quality of authorization basis documents at two defense nuclear sites to ensure that hazards are adequately identified and controls are in place to prevent unwanted events, as well as to ensure that hazard assessments are integrated with the emergency management activities for better mitigation of potential accidents.

As a result of these reviews, DOE will provide an adequate approach and schedule for resolution of identified issues that supports safe startup and operation of new or modified defense nuclear facilities.

## FY 2002 Performance

**Implementation of ISM.** The Board has monitored and guided DOE's implementation of ISM on a continuing basis since issuing Recommendation 95-2, *Safety Management*. All sites have declared ISM implemented. DOE has committed to using its feedback and improvement program, including its annual ISM update process, to ensure continued improvement.

**Outcome: Implementation of the basic elements of ISM has been accomplished at all DOE sites, DOE has acknowledged the need to continue to improve its ISM program, and work is being performed more safely and efficiently.**

**ISM Annual Review Process.** While considerable progress has been made in the implementation of ISM, continued DOE line oversight of ISM is necessary to maintain ISM systems and to ensure continuous improvement across the complex. In FY 2002, the Board communicated to DOE a number of deficiencies in DOE's annual ISM review process. **Outcome: In response, DOE developed a series of corrective actions for strengthening the annual ISM update process and for implementing DOE P 450.5, *Integrated Safety System Management Guide*. When completed, these actions should greatly strengthen ISM Systems across the complex.**

**Hanford ISM System.** The Board found weaknesses in a Hanford contractor's feedback and improvement program. Following the implementation of corrective actions, DOE performed a review of the ISM system of the Office of River Protection and the contractor.

**Outcome: DOE took action to strengthen the Hanford contractor's feedback and improvement program.**

**Maintenance Program Reviews.** The Board's reviews of maintenance programs at Y-12 and the Spent Nuclear Fuel Project at Hanford identified a number of program weaknesses. At Hanford, these deficiencies threatened to delay the schedule for removing the fuel from the reactor basins. **Outcome: DOE and its contractors implemented a number of improvements that have strengthened both programs.**

**Quality Assurance.** The Board continued to seek improvements in DOE's quality assurance program in FY 2002. To that end, the Board issued Recommendation 2002-1, *Quality Assurance for Safety-Related Software*, to strengthen requirements and guidance on engineering practices for safety-related software. **Outcome: DOE accepted Recommendation 2002-1 and issued a *Quality Assurance Improvement Plan* to strengthen the implementation of existing quality requirements for safety-related components and systems.**

**Recommendation 2000-2.** The Board's Recommendation 2000-2, *Configuration Management, Vital Safety Systems*, called upon DOE to assess the condition of vital safety systems needed to protect the public and workers. In response, DOE completed detailed reviews of vital safety systems that identified equipment degradation, as well as program weaknesses (such as control of drawings), that needed improvement. For example, inspections of dry pipe fire protection systems at Hanford, conducted in response to Recommendation 2000-2, revealed significant quantities of debris obstructing these systems within the Central Waste Complex. **Outcome: The fire protection systems at Hanford have been cleared of debris, and DOE has taken steps to ensure that the condition of all vital safety systems is understood and controlled at all defense nuclear facilities.**

**Authorization Basis for High-Level Waste Facilities at SRS.** The Board questioned the assumptions and methodology DOE used to develop the documented safety analysis for high-level waste facilities at SRS. In response, the SRS contractor performed additional sensitivity calculations and added specific administrative controls in the Technical Safety Requirements to protect key input values and assumptions used in the accident analyses. **Outcome: DOE has strengthened the controls to ensure the safety of high-level waste operations at SRS.**

**Authorization Basis Requirements for Nuclear Facilities at NTS.** The Board informed NNSA that safety controls had not been implemented adequately at NTS waste facilities. NNSA subsequently added nuclear facility requirements to the contract with its primary contractor and initiated a complete revision of the documented safety analysis of all waste activities at NTS. **Outcome: Nuclear-grade safety controls are now required and are being put in place to ensure that these hazardous nuclear activities are carried out safely.**

**Unreviewed Safety Question Procedures.** The Unreviewed Safety Question (USQ) process required by DOE's nuclear safety management rule, 10 CFR 830.203, is the mechanism for ensuring that safety bases assumptions, analyses, and controls for defense nuclear facilities are not invalidated by undocumented or unauthorized changes. In FY 2002, the Board conducted a complex-wide review of the USQ process and implementing procedures and identified changes needed to improve USQ procedures. **Outcome: In response to the Board's oversight, DOE made substantial improvements to each site's USQ procedure to ensure that safety bases are properly maintained.**

**Tritium Extraction Facility (TEF) Design.** The Board found that the design of the TEF at SRS would not adequately protect workers from a tritium release in an earthquake. **Outcome: DOE responded by adding a seismic monitor and alarm system to the design that will alert workers to exit the hazardous area before or during an earthquake.**

**Hanford Waste Treatment Plant (WTP).** When out-of-specification concrete was placed for the WTP Low-Activity Waste basemat, the Board questioned the effect of the deficiency on the structural integrity of the building under all design loading conditions. **Outcome: In response, WTP developed a systematic approach to investigating and correcting the areas of weak concrete. This approach will help ensure that the structure will perform its safety function during all design loading conditions.**

**Highly Enriched Uranium Materials Facility (HEUMF) Design.** The Board determined that the proposed structural configuration for the HEUMF at Y-12 would not safely resist seismic forces and that the design might not ensure a criticality-safe configuration of the uranium storage cans after an earthquake. **Outcome: In response, DOE strengthened the structure and reconfigured the storage design.**

## **GOAL 2. SAFE STEWARDSHIP OF NUCLEAR WEAPONS STOCKPILE AND COMPONENTS**

*Safe execution of nuclear weapons stockpile support and defense nuclear research activities at DOE's defense nuclear facilities has continued. The objectives and annual performance goals under Goal 2 address the Board's efforts to support DOE's safe execution of its national security mission.*

*Achieving that goal requires that the Board evaluate DOE's work at multiple sites in direct support of the nuclear weapons stockpile, as well as associated research and development. The two strategic objectives that support this general goal address the safe execution of various activities within DOE's two primary nuclear weapon mission components: direct support of the stockpile, and nuclear weapon research and development activities.*

### **OBJECTIVE 2-A. SAFE CONDUCT OF STOCKPILE MANAGEMENT**

The Board will verify the safety of DOE's defense nuclear facilities and activities relating to the maintenance, storage, and dismantlement of the nuclear weapon stockpile.

#### **FY 2002 Performance Goal**

The Board 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's efforts to develop safety systems (e.g., system and process designs, safety bases, control schemes, and administrative programs) and DOE's efforts to implement aspects of safety management systems. These reviews will focus on the Pantex Plant, Y-12, and SRS tritium activities. Candidate areas for review by the Board include the following:

- ! Site-wide and facility-specific safety analyses and identification and implementation of controls for nuclear weapon activities (e.g., Safety Analysis Reports)
- ! Weapon-specific safety analyses and identification and implementation of controls for nuclear weapon activities (e.g., B83);
- ! Nuclear Explosive Safety Studies (e.g., W80);
- ! Cross-cutting functional areas at the Pantex Plant, Y-12, or SRS tritium facilities (nuclear criticality safety, fire protection, nuclear explosive safety); and

- ! Special studies of unique or significant hazards at DOE weapon facilities (e.g., processing technology alternatives).

While performing its reviews, the Board will assess the effectiveness of ISM implementation and the safety controls identified for ongoing operations, as well as any new weapon system dismantlement projects at the Pantex Plant or Y-12 that start in FY 2002.

## FY 2002 Performance

**Compliance with Procedures at Pantex.** In October 2001, the Board sent NNSA a letter expressing concern regarding the increasing number of procedure violations at Pantex. Although NNSA took some actions to address this problem, the Board again wrote to NNSA in March 2002 noting that further improvements were warranted. In this letter, the Board emphasized the importance of taking strong action to correct inadequate procedural compliance at Pantex. In response, the Pantex contractor executed an action plan designed to decrease the frequency and significance of events attributed to lack of compliance with procedures. Key corrective actions remain to be completed in 2003, including a procedure upgrade project and implementation of a fully automated material movement system. **Outcome: Nuclear explosive safety at the Pantex Plant has been improved.**

**Fire Protection at Pantex.** A Baseline Needs Assessment of the Pantex Fire Department conducted in 2002 identified numerous and significant safety-related deficiencies. However, the Pantex contractor exhibited reluctance to act on these findings. The Board intervened to emphasize the need for NNSA and its contractor to act promptly to address the deficiencies. **Outcome: The Pantex contractor has drafted and is implementing a corrective action plan to improve the fire department's readiness.**

**Nuclear Material Storage Facilities at Y-12.** In response to the Board's oversight, Y-12 developed a 10-year plan for consolidating nuclear material stored in deteriorating facilities. The contractor resolved the safety concern posed by the building that was in the worst physical condition by removing all nuclear material from that building, and began removing material from another building unsuitable for nuclear material storage. The contractor also began to integrate long-range facility planning with planning for storage requirements. **Outcome: DOE has substantially improved the storage conditions of nuclear material at Y-12 and has developed a process to prevent the recurrence of hazardous storage situations.**

**Fire Protection for Highly Enriched Uranium (HEU) Operations at Y-12.** Y-12 proposed only minor plant improvements and nearly three dozen administrative controls to correct long-standing fire protection deficiencies in a major chemical operation involving HEU. The Board identified significant problems with maintaining administrative controls at Y-12, and also identified nonconservative and inconsistent assumptions in the safety basis supporting this operation. **Outcome:**

**NNSA has acknowledged this safety issue, reevaluated the safety basis, and is now assessing the installation of a sprinkler system as an engineering alternative to administrative controls.**

**Chemical Safety at Y-12.** Problems with the management of chemicals at Y-12 have been highlighted in extensive correspondence from the Board. In 2002, as a result of the Board's efforts, Y-12 made improvements in the chemical safety program. The site has documented a chemical safety management program, Operational Safety Boards continue to improve, hazard surveys are on track for completion, authorization basis documents for chemically hazardous facilities have been issued, and the Hazardous Material Inventory System has been upgraded. **Outcome: Chemical safety at Y-12 has been significantly improved.**

**Lightning Protection at the Pantex Plant.** In response to continuous oversight by the Board, DOE has spent more than three years improving its understanding of the threat of lightning to nuclear explosives, and devising controls to ensure nuclear explosive safety when lightning is present. The Board's efforts to improve lightning protection at Pantex reached a milestone in FY 2002 when Sandia National Laboratories (SNL) completed low-voltage testing of all selected nuclear facilities under the project plan for lightning protection. **Outcome: The completion of testing gives confidence that all necessary safety controls are in place to protect nuclear explosives from the effects of lightning.**

**Nuclear Explosive Program Activities.** The Board has continued to urge DOE to simplify and expedite its process for reengineering nuclear explosive processes at Pantex. During FY 2002, DOE began identifying improvements for the disassembly & inspection (D&I) programs for the W78 and W88 warheads. These improvements were developed under the Seamless Safety for the 21st Century (SS-21) program, a program developed in response to Board concerns. **Outcome: The D&I programs for the W78 and W88 systems will be conducted safely using the vastly improved tooling and procedures developed as part of the SS-21 program.**

**Resumption of HEU Operations at Y-12.** The Board found that preparations for the wet chemistry process involving HEU at Y-12 were inadequate in the areas of operating procedures, conduct of operations, and training. **Outcome: DOE agreed that safety improvements were necessary and suspended the resumption of hazardous activities pending the completion of the improvements.**

**Building 12-64 Seismic Analysis at Pantex.** In 1998, the Board wrote a letter to DOE questioning the seismic response of Building 12-64. In response, DOE terminated all nuclear explosive operations in the building. In April 2002, NNSA informed the Board of its intention to upgrade Building 12-64 in preparation for resuming nuclear explosive operations there. At a subsequent meeting with NNSA personnel, the Board challenged the adequacy of the analysis that had been completed to address the Board's original concerns. **Outcome: DOE is working to improve the analyses and identify potential engineering solutions.**

**Maintenance Improvement Program at Y-12.** In FY 2002, Y-12 implemented a maintenance improvement program. This action was taken in response to the Board's concern that overdue and deferred maintenance undermined the effectiveness and reliability of safety systems. Y-12 has now instituted systematic, scheduled outages at nuclear facilities and is prioritizing and reducing its maintenance backlog. **Outcome: Safety equipment at Y-12 is more available and reliable than in the past.**

**Recommendation 99-1.** Continuing to respond to the Board's Recommendation 99-1, *Safe Storage of Fissionable Material called "Pits,"* DOE has now repackaged more than 5,000 pits into robust containers suitable for interim storage. **Outcome: The likelihood of the nuclear material from pits being involved in an accident is steadily decreasing.**

## **OBJECTIVE 2-B. SAFE CONDUCT OF STOCKPILE STEWARDSHIP**

The Board will verify the safety of DOE's defense nuclear activities undertaken to ensure the continuing effectiveness of the nuclear weapon stockpile in the absence of underground nuclear testing.

### **FY 2002 Performance Goal**

The Board will conduct assessments of DOE's efforts to develop and implement safety management systems for stockpile stewardship activities. The Board will also review DOE's efforts to address safety issues associated with aging-related changes in nuclear weapon components, including research and modeling, for weapon systems and components in the enduring stockpile. These reviews will focus on activities at LLNL, LANL, NTS, and SNL. Candidate areas for Board review include the following:

- ! The safety basis analysis for defense nuclear activities or facilities;
- ! The work planning process (i.e., activity-specific hazard analysis, and identification and implementation of safety controls);
- ! DOE/contractor operational readiness reviews (ORR) or other readiness determinations;
- ! Design and construction phases of the life cycle of defense nuclear facilities, (e.g., replacement for the Los Alamos Critical Experiments Facility);
- ! Aging-related changes in nuclear weapon components for weapon systems in the enduring stockpile;
- ! Safety controls selected for hazardous activities within the weapons complex; and

- ! Cross-cutting functional areas at LANL, LLNL, NTS, and SNL.

While performing the above reviews, the Board will assess the effectiveness of ISM implementation for proposed and ongoing operations.

## FY 2002 Performance

**Weapons Laboratory Technical Support for Resolving Safety Issues.** The Board identified shortcomings affecting health and safety and issued Recommendation 2002-2, urging the Secretary of Energy to reemphasize the priority of the nuclear weapons laboratories to support the resolution of safety issues within the nuclear weapons program and to ensure that clear lines of communication are maintained between the laboratories and the complex. **Outcome: The Secretary of Energy acknowledged the need to address the issues raised by the Board. Specific plans to improve safety will be executed in 2003.**

**Readiness to Dispose of a Damaged Nuclear Weapon at NTS.** The Board has consistently highlighted to DOE the need to develop the programs and infrastructure required to safely dispose of a damaged nuclear weapon or improvised nuclear device. In response, DOE is upgrading its capabilities to conduct these activities safely by making physical improvements to G-Tunnel; developing a safety basis for G-Tunnel; and taking steps to identify needed improvements in policy, personnel, and procedures. **Outcome: DOE made significant physical and procedural improvements designed to ensure that it is prepared to dispose of a damaged nuclear weapon or improvised nuclear device safely.**

**Emergency Power System (EPS) at LLNL.** The Board found deficiencies in the EPS of Building 332 that threatened the reliability and efficacy of power-dependent hazard controls. In response, the LLNL contractor developed a set of compensatory measures and design modifications to address the identified deficiencies and foster an enhanced understanding of EPS vulnerabilities. **Outcome: EPS reliability has been enhanced, and should meet commercial standards upon completion of the corrective actions currently in progress.**

**Startup of the Plutonium-238 Scrap Recovery Line at LANL.** Near the end of FY 2002, LANL was proceeding toward initial operation of the plutonium-238 scrap recovery line. However, the Board concluded that the project had not adequately classified and developed controls to address the hazards of this operation. DOE and LANL have postponed the start of this hazardous activity to allow time to correct the safety deficiencies identified by the Board. **Outcome: Modifications are being made to safety-related controls that will enhance the safety (particularly worker safety) and operational readiness of this activity.**

**LANL Tritium Facility.** The Board identified numerous physical deficiencies with the lightning protection system at the Weapons Engineering Tritium Facility at LANL.

**Outcome: DOE and its contractor have corrected the deficiencies identified by the Board, and have imposed administrative controls to preclude future deficiencies.**

**Sandia Underground Reactor Facility (SURF).** The Board reviewed preliminary plans for the Sandia Underground Reactor Facility project and found health and safety deficiencies in the protection of workers exposed to radiological and industrial hazards. Some of these problems stemmed from the below-ground location of the facility. **Outcome: NNSA committed to correct the deficiencies before approving the preliminary safety analysis. On November 12, 2002, however, NNSA canceled the project.**

**Emergency Operations Center (EOC) at LANL.** LANL is constructing a new Emergency Operations Center (EOC), located such that the prevailing winds would carry plumes from most postulated accidents away from the EOC. The location, however, is in the deformation zone associated with a seismically active fault. To solve the location problem, the Board suggested that LANL consider the new EOC to be part of a system comprising the new EOC, an older fixed EOC, and a mobile command center. NNSA and LANL have taken this approach; procurement of a mobile command center should be completed by September 2003. **Outcome: LANL agreed that this concept provided a more robust emergency operations capability, and it is being implemented**

## **GOAL 3. SAFE DISPOSITION OF HAZARDOUS REMNANTS OF WEAPONS PRODUCTION**

*Hazardous materials remaining from weapons production continue to be safely and effectively characterized, stabilized, and stored. Legacy facilities are being decommissioned in a manner that protects workers, the public, and the environment. The objectives and annual performance goals under Goal 3 address the Board's efforts to confirm the safe dispositioning of hazardous legacy materials and facilities associated with nuclear weapons. Achieving that goal requires a multiyear, multifocus, multisite effort extending beyond a single annual performance period. The two strategic objectives that support this general goal address DOE's activities to reduce the risks of legacy materials by appropriate processing and disposition, as well as to decommission production facilities and sites no longer essential to the national security mission.*

### **OBJECTIVE 3-A. MATERIAL STABILIZATION**

The Board will verify that DOE properly characterizes, stabilizes, processes, and safely stores surplus plutonium, uranium, and other actinides, residues, spent fuel, and wastes from the nuclear weapons program, and that DOE provides for expeditious disposal, as needed.

#### **FY 2002 Performance Goal**

The Board 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 ISM 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, the safety of ongoing operations, and the suitability of long-term storage and disposal facilities. Representative areas for review include the following:

- ! Stabilization and packaging of plutonium metal and oxide at Hanford and LANL (Recommendation 94-1);
- ! Design of facilities for stabilization and packaging of plutonium metal and oxide at SRS (Recommendation 94-1);

- ! Stabilization and disposal of plutonium-bearing solutions and residues at SRS and LANL (Recommendation 94-1);
- ! Characterization, stabilization, and packaging of neptunium solutions at SRS (Recommendation 94-1);
- ! Preparations for pretreatment and vitrification of americium/curium solutions at SRS (Recommendation 94-1);
- ! Characterization, stabilization, and packaging of uranium-233 materials at Oak Ridge (Recommendation 97-1);
- ! Stabilization and disposition of highly-enriched uranium solutions at Savannah River (Recommendation 94-1);
- ! The designs for the proposed Plutonium Immobilization Facility and Pit Disassembly and Conversion Facility, and their interfaces with the proposed mixed oxide fuel fabrication facility;
- ! The design chosen for the treatment process for high-level waste liquids and salts at SRS (Recommendation 96-1);
- ! The design for facilities for treatment of high-level waste, and testing and operation of high-level waste retrieval and transfer systems at Hanford; and
- ! Safety of operations at the Waste Isolation Pilot Plant (WIPP) and at sites preparing wastes for shipment to WIPP.

## FY 2002 Performance

**Safe Disposition of Hazardous Remnants of Nuclear Weapons Production.** In Recommendations 94-1, *Improved Schedule for Remediation in the Defense Nuclear Facilities Complex*, and 2000-1, *Prioritization for Stabilizing Nuclear Materials*, the Board urged DOE to assess and take action on legacy nuclear materials, recognizing that unstable materials and undesirable storage conditions would worsen with time. In FY 2002, the Board urged DOE to improve the strategy and schedule for stabilization activities at SRS and LANL. In response, DOE revised its approach to completing plutonium stabilization at SRS in a manner consistent with the Board's suggestions. However, the plan and schedule for nuclear materials stabilization at LANL remained unacceptable. The Board urged DOE to accelerate the cleanup of legacy materials by pursuing direct disposal of unneeded residues at LANL, instead of processing them to recover plutonium. Recently, DOE took a first step toward implementing this approach by approving a safeguards vulnerability

assessment for disposal of such residues. **Outcome: DOE is reducing the risk that hazardous nuclear materials will be released into the environment and harm workers and the public by continuing to stabilize and repackaging its inventory of legacy nuclear materials, implementing an improved approach toward plutonium stabilization at SRS, and working to improve the stabilization program at LANL.**

**Stabilization Capabilities at SRS.** In March 2002, the Board issued DNFSB/TECH-32, *Savannah River Site Canyon Utilization*, emphasizing the role of the F-Canyon facility in safely stabilizing nuclear materials. DOE has continued to pursue deactivation of F-Canyon, leading the Board to issue additional correspondence suggesting that DOE identify clear and achievable disposition paths for materials present in F-Canyon and define how future fissile materials disposition requirements could be met without F-Canyon before proceeding with deactivation. In June 2002, the Board notified DOE of the need to make repairs to the H-Canyon ventilation system at SRS—a safety system important to the protection of workers and the public. DOE has begun planning for the needed repairs. **Outcome: DOE was apprised of the advantages of continued utilization of F-Canyon and the need to determine whether its shutdown would have a negative impact on the stabilization of legacy nuclear materials, and was advised of the need to repair the H-Canyon ventilation system.**

**Inactive Nuclear Materials at NNSA Sites.** The Board found that NNSA has not been effectively managing its growing inventory of nuclear materials, stored primarily at LANL and LLNL that have no identified programmatic application. Many of these materials are inadequately characterized or are not packaged appropriately for extended storage. The Board issued a letter to NNSA in May 2002, requesting that NNSA examine the safety issues and propose measures to improve the safe management of these materials. NNSA's response of September 24, 2002, documented agreement that improvement in management of these nuclear materials is needed. **Outcome: NNSA senior management agreed with the safety issues raised by the Board that improvement is needed in the management of its nuclear materials and is planning steps to improve the situation.**

**Plutonium Stabilization and Packaging.** During FY 2002, the Rocky Flats Environmental Technology Site (RFETS) completed packaging of more than 100 tons of plutonium-bearing residues into a stable configuration, ready for shipment to WIPP, and finished processing all plutonium-bearing solutions into stable oxide form. Also during FY 2002, Hanford completed packaging of plutonium metal, disposing of plutonium solutions, and stabilizing of plutonium alloy turnings that had been stored in oil, and began stabilizing plutonium-bearing polycubes. These accomplishments represent the culmination of several years of preparation and stabilization operations undertaken in response to the Board's Recommendations 94-1 and 2000-1. **Outcome: Stabilization of several categories of hazardous legacy plutonium materials has been completed.**

**Safety Improvements for Plutonium Stabilization Operations.** The Board's reviews at several sites have led to noteworthy improvements in the safety of plutonium stabilization activities. The Board identified deficiencies in the practices at RFETS and Hanford for measuring moisture and other volatile materials remaining in stabilized plutonium oxides; as a result, DOE changed its measurement techniques and strengthened its understanding of moisture measurement. The Board also found that DOE had not implemented adequate controls to prevent a deflagration or explosion in the furnaces during stabilization of impure plutonium oxides at RFETS. As a result, DOE modified the stabilization furnaces and process parameters to ensure that these materials could be safely stabilized. As a final example, the Board questioned the safety of the polycube stabilization process at Hanford, which was experiencing regular shutdowns because of clogged off-gas filters. In response, DOE took compensatory actions until the plugging could be eliminated by installing new equipment and modifying the stabilization process. **Outcome: Appropriate safety upgrades have been made in plutonium stabilization processes.**

**Disposition of Americium/Curium Solutions.** The need to expedite stabilization of americium/curium solutions at SRS was identified in the Board's Recommendation 94-1. After failing to develop a vitrification process for this material, DOE has decided to blend the solution with high-level waste for vitrification at SRS's Defense Waste Processing Facility. The Board evaluated this strategy, and concluded that it could be executed safely provided several issues were addressed. Improvements DOE has agreed to implement include verifying the functionality of safety equipment prior to the transfer, modifying response times to radiation alarms to minimize potential worker exposure, implementing additional controls to preclude plugging the F-Canyon waste header through which the transfer will be made, and performing additional cold runs to demonstrate the viability of the transfer path. **Outcome: DOE improved its plans for disposing of the americium/curium solutions by implementing safety improvements identified by the Board.**

**Hanford Spent Nuclear Fuel Project.** During FY 2002, Hanford made substantial progress toward removal of deteriorating spent nuclear fuel from the K-East Basin. This activity is a key component of the implementation of Recommendation 94-1, and the Board exercised close oversight of the safety measures for fuel retrieval and handling. In response to the Board's findings, DOE modified the design of the fuel cask handling equipment to limit the distance a dropped cask could fall, and thus reduce the potential for a release of sludge and water from the cask in the event of a drop. The Board also identified problems with the contamination control strategy for the fuel casks, leading DOE to implement improved controls. These activities recently culminated in the successful start of fuel removal from the K-East Basin.

**Outcome: Substantial progress was made toward the removal of deteriorating spent fuel from the K-East Basin; the safety of the fuel removal process was enhanced.**

**Hanford High-Level Waste (HLW) Tanks.** The Board has continued to press DOE to improve programs that protect and verify the integrity of the HLW storage tanks at Hanford. As a result, during FY 2001 and 2002, DOE added corrosion inhibitors to tanks with off-specification

chemistry, implemented improved requirements for monitoring tank chemistry, and resumed operating the annulus ventilation systems to help prevent corrosion of the primary tank walls. The Board has continued its evaluations of the HLW systems. In 2002, the Board found that waste transfers were being planned without the needed qualification and inspection of equipment for the transfers. DOE responded by directing the Hanford contractor to perform the necessary actions. **Outcome: The risk of leaking HLW tanks has been reduced.**

**Savannah River Site HLW Tanks.** In response to the Board's Recommendation 2001-1, *High-Level Waste Management at SRS*, SRS developed an improved inservice inspection program for its HLW tanks. Based upon the Board's evaluation, DOE modified the program to require ultrasonic inspection of all double-shell HLW tanks at SRS instead of just a subset, and to inspect the tanks at greatest risk of corrosion early in the program.

**Outcome: The risk of leaking HLW tanks has been reduced.**

**Pit Disassembly and Conversion Facility (PDCF).** The Board is conducting an in-depth safety review of the preliminary design of the PDCF at SRS. The Board found the most pressing safety issue to be the need to assess the effects of the settlement of PDCF structures due to soft zones in the soil at the proposed site for the facility. The Board also found that the safety and hazard analyses needed improvement to ensure proper identification of safety-significant systems, structures, and components for worker protection. Since the PDCF design is still in the preliminary stage, the Board believes that NNSA should be able to resolve these issues readily. **Outcome: Safety-related design issues have been identified at a stage of the design at which they can be resolved readily.**

**Sodium Fluoride (NaF) Traps at Oak Ridge.** NaF traps containing uranium-233 ( $^{233}\text{U}$ ) in the form of uranium hexafluoride, are stored in Building 3019A at Oak Ridge. These containers are becoming pressurized with fluorine gas produced by radiolysis of the uranium hexafluoride. On September 23, 2002, the Board issued a letter identifying weaknesses in DOE's disposition program for the NaF traps; in response, DOE committed to timely decisions and corrective actions. **Outcome: DOE is pursuing timely stabilization of the NaF traps.**

**Integrity of Savannah River Confinement Ventilation System.** In June 2002, the Board determined that DOE was not taking appropriate or timely actions to correct a known deficiency with the H-Canyon confinement ventilation system. An interface with a non-seismically qualified system renders the facility vulnerable to an unfiltered ground-level release of contamination during canyon accidents, especially an earthquake. **Outcome: DOE is taking action to correct the deficient ventilation system in a more timely manner.**

**Storage of Depleted Uranium at SRS.** In March 2002, the Board highlighted the need for DOE to reduce the safety risk posed by more than 22,000 metric tons of depleted uranium materials stored in deteriorating containers and facilities at SRS. The Board urged DOE to take action to safely dispose of unneeded materials. DOE embraced this approach and has developed an aggressive

strategy to rid SRS of this safety risk. **Outcome: DOE has initiated actions to dispose of this material.**

**Uranium-233 Stabilization.** In response to the Board's Recommendation 97-1, DOE commenced in FY 2002 the  $^{233}\text{U}$  inspection program at Oak Ridge National Laboratory. This program will characterize the hazards of materials stored for more than 20 years with little surveillance. Thus far, most packages inspected have been found to be in good condition, except for a package containing an uncommon form of  $^{233}\text{U}$ . The inner can of this package was severely corroded.

**Outcome: After several years of preparations, the  $^{233}\text{U}$  inspection program has safely commenced.**

## **OBJECTIVE 3-B: FACILITY DECOMMISSIONING**

The Board will verify that DOE aggressively pursues the safe decommissioning of excess defense nuclear facilities that pose a significant risk to workers or the public.

### **FY 2002 Performance Goal**

The Board will conduct assessments of the adequacy of plans, standards, procedures, and execution for activities associated with decommissioning of DOE defense nuclear facilities. These assessments will be conducted using the principles of ISM to ensure that decommissioning efforts are performed safely. Additionally, the Board will continue efforts to confirm that high-risk facilities are decommissioned in a timely manner. These assessments are conducted in collaboration with state and other regulatory authorities, as needed, and on a schedule that supports DOE's operational plans. Representative areas for Board review include the following:

- ! Planning for the deactivation of the Plutonium Finishing Plant at Hanford;
- ! Building 371, 707, or 776 at RFETS;
- ! Excess facility risk reduction activity at SRS;
- ! Decommissioning activity at LANL; and
- ! Decommissioning plans for the 602 Reprocessing Plant at the Idaho National Engineering and Environmental Laboratory (INEEL).

## **FY 2002 Performance**

**RFETS Deactivation and Decommissioning (D&D) Activities.** In a March 2002 letter to DOE, the Board concluded that improvements in activity-level work planning were needed to ensure that D&D work at RFETS could be conducted safely. The Board highlighted the need for improved DOE oversight of the contractor's work planning, and for improved feedback and improvement processes to ensure that the underlying causes of problems in the planning and execution of D&D work were identified and corrected. An increasing amount of decommissioning work at RFETS is planned to be performed by subcontractors and other personnel not directly attached to the major D&D projects. For this reason, the Board encouraged DOE to ensure the proper flowdown of safety requirements and processes for work planning and work control to subcontractors. **Outcome: As a result of the Board's involvement, DOE has taken comprehensive actions to improve the safety of D&D work at the site.**

**Radiological Safety at RFETS.** In February 2002, the Board reviewed radiological work practices for decommissioning activities at RFETS. In response to the observations provided by the Board during this review, RFETS has increased monitoring of airborne radioactivity, improved requirements and guidance for air flow testing following reconfiguration of a room area and for hand protection against cuts and punctures that could result in radiological injection doses. **Outcome: RFETS has implemented improved worker protection measures for D&D activities.**

**Deactivation of the Heavy Element Facility at LLNL.** The Board reviewed LLNL's plans for deactivation of the Heavy Element Facility, a project that involves the removal of nearly 300 radioactive items. The Board found that planning for the project was being approached piecemeal, rather than in a systematic and integrated manner. In a March 2002 letter, the Board stated that the use of an integrated and systematic planning approach would result in safety and efficiency improvements by better identifying hazards and necessary controls, improving the sequencing of tasks, and identifying repetitive tasks that could be standardized. **Outcome: LLNL has started developing a project management plan that has already resulted in a better understanding of the complexity of the proposed work.**

**Risk Reduction at Y-12.** The Board has in the past expressed significant concern with regard to deteriorating nuclear storage facilities and material disposition activities at Y-12. In particular, Building 9206 at Y-12 contains substantial quantities of radioactive materials in unstable forms and aging packaging. In FY 2002, the Y-12 contractor made substantial progress in reducing the inventory of highly enriched uranium in Building 9206, as well as in developing disposition pathways for unique items currently stored in the warehouse. **Outcome: The risk of unstable and poorly packaged nuclear material has been reduced.**

**Miamisburg Environmental Management Project (MEMP).** During a review of the MEMP work control program, the Board identified discrepancies between the integrated work control

and maintenance control procedures, and a need for improved linkage between the two documents. The contractor took corrective actions to improve the work flow and the safety of maintenance activities. **Outcome: Work control procedures important to worker safety have been improved.**

**Fernald Environmental Management Project.** In 2002, the Board conducted reviews of the work authorization programs for each of the seven major closure projects at Fernald and reviewed the safety oversight programs of DOE and its primary contractor. The Board found that both DOE and its contractor needed to pay closer attention to worker safety and proper conduct of operations on most site projects, especially projects involving subcontractors. The Board also evaluated the design and safety analysis for the Silos project, which will remove and treat radioactive waste stored in three concrete silos for approximately 50 years. This work is still planned, and the Board has provided technical oversight to DOE on the structure and content of the safety basis for these activities.

**Outcome: The Board's reviews are leading to greater assurance that D&D work at Fernald is planned and executed in a controlled and safe manner.**

**Hanford D&D Activities.** The Board identified a serious worker safety hazard at a Hanford nuclear facility—the use of canvas gloves to remove stuck and damaged blades from a large portable band saw used for D&D work. Hanford management acknowledged this hazard and directed workers to perform such activities using tools rather than their hands.

**Outcome: Worker safety for D&D work at Hanford was improved.**

## LIST OF ABBREVIATIONS AND ACRONYMS

Board	Defense Nuclear Facilities Safety Board
CFR	Code of Federal Regulations
D&D	deactivation and decommissioning
D&I	disassembly and inspection
DNFSB	Defense Nuclear Facilities Safety Board
DOE	(U.S.) Department of Energy
EOC	Emergency Operations Center
EPS	emergency power system
FRA	Functions, Requirements, and Authorities
FY	fiscal year
GPRA	Government Performance and Results Act
HC	hazard category
HEU	highly enriched uranium
HEUMF	Highly Enriched Uranium Materials Facility
HLW	high-level (radioactive) waste
INEEL	Idaho National Engineering and Environmental Laboratory
ISM	Integrated Safety Management
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
MEMP	Miamisburg Environmental Management Project
NaF	sodium fluoride
NNSA	National Nuclear Security Administration
NTS	(Department of Energy) Nevada Test Site
ORR	operational readiness review
PDCF	Pit Disassembly and Conversion Facility (at SRS)
SNL	Sandia National Laboratories
SRS	Savannah River Site
SS-21	Seamless Safety for the 21 <sup>st</sup> Century
SURF	Sandia Underground Reactor Facility
TEF	Tritium Extraction Facility
USQ	Unreviewed Safety Question
WIPP	Waste Isolation Pilot Plant
WTP	Waste Treatment Plant (at Hanford)
Y-12	Y-12 National Security Complex
<sup>233</sup> U	uranium-233