John T. Conway, Chairman
A.J. Eggenberger, Vice Chairman
John E. Mansfield

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004-2901
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February 21, 2003

Mr. Mark B. Whitaker Jr.
Departmental Representative to the DNFSB, S-3.1
U. S. Department of Energy
1000 Independence Avenue, SW
Forrestal Building, Room 6H-025
Washington, DC 20585-1000

Dear Mr. ~~Whitaker~~: MARK

The Defense Nuclear Facilities Safety Board (Board) is pleased to enclose a printed copy of its Thirteenth Annual Report to Congress which describes the Board's health and safety activities relating to the Department of Energy's defense nuclear facilities during the calendar year 2002.

Sincerely,

John

John T. Conway
Chairman

Enclosure: As stated

THIRTEENTH ANNUAL REPORT

TO CONGRESS

DEFENSE NUCLEAR FACILITIES
SAFETY BOARD

FEBRUARY 2003

John T. Conway, Chairman
A.J. Eggenberger, Vice Chairman
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February 21, 2003

To the Congress of the United States:

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

As required by statute, the Board's report summarizes activities during calendar year 2002, assesses improvements in the safety of DOE defense nuclear facilities, and identifies remaining health and safety problems.

The Board wishes to recognize the contributions of Mr. Harry G. Waugh, who passed away this year while still on duty with the Board. Mr. Waugh dedicated his professional life to the nuclear weapons complex and to the interests of the nation. A World War II veteran, his exemplary government service spanned more than 50 years, 40 as a weapons expert at the Los Alamos National Laboratory and 10 as a site representative for the Board at the Pantex Weapons Plant in Texas. He served as a mentor to our younger technical staff and was unstinting in his efforts to share his vast knowledge. His unparalleled knowledge and sage advice will be sorely missed.

Respectfully submitted,*

John T. Conway
Chairman

A. J. Eggenberger
Vice-Chairman

John E. Mansfield
Member

*Although not a signatory to this report, Board Member Joseph J. DiNunno contributed substantially to the Board's achievements during 2002. Mr. DiNunno retired in June 2002.

PREFACE

Congress created the Defense Nuclear Facilities Safety Board (Board) as an independent agency within the Executive Branch (42 U.S.C. § 2286, *et seq*.) to identify the nature and consequences of potential threats to public health and safety at the Department of Energy's (DOE) defense nuclear facilities, to elevate such issues to the highest levels of authority, and to inform the public.

The Board is required to review and evaluate the content and implementation of health and safety standards, including DOE's orders, rules, and other safety requirements, practices, and events relating to system design, construction, operation, and decommissioning of DOE's defense nuclear facilities. The Board makes recommendations to the Secretary of Energy that the Board believes are necessary to ensure adequate protection of public health and safety. The Board must consider the technical and economic feasibility of implementing the recommended measures. The Secretary may accept in whole or in part or reject the recommendations. If the Secretary rejects a recommendation in whole or in part for any reason, the Board does not withdraw or modify the recommendation, and the Secretary maintains the rejection, the Secretary must publish his or her decision and reasoning in the *Federal Register* and must formally notify both Houses of Congress. The Secretary must report to the President and Congress if implementation of a recommendation is impracticable because of budgetary considerations. Should the Board determine that an imminent or severe threat to public health or safety exists, the Board must transmit its recommendation to the President, and the Secretaries of Energy and Defense.

The Board may conduct investigations, issue subpoenas, hold public hearings, gather information, conduct studies, establish reporting requirements for DOE, and take other actions in furtherance of its oversight of health and safety at defense nuclear facilities.

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

EXECUTIVE SUMMARY

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

During this past year, actions by the Board resulted in numerous health and safety improvements. These improvements are described in this Annual Report along the lines of the Board's three strategic areas of concentration:

- Safe management and stewardship of the nation's nuclear stockpile and nuclear weapons components;
- Safe disposition of the hazardous remnants of nuclear weapons production; and
- Complex-wide health and safety issues.

The most significant health and safety improvements during 2002 are summarized below.

SAFE MANAGEMENT AND STEWARDSHIP OF THE NATION'S NUCLEAR WEAPONS STOCKPILE AND NUCLEAR WEAPONS COMPONENTS

- In response to the Board's Recommendation 99-1, during 2002 NNSA met a safety goal of repackaging an average of 200 pits per month into robust containers with inert internal environments, reaching a total of more than 6,000 pits repackaged by the end of the year.
- The Board's efforts to improve the lightning protection posture at the Pantex Plant reached a milestone in 2002 when Sandia National Laboratories (SNL) completed low-voltage testing of all selected nuclear facilities under the project plan for lightning protection.
- Responding to deficiencies identified by the Board, NNSA directed the Pantex Plant contractor to revise the Unreviewed Safety Question (USQ) process to fulfill the requirements of 10 CFR § 830.203.
- Based on observations of a contractor operational readiness review (ORR) for the wet chemistry process at the Y-12 National Security Complex (Y-12), the Board found that

preparations in the areas of operating procedures, conduct of operations, and training were inadequate. The ORR was suspended pending corrective actions.

- In response to the Board's oversight, DOE's Y-12 site contractor moved non-nuclear material out of inadequate facilities, razed one facility, prepared another facility for transfer, reduced the material inventory in Building 9206, and developed disposition pathways for several unique items.

- The Board issued Recommendation 2002-2, *Weapons Laboratory Support of the Defense Nuclear Complex* urging the Secretary of Energy for safety reasons to reemphasize the priority of the nuclear weapons program at the nuclear weapons laboratories, and to ensure that clear lines of communication are maintained between the laboratories and the complex.[1]

- The Board identified significant deficiencies in the safety basis and controls associated with the Plutonium-238 Scrap Recovery Line at the Los Alamos National Laboratory (LANL). The weapons laboratory contractor performed a new process hazards analysis, and proposed new, more robust controls to NNSA.

- The Board identified numerous physical deficiencies with the lightning protection system at the Weapons Engineering Tritium Facility at LANL. The laboratory corrected the deficiencies and imposed administrative controls to minimize the possibility of future deficiencies.

- As a result of Recommendation 2000-2, LANL found institutional and facility-level deficiencies in the inspection, testing, and maintenance of fire protection systems. Subsequently, LANL developed and is now executing a corrective action plan.

- At the urging of the Board, DOE's contractor for the Lawrence Livermore National Laboratory (LLNL) has developed a set of compensatory measures and design modifications to address deficiencies associated with the emergency power system for Building 332, and to foster an enhanced understanding of vulnerabilities in emergency power systems.

- The Board found that deactivation planning for LLNL's Heavy Element Facility was piecemeal rather than systematic and integrated. In response to the Board's letter dated March 11, 2002, LLNL corrected the poor planning, leading to improvements in safety and efficiency.

- The Board identified serious deficiencies in the Nevada Test Site's (NTS) readiness to safely conduct underground nuclear weapons tests. NNSA is preparing a safety basis, improving the state of readiness of facilities and equipment, and developing a readiness review process compliant with NNSA requirements.

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[1] See Appendix A for the full text of the recommendation.

- 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.

SAFE DISPOSITION OF THE HAZARDOUS REMNANTS OF NUCLEAR WEAPONS PRODUCTION

- The Board pressed DOE to complete the stabilization of remaining nuclear materials posing the highest risk. The following activities were carried out in continuing response to the Board's recommendations:

  - At the Rocky Flats Environmental Technology Site (RFETS), all plutonium- bearing residues (more than 100 metric tons) were packaged into stable configurations; all plutonium-bearing solutions were eliminated; and more than 60 percent of the plutonium metal and oxide material was stabilized and packaged into robust sealed containers.

  - At the Hanford Spent Nuclear Fuel Project, a major milestone was reached with the removal, stabilization, and packaging of the first containers of deteriorating spent nuclear fuel from the K-East Basin.

  - At the Hanford Plutonium Finishing Plant, stabilization of plutonium-impregnated polystyrene cubes was begun; all plutonium solutions were disposed or converted to stable solids; thermal stabilization of plutonium alloys was completed; and all plutonium-bearing ash and sand, slag, and crucible residues were packaged for disposal at the Waste Isolation Pilot Plant (WIPP).

  - At the Savannah River Site (SRS), disposition of plutonium-bearing residues and dissolution of damaged and deteriorating targets and spent nuclear fuel continued; stabilization and disposition of plutonium solutions began.

  - At LANL, processing of plutonium residues and oxide items continued; higher- risk materials and organic solutions were eliminated.

- 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 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 disposition requirements for fissile materials could be met without F-Canyon before proceeding with deactivation. Full response by DOE is still awaited.

- The Board identified safety deficiencies in the practices at RFETS and Hanford for measuring moisture and other volatile materials remaining in stabilized plutonium oxides. To correct the

deficiencies, DOE changed its measurement techniques and strengthened its understanding of moisture measurement.

- The Board identified safety deficiencies in the processes for stabilizing impure plutonium oxide materials at RFETS and plutonium-impregnated polystyrene cubes at Hanford, resulting in process modifications to improve health and safety.

- The Board advised DOE to correct promptly the known deficiencies in the confinement ventilation system for the H-Canyon facility at SRS, with the result that DOE is making the needed repairs.

- The Board issued a letter identifying weaknesses in DOE's disposition program for uranium-233-bearing sodium fluoride traps stored at the Oak Ridge National Laboratory (ORNL); in response, DOE committed to timely decisions and corrective actions.

- In response to a letter from the Board identifying vulnerabilities associated with the large quantity of depleted uranium stored at SRS, DOE started to dispose of the material housed in the worst storage conditions and to evaluate the best way to dispose of the remaining materials by fiscal year 2006.

- The Board's evaluations of the Hanford Spent Nuclear Fuel Project resulted in several key improvements, including enhanced safety of the equipment used for transferring spent fuel from the Hanford K-East Basin; improved contamination controls for the transfer casks; and an improved mechanical sealing process for storage canisters and the commitment to expedite closure welding of these canisters.

- In response to the Board's oversight, DOE modified the in-service inspection program at SRS to require ultrasonic inspection of all double-shell high-level waste tanks instead of just a subset, and to inspect the tanks at greatest risk of corrosion early in the program.

- In response to a letter from the Board regarding the draft documented safety analysis for high-level waste facilities at SRS, 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.

- Following continued urging by the Board to reduce the hazards in Building 9206 at the Y-12 National Security Complex (Y-12), pyrophoric material was stabilized.

COMPLEX-WIDE HEALTH AND SAFETY ISSUES

Accomplishments affecting multiple sites:

- In response to Recommendation 2000-2, 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. DOE has taken positive steps to ensure that the condition of vital safety systems is understood and controlled.

- The Board has urged DOE to integrate hazard and safety analyses more effectively. In response, DOE has developed a draft handbook—*Integration of Multiple Hazard Analysis Requirements and Activities*.

- The Board continued to seek improvements in DOE's quality assurance program in 2002. At the Board's urging, DOE issued a *Quality Assurance Improvement Plan* to strengthen the implementation of existing quality requirements for safety-related components and systems.

- The Board issued Recommendation 2002-1, *Quality Assurance for Safety-Related Software*, to strengthen requirements and guidance on engineering practices for safety-related software.[2]

- The Board issued Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*. This recommendation charges DOE to promulgate a set of requirements for safety-class and safety-significant administrative controls; to establish appropriate expectations for the design, implementation, and maintenance of these important safety controls; and to ensure that all existing administrative controls are evaluated against these new requirements and upgraded as necessary.[3]

- The Board has continued its efforts to ensure the availability of a criticality safety infrastructure to support nuclear operations (see Recommendation 97-2, *Criticality Safety)*. One significant DOE accomplishment in response to the Board was the establishment of a stable funding source for future criticality safety programs.

Accomplishments at Specific Sites:

- The Board identified deficiencies in the Integrated Safety Management (ISM) System of the Oak Ridge environmental management contractor. In response, DOE and the contractor completed more than 150 actions to strengthen the ISM System, including adding 25 DOE health and safety orders to the contract, conducting training in safety basis fundamentals for key personnel, and hiring additional technical staff.

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[2] See Appendix A for the full text of the recommendation.

[3] Also found in Appendix A.

- The Board found weaknesses in a Hanford contractor's feedback and improvement program. Following implementation of corrective actions, DOE performed a focused review of the ISM system of the Office of River Protection (ORP) and the contractor, and found that significant improvement had occurred.

- Inspections of dry pipe fire protection systems at Hanford, conducted in response to the Board's Recommendation 2000-2, found significant quantities of debris obstructing fire protection systems within the Central Waste Complex. The systems have been cleaned.The Board found a number of weaknesses related to work control, outage planning, and equipment reliability related to the Spent Nuclear Fuel Project at Hanford. As a result of the Board's review, DOE and its contractor made changes that have improved project reliability and equipment availability.

- In response to the Board's observations on the maintenance program at Y-12, the site implemented a comprehensive maintenance improvement plan that has resulted in measurable improvement in the site's maintenance program and equipment availability.

- The Board found that the design of the Tritium Extraction Facility (TEF) at SRS would not adequately protect workers from a tritium release in an earthquake. DOE responded by adding a seismic monitor and alarm system to the design.

- When out-of-specification concrete was placed for the Hanford Waste Treatment Plant (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. In response, WTP developed a systematic approach to investigating and correcting the areas of weak concrete.

- The Board determined that the proposed structural configuration for the Highly Enriched Uranium Materials Facility 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. In response, DOE strengthened the structure and reconfigured the storage design.

OUTSTANDING SAFETY PROBLEMS OF DEFENSE NUCLEAR FACILITIES

- **Ensuring that safety information developed at the national laboratories is adequately communicated to DOE's defense nuclear complex.** Recommendation 98-2, *Safety Management at the Pantex Plant*, urged DOE to improve the tooling and procedures used to work on nuclear explosives by means of an engineering process known as Seamless Safety for the 21st Century (SS-21). In 2002, the Board continued to urge DOE to expedite the full implementation of SS-21 for all weapon systems to improve health and safety. Although DOE has made progress, technical and resource issues continue to impede SS-21 implementation. These issues are often the result of poor communication between the

national laboratories and the complex. To address this support issue complex-wide and to maintain progress in the implementation of Recommendation 98-2, the Board issued Recommendation 2002-2, *Weapons Laboratory Support of the Defense Nuclear Complex*. This recommendation outlined a number of actions DOE should take to ensure that information on weapons safety is developed by the national laboratories in a timely fashion and is promptly and effectively disseminated to the complex.[4]

- **Ensuring safety in the design and construction of new defense nuclear facilities.** The Board's enabling statute requires that it review the design and construction of new defense nuclear facilities to ensure that adequate health and safety requirements are identified and implemented, and that it make timely recommendations to the Secretary of Energy on any needed public health and safety improvements.

  DOE is committed to numerous new design and construction projects during the next decade to provide support for the nuclear weapons stockpile for the nation's defense, and to resolve the remaining health and safety issues that are the historical legacy of weapons production. For example, tritium extraction for stockpile use, conduct of nuclear experimentation, and preservation of the strategic pit inventory will require the Board to oversee the health and safety of new defense nuclear operations. New defense nuclear facilities currently in the design and construction phases that support these missions include the Highly Enriched Uranium Materials Facility at Y-12, TEF at SRS, and WTP at Hanford.

  These facilities must be designed and constructed in a manner that will support safe and efficient operations for 20 to 50 years. This in turn requires a robust design process to ensure that appropriate health and safety controls are identified and properly implemented early in the process. ISM provides the framework for this process. DOE continues to struggle with incorporating ISM principles into the design process. The Board's expectation is that the design and construction phases of defense nuclear facilities will demonstrate clear and deliberate implementation of the principles and core functions of ISM, codified in manuals of practice and implemented on design and construction projects.

- **Stabilizing and confining nuclear materials and waste stored in degrading conditions.** In response to the Board's oversight, DOE is pursuing stabilization and disposition of the hazardous remnants of nuclear weapons production. Substantial progress is being made toward characterizing, stabilizing, and dispositioning many high-hazard nuclear materials, and several associated new facilities are in either design, construction, or initial operation. However, DOE is encountering difficulty in maintaining its momentum in all areas of this important risk reduction effort. The Board will continue to urge DOE to maintain, and in some areas accelerate, these risk reduction activities. During 2002, DOE suspended operations at the F-Canyon facility at SRS, a significant resource for the stabilization of nuclear materials. The Board has strongly urged DOE to establish well-defined disposition

[4] See Appendix A for the full text of the recommendation.

paths for materials that might have gone to F-Canyon, and will continue to review DOE's efforts in this area.

- **Ensuring that health and safety controls established to prevent or mitigate the hazards of activities at defense nuclear facilities are designed, implemented, and maintained to be effective and reliable.** Most facilities of interest to the Board were constructed many years ago and are deteriorating as they age. The Board's Recommendation 2000-2, *Configuration Management, Vital Safety Systems*, addressed the degrading condition of safety systems, calling upon DOE to assess the condition of vital safety systems, designate technically competent system engineers, codify this program in the DOE directives system, and ensure that DOE possesses the requisite technical expertise to monitor and oversee these systems.

  In 2002, DOE completed initial assessments of vital safety systems in high-priority defense nuclear facilities, and began more in-depth assessments of specific systems and programs (e.g., control of drawings and configuration management) that the initial assessment identified as problematic. These detailed assessments have continued to identify significant weaknesses in the operability of a number of vital safety systems across the complex (examples include the confinement ventilation system in Technical Area-48 at LANL and the fire suppression system in the Central Waste Complex at Hanford). With the basic assessments nearing completion, the Board has begun to place greater emphasis on the broader aspects of vital safety system operability. At the Board's urging, DOE issued a *Quality Assurance Improvement Plan* to strengthen the implementation of quality assurance for the design, procurement, construction, operation, and maintenance of vital safety systems. The Board issued Recommendation 2002-1, *Quality Assurance for Safety-Related Software*, to strengthen engineering practices for safety-related software.[5]

  The Board has also challenged the reliability and design of systems reclassified as safety-related systems during development of the authorization basis of a facility. Several sites are now developing backfit policies to formally evaluate reclassified systems against current design criteria. Finally, the Board observed that, in many applications, DOE and its contractors rely on technically inadequate operator actions or administrative programs to reduce anticipated consequences of potential accidents. For this reason, the Board issued Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*.[6]

- **Maintaining the direction and momentum of the ISM program.** In 1995, the Board issued Recommendation 95-2, *Safety Management*, urging DOE to integrate work planning and safety planning more effectively. The methodology that evolved from this

[5] See Appendix A for the full text of the recommendation.

[6] Also found in Appendix A.

recommendation and from DOE's Implementation Plan is termed Integrated Safety Management. The term "integrated" is used to indicate that all aspects of safety, work planning, and performance are integrated into a single process under the responsibility of line management. ISM is a structured, comprehensive, common-sense approach to performing work safely. Through ISM, the Board has encouraged DOE to identify and implement measures to protect the public, workers, and the environment from a wide range of hazards: nuclear, chemical, and physical. The identification of hazards and development of protective measures should be carried out in an integrated way. In 2002, DOE and the Board focused on raising the technical expertise of DOE as a means to foster ISM growth. (This is a congressional mandate to the Board—see S. Rep. No. 232, 100th Cong., 1st Sess., 10 (1987)—as well as a specific deliverable under Recommendation 2000-2, *Configuration Management, Vital Safety Systems*). The Board evaluated and found wanting DOE's efforts to institutionalize the use of system engineers and federal subject matter experts for vital safety systems. Qualification and training programs were deficient, and requirements for many vital technical personnel, both system engineers and federal subject matter experts, were unfulfilled. These issues remained open at the end of 2002.

HUMAN CAPITAL MANAGEMENT

The ability of the Board to fulfill its mission to ensure the health and safety of workers and the public depends heavily on attracting and retaining top-caliber technical staff. The Board has been successful in creating a work environment that emphasizes excellence as the standard for staff performance, and rewards staff members accordingly. The pay banding and pay for performance programs developed and implemented by the Board have proven to be effective in hiring technical talent, holding employees accountable for their performance, and rewarding outstanding performance on the job.

The Board's enabling legislation grants authority for excepted service hiring and classification. During fiscal year (FY) 2002, the Board operated at 63 percent of its statutory employment ceiling of 150 Full Time Equivalents due to fiscal constraints. Within these constraints, however, the Board used excepted service authority, along with recruitment and relocation bonuses, student loan repayments, and retention allowances. In consequence, the Board has been successful in competing for scientific and technical staff in a competitive employment market. The recruitment and retention of scientific and technical staff with outstanding qualifications continues to be critical to the successful accomplishment of the Board's mission.

The Board expects its engineers and scientist to maintain the highest level of technical knowledge to meet the wide range of health and safety challenges it faces. As of the end of FY 2002, 87 percent of the staff held advanced degrees, 29 percent of which were at the Ph.D. level. To meet expected staffing needs, the Board continued its recruitment of senior, experienced technical staff by traditional methods. To attract younger staff members, the Board relies on its Professional Development Program (PDP), a 3-year program that brings entry-level technical talent into professional positions within the Board. Through

a technical mentor, individuals are provided a series of individually tailored developmental assignments, formal academic schooling, and a 1-year hands-on field assignment. This is a highly competitive program to attract the next generation of scientific and technical talent to federal service.

In summary, the Board's ability to accomplish its health and safety mission successfully begins with a determined, focused, and well-executed human capital program. This program uses all available tools to attract and retain the people necessary to accomplish the job that Congress has asked the Board to do.

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1. INTRODUCTION

1.1 BACKGROUND

The Defense Nuclear Facilities Safety Board (Board) is an independent federal agency established by Congress in1989. Simply stated, the Board's mandate under the Atomic Energy Act is safety oversight of the civilian nuclear weapons facilities managed by the Department of Energy (DOE). The nuclear weapons program remains a complex and hazardous operation. DOE must maintain in readiness a nuclear arsenal, maintain aging facilities, dismantle surplus weapons, dispose of excess radioactive materials, clean up surplus facilities, and construct new facilities for many purposes. All of these functions must be carried out in a manner that protects the public, workers, and the environment.

Congress expects the Board to be an independent, expert agency capable of understanding the complexity of nuclear weapons facilities and operations. For that reason, Members of the Board are required by statute to be experts in the field of nuclear safety. The Board has, in turn, assembled a permanent staff with broad nuclear industry experience and competence in all major aspects of nuclear safety: nuclear, mechanical, electrical, chemical, and structural engineering, as well as physics and metallurgy. Currently, 87 percent of the Board's technical staff hold advanced degrees, of which 29 percent are at the Ph.D. level.

The Board has established site offices at six high-priority defense nuclear sites: Pantex Plant in Texas, Los Alamos National Laboratory (LANL) in New Mexico, the Y-12 National Security Complex (Y-12) in Tennessee, Savannah River Site (SRS) in South Carolina, the Hanford Reservation in Washington State, and the Rocky Flats Environmental Restoration Site (RFETS) in Colorado. These site offices provide the Board with capability for continuous on-site oversight.

During the Board's 13 years of operation, its priorities have evolved with changes in the nuclear weapons program. The Board uses its Strategic Plan under the Government Performance and Results Act (GPRA) to ensure that its limited resources remain focused on the most significant health and safety challenges, and to keep pace with shifts in those challenges from year to year. The Board's health and safety activities are closely tied to goals and objectives embodied in this plan.

This Annual Report summarizes the Board's work during calendar year 2002. Sections 2, 3, and 4 describe progress in the three major areas of the Board's operations: safe management and stewardship of nuclear weapons, safe disposition of hazardous nuclear materials and facilities, and complex-wide health and safety issues. Section 5 addresses the Board's interactions with the public. Appendices A through F provide additional material: the text of the Board's recommendations (Appendix A), a list of reports requested from DOE (Appendix B), a list of the Board's letters (Appendix C), a summary of administrative activities (Appendix D), a description of the Board's human resources activities (Appendix E), and a list of abbreviations and acronyms used in this report (Appendix F).

1.2 HEALTH AND SAFETY OVERSIGHT STRATEGY

Maintaining an effective safety oversight program that fulfills the broad mandates of the Board's enabling legislation requires a constant reassessment of health and safety conditions throughout DOE's defense nuclear complex. The Board continues to focus its attention on the most hazardous DOE operations and complex-wide health and safety issues, consistent with its strategic plan and the health and safety oversight philosophy described below.

On the basis of 13 years of operating experience, the Board has established the following guiding principles for maximizing the effective use of its resources:

- The primary responsibility for ensuring protection of the health and safety of the public and workers rests with DOE's line managers, extending in an unbroken chain from the Secretary of Energy to the workers on the floor.

- As an external action-forcing agency, the Board influences the actions of DOE's line management to the extent necessary to achieve its objectives of improved health and safety.

- Effective safety management demands that safety expectations be clearly defined and tailored to specific hazards at all levels—site, facility, and activity.

- Technical expertise is required to define, and ensure compliance with, controls commensurate with the identified hazards.

- Health and safety oversight activities are prioritized largely on the basis of risks to the public and workers. Key indicators are the types and quantities of nuclear material at risk and the process and setting of the operations involved.

- With regard to final cleanup, demolition, and environmental restoration activities, the Board's health and safety oversight activities will be carried out in full cooperation with individual states and other agencies such as the Environmental Protection Agency, in compliance with the Atomic Energy Act of 1954, as amended, and federal environmental laws.

The Board is provided by statute with a number of action-forcing mechanisms to elicit a DOE response to safety problems. Among these mechanisms are recommendations, typically broad and comprehensive in nature; reporting requirements, most often sharply focused on specific safety issues; and public hearings, used to obtain information from DOE, other expert sources, and the public at large on important health and safety issues.

Since 1989 when the Board began operations, 45 formal recommendations, comprising 210 individual sub-recommendations, have been transmitted to the Secretary of Energy. Eighty-nine reporting requirement letters have been sent to DOE requesting specific information on actions that DOE agrees to take to resolve the identified health and safety deficiencies. It is informative, in retrospect, to look at the

topics the Board has asked DOE to target for safety improvements. The 45 recommendations and 89 reporting requirement letters fall into the broad categories of human resources (11), safety standards (10), design and construction (13), decommissioning (12), safety management (35), and operational safety (55). A review of these actions shows that in the early years, the Board focused on ensuring that safety standards and DOE's technical competence were adequate, while at the same time trying to ensure that operational safety issues were dealt with expeditiously. Once adequate safety standards were in place, the Board focused more explicitly on DOE's safety management activities, on continuing improvement in conduct of operations, and on ensuring the integration of safety principles into design, construction, and decommissioning activities.

The Board's recommendation authority has been used most fruitfully for gaining DOE response to broad, cross-cutting matters that affect much of the defense nuclear complex. Examples of complex-wide issues include stabilization and remediation of hazardous materials, technical qualifications, criticality safety, and configuration management of vital safety systems. In view of the typical breadth and complexity of the issues addressed by a recommendation, the time required for DOE to develop an implementation plan and carry it to completion is measured in years.

In contrast, a mandatory reporting requirement has been an effective tool in compelling DOE to respond in a more expeditious manner to important safety issues. Comparison of the Board's use of these two methods shows a marked shift beginning in 1994 toward much greater reliance on reporting requirements. Prior to 1995, the Board had issued 31 recommendations and 17 reporting requirement letters. For the 7-year period from 1995 through 2002, the Board issued 14 recommendations and 72 reporting requirement letters. In 2002 alone, the Board sent 22 reporting requirement letters to DOE.

Using both recommendations and reporting requirements, the Board has been able to enhance markedly DOE's integrated safety management program. The health and safety of the public and workers, and protection of the environment, have been improved as a result of the actions taken by DOE in response to the combined 299 sub-recommendations and reporting requirement letters.

1.3 GOALS AND OBJECTIVES OF THE BOARD'S STRATEGIC PLAN

The Board organizes its safety work by merging the broad health and safety mandate of its statute with the requirements of GPRA. The Board's Strategic Plan identifies the serious hazards associated with the handling of nuclear weapons, weapon materials, and cleanup of aging and surplus facilities. These hazards include the following:

- Tons of fissionable material, in various forms, housed in 50-year-old buildings and structures;
- Thousands of nuclear weapons being dismantled, inspected, or modified;
- Tons of plutonium, including components from dismantled nuclear weapons;

- The nation's strategic inventory of tritium gas, including thousands of individual tritium containers removed from nuclear weapons;

- Thousands of tons of deteriorating spent nuclear fuel in water-filled storage basins; and

- More than 100 million gallons of high-level radioactive waste awaiting treatment.

The Board's Strategic Plan sets forth its statutory mission, divided logically along the lines established by three general goals:

- *Safe stewardship of the nuclear weapons stockpile and nuclear weapons components*—Nuclear weapons stockpile support and defense nuclear research activities continue to be planned and executed safely at DOE's defense nuclear facilities under the National Nuclear Security Administration (NNSA).

- *Safe disposition of the hazardous remnants of weapons production*—Hazardous remnants of nuclear weapons production are appropriately characterized, stabilized, and stored, and legacy facilities are decommissioned in a manner that protects workers and the public.

- *Complex-wide health and safety issues*—Integrated Safety Management continues to evolve through feedback and improvement and is implemented in all life-cycle phases—design and construction, startup, operation, and decommissioning.

2. SAFE MANAGEMENT AND STEWARDSHIP OF NUCLEAR WEAPONS STOCKPILE AND COMPONENTS

2.1 SAFE CONDUCT OF STOCKPILE MANAGEMENT

Stockpile management is the term used to describe the industrial aspects of maintaining the National Nuclear Security Administration's nuclear weapons stockpile and complex. Examples of the Board's activities to improve health and safety in stockpile management are discussed in the following subsections.

2.1.1 Pantex Plant

The Pantex Plant, located near Amarillo, Texas, serves a central role in stockpile management. Operations at the site include the assembly, disassembly, dismantlement, and surveillance of nuclear weapons,[7] as well as interim storage of plutonium removed from retired weapons. In 2002, the Board sought health and safety improvements in weapons operations, fire protection, lightning protection, laboratory support, and storage of special nuclear materials. The Board's pursuit of operational safety improvements at Pantex involved three related areas: development of adequate safety bases, re-engineering of nuclear explosive processes consistent with the Board's Recommendation 98-2, and operators' procedural compliance.

NNSA and its contractors have been working to develop site safety bases compliant with 10 CFR Part 830 by the April 2003 deadline. A key element of the system to protect and maintain these safety bases is the site's Unreviewed Safety Question (USQ) program. Responding to deficiencies pointed out by the Board, NNSA directed the Pantex Plant contractor to revise the USQ process to ensure compliance with the requirements of 10 CFR Part 830.

The Board has closely monitored safety basis development at the Pantex Plant to ensure that hazards are being accurately identified and controls properly classified. In November 2002, the Board noted deficiencies in the classification and reliability of worker safety controls identified in the hazard analysis. To correct these deficiencies, NNSA has agreed to impose alternative controls to protect workers from potential exposures to tritium. Likewise, in a staff report enclosed with an August 2002 letter, the Board challenged the reliability of existing systems reclassified as safety-class or safety-significant. The Board observed that insufficient effort had been made to verify or validate the design adequacy of reclassified systems. In response, the Pantex Plant contractor and the Office of Amarillo Site Operations are developing a policy to evaluate reclassified systems against current design criteria. Where appropriate from a cost-benefit perspective, these backfit evaluations will lead to improvements in the reliability of existing safety systems.

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[7] The terms "disassembly" and "dismantlement" are not synonymous. Disassembly refers to the activities associated with taking apart a weapon for purposes of inspecting or testing its components, while dismantlement is a permanent action to render the weapon no longer usable.

In a letter dated March 25, 2002, the Board emphasized the importance of aggressively addressing inadequate procedural compliance at the Pantex Plant. 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. Observations by the Board's staff and NNSA personnel indicate significant improvement in safety for handling of several weapons programs.

The Board continued to emphasize the need for improved tooling and procedures for work on nuclear explosives by urging DOE to complete the engineering process called Seamless Safety for the 21st Century (SS-21). In December 2002, the Board accepted NNSA's proposed revision to the Implementation Plan for Recommendation 98-2. NNSA has started the SS-21 process for four additional enduring stockpile programs. The wisdom of moving rapidly ahead with SS-21 was illustrated when, in an attempt to perform disassembly and inspection of several W62 warheads, an unexpected bond separation occurred. This event could have been averted had the SS-21 process been fully implemented for this operation. The Board's oversight of NNSA resulted in a more careful and thorough accident analysis by the contractor to ensure safe disassembly of these units. All future units will be disassembled using new SS-21 tooling.

During the last several years, the Board, NNSA, and the Pantex contractor have noted deficiencies at Pantex in the implementation of fire protection controls in the authorization basis, existing fire detection and suppression systems, and the response capability of the Pantex Fire Department. In 2002, NNSA and its contractor undertook to correct many of these deficiencies. The Board also provided additional guidance and insights to further improve fire protection at Pantex in a report forwarded to NNSA in September 2002.

The Board's efforts to improve lightning protection at the Pantex Plant reached a milestone in 2002 when Sandia National Laboratories (SNL) completed low-voltage testing of all selected nuclear facilities as part of the Pantex Plant's Project Plan for Lightning Protection Authorization Basis Post-Start Implementation. Information from this testing is critical for validating the conservatism of voltage estimates that are used to derive safety controls. The evaluation of these critical data will continue into 2003. An August 2002 letter from the Board urged the timely completion of these evaluations to verify the efficacy of lightning protection controls.

The Board continued to press NNSA to make safety improvements in the packaging and storage of special nuclear materials at Pantex. During 2002, NNSA sustained its goal of repackaging an average of 200 pits per month into robust containers with inert internal environments. The Pantex Plant contractor reduced by half the existing surveillance backlog. In a May 2002 letter, the Board outlined the remaining health and safety issues associated with the packaging of pits. (See Recommendation 99-1, *Safe Storage of Fissionable Material called "Pits"*.)

2.1.2 Y-12 National Security Complex

Y-12 is a manufacturing facility located in Oak Ridge, Tennessee. Stockpile management activities at Y-12 include the production, maintenance, refurbishment, dismantlement, evaluation, and storage of certain components of nuclear weapons. Production activities include the manufacture or re-manufacture of unique nuclear weapon components required by the nation's long-term defense capabilities. The Board's most recent efforts to improve safety at
Y-12 were concentrated in the areas of preparations for processing of highly enriched uranium, criticality safety, maintenance, nuclear material storage, and fire protection/combustible loading.

In several letters to DOE, the Board highlighted health and safety deficiencies in the management of readiness preparations at Y-12. Based on observations of a contractor operational readiness review (ORR) for the wet chemistry process in Building 9212, the Board found that preparations in the areas of operating procedures, conduct of operations, and training were inadequate. The ORR was suspended. The inability to complete this contractor ORR indicated that the corrective actions taken by the contractor in response to previous letters from the Board on this topic had not been effective. The Board continues to impress upon NNSA that satisfactory preparations prior to the restart of hazardous activities are imperative to ensure the health and safety of workers and the public.

The Board has continued intense oversight of criticality safety practices at Y-12. During 2002, criticality safety violations in Building 9212 gave the Board cause for concern, pointing to a general neglect of some criticality controls in the storage and handling of fissile material. In November, the Board emphasized the need to correct deficiencies in the criticality safety program at Y-12, as well as the associated formality of operations program. The Board urged NNSA to standardize storage conditions, requirements, postings, and containers to further operators' understanding of and compliance with the essentials of criticality safety. In previous correspondence, the Board had urged Y-12 to reduce maintenance backload, establish reliable maintenance schedules, track and reduce equipment unavailability, track maintenance history, and identify maintenance for vital safety equipment. In 2002, Y-12 made some progress in most of these areas, but further efforts are required to demonstrate that the maintenance program has reached nuclear quality and effectiveness.

The Board has expressed significant concern with regard to deteriorating nuclear storage facilities and material disposition activities at Y-12. In 2002, NNSA reduced specific risks in these areas. Particularly noteworthy were actions taken to move non-nuclear material out of inadequate facilities, raze one of these inadequate facilities, and prepare another facility for imminent transfer to the Infrastructure Reduction organization. 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. The Y-12 contractor also began to integrate long-range facility planning with overall storage planning, which will result in a significant upgrade in the future safety posture of the site.

This year, the Board also reviewed NNSA's plans to build a new long-term storage facility at Y-12 for highly enriched uranium, a material critical to the nation's security posture. Many issues were identified in the areas of siting, safety analysis, and disposition and containerization of legacy material.

Some issues have been resolved, and others require more action by NNSA and its contractor. (For more details, see Section 4.4.)

Based on the high risk of fire and the grave potential consequences of fire in the wet chemistry area of Building 9212 (B-l Wing), the Board suggested that NNSA consider installation of a fixed fire suppression system to protect the structure and its workers. NNSA has decided to reexamine the process to be used for fire prevention and remediation and to seek alternatives that would reduce fire hazards. In the interim, the contractor has proposed upgrades to the fire protection program to support resumption of operations in this area. These upgrades will include installation of full sprinkler coverage for the long term if the activities in the B-1 Wing are to continue. The Board also found that combustible loading control and general housekeeping in Building 9204-4 were deficient. In response, facility management removed hundreds of cubic meters of combustible waste. Recent walkdowns of the facility revealed measurable improvement, significantly lowering the likelihood of a building-wide fire.

2.1.3 Tritium Production

Tritium, a radioactive isotope of hydrogen, has a relatively short half-life (12.3 years) and must be replaced periodically. The tritium facilities at SRS, located near Aiken, South Carolina, play a vital role in stockpile management: ensuring the nation's capability to replenish certain weapon components with tritium gas and to process and store the gas. In 2002, the Board devoted time and resources to reviewing the design and construction of the Tritium Extraction Facility (TEF) at SRS, currently under construction. This facility will be used to extract tritium from target rods irradiated in commercial light water reactors. The Board reviewed the application of integrated safety management (ISM) to the TEF design to ensure that hazards had been identified and appropriate controls developed. Based on the Board's latest review, TEF operations can be conducted while providing adequate protection of workers, the public, and the environment. (For more information, see Section 4.4.)

2.2 SAFE CONDUCT OF STOCKPILE STEWARDSHIP

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

2.2.1 Recommendation 2002-2, *Weapons Laboratory Support of the Defense Nuclear Complex*

Safe operations in the nuclear weapons complex depend directly upon the technical abilities of the highly skilled scientists and engineers at the nuclear weapons laboratories. These personnel apply their unique expertise to address the health and safety of operations throughout the complex. The information generated at the laboratories is of little use, however, unless it is disseminated effectively to the relevant

operations in the complex. Thus, clear lines of communication are vital to ensure that issues raised anywhere in the complex are properly routed to the laboratories for resolution, that timely answers are developed, and that information generated at the laboratories is transmitted successfully for use throughout the complex.

While NNSA has taken some actions to ensure that there is a steady supply of qualified scientists and engineers and that clear lines of communication are maintained, the Board believes additional attention is needed to assure health and safety. In Recommendation 2002-2, the Board recommended that the Secretary of Energy reemphasize the priority of the nuclear weapons program at the nuclear weapons laboratories. The Board recommended that each nuclear weapon system in the stockpile have a senior, technically competent expert serving as the single point of contact responsible for that system at the cognizant laboratory.

This single point of contact should have the ability to ensure that emergent health and safety issues are tracked, prioritized, and resolved in a timely manner. Technical qualifications should be of the highest caliber, and a commensurate qualification and development program should be established to ensure the availability of personnel to fill these positions. The Board recommended that NNSA, as the integrator of the activities in the defense nuclear complex, also establish a point of contact within its laboratory site offices to ensure that requests for laboratory support are being met in a timely fashion and to resolve resource conflicts.[8]

2.2.2 Los Alamos National Laboratory

Los Alamos National Laboratory, located in New Mexico, is the NNSA weapons laboratory with the largest number of defense nuclear facilities and weapon-related activities. Site personnel are heavily involved in ongoing research and development on means for certifying the safety and reliability of nuclear weapons in the absence of nuclear testing. At present, LANL is the planned location of NNSA's limited-scale manufacturing capability for replacement pits for existing nuclear weapons. In 2002, the Board focused its attention on the effort to start up the Plutonium-238 (^{238}Pu) Scrap Recovery Line, development of adequate documented safety analyses for selected facilities, quality assurance, lightning protection, construction of the new emergency operations center, fire protection, and formality of operations.

LANL is completing construction of a new aqueous processing line for recovery of scrap ^{238}Pu. This new recovery line will be the only source of purified ^{238}Pu for at least the next decade. The Board found significant deficiencies in the safety basis and the proposed implementation of safety controls associated with the line. LANL personnel have been working with the Board to develop a more rigorous safety basis. A new process hazards analysis has been performed, and new, more robust controls have been proposed to NNSA. The revised safety basis documentation is currently under review by contractor management prior to submission to NNSA for approval.

[8] See Appendix A for the full text of the recommendation.

LANL's development of documented safety analyses complying with the requirements of 10 CFR Part 830 has led to the identification of new safety-class and safety-significant structures, systems, and components (SSCs), as well as the reclassification of some existing SSCs. However, LANL has not demonstrated that systems reclassified as safety-class or safety-significant equipment are designed adequately. The Board was briefed by NNSA personnel on this issue in November 2002, and expects that in 2003 LANL will remedy the situation with the Board's oversight.

For new projects at LANL, the Board has observed a need for early identification of candidate safety-related SSCs to preserve design flexibility as the coupled design and safety processes mature. This need is especially great with respect to the ^{238}Pu Scrap Recovery Line and the DynEx Project. The Board also found deficiencies in the Safety Analysis Report developed by LANL for the Weapons Engineering Tritium Facility, and suggested ways to improve tritium containment. In response, NNSA has limited the amount of material approved for use in facility operations, and has demanded improvements in the tritium containment strategy.

In 2002, the Board continued to urge NNSA and the LANL contractor to improve the quality assurance program across the site. Institutional plans were still in development, and the Board found that several LANL divisions and projects for which quality programs needed to be in place sooner were proceeding with their own programs independent of the institutional effort. These disparate efforts were at cross-purposes in several cases. As a result of the Board's intervention, NNSA is now coordinating the improvement of quality assurance programs at LANL.

In August, the Board noted that, although the lightning protection system at the Weapons Engineering Tritium Facility had been designated as safety-class (important for the protection of the public), a rooftop review had identified numerous physical deficiencies in system components. The LANL contractor took immediate action to correct these deficiencies, and changed its safety controls to minimize the possibility of recurrence. The Board also found deficiencies in LANL's lightning warning and detection systems, and is closely monitoring improvements being made in these systems.

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. The initial design considered the new EOC in isolation, rather than as part of a system of EOCs that would include an older EOC and a mobile command center under consideration. The Board suggested that LANL adopt a systems approach to address the possible lack of functionality of the new EOC under severe seismic conditions. Moreover, the Board suggested that LANL consider the new EOC to be part of a system of EOCs that includes an older EOC and a mobile command center. NNSA and LANL have taken this approach and expect procurement of a mobile command center to be completed by September 2003. The new EOC is expected to be completed by then.

In January 2002, LANL experienced an uncontrolled energetic reaction in a non-nuclear laboratory, due in part to a lack of disciplined operations. An investigation by LANL personnel identified weaknesses in safe work practices as a cause. At LANL, documented safe work practices are the

mechanism for incorporating ISM into program work for both nuclear and non-nuclear facilities. The Board has concluded that the lessons learned from this event may have laboratory-wide implications on work control, formality of operations, and safe work practices; LANL is currently evaluating these implications, and has committed to improving formality of operations in facility and program work.

As a result of the Board's Recommendation 2000-2, NNSA and LANL assessed fire protection and alarm systems in several nuclear facilities at LANL. In May 2002, these assessments led LANL to determine that institutional and facility-level issues exist with regard to inspection, testing, and maintenance of fire protection systems. LANL has developed and is executing a corrective action plan. The Board has also questioned the hydraulic adequacy of the fire suppression system at the Plutonium Facility known as Technical Area-55 (TA-55). NNSA and LANL plan to address this potential safety issue as part of the improved TA-55 Documented Safety Analysis, to be completed in 2003.

2.2.3 Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory (LLNL), located 45 miles southeast of San Francisco, California, is a nuclear weapons research and development laboratory. It provides technical expertise to support stockpile stewardship and management, including consultation on the surveillance and dismantlement of LLNL-developed nuclear weapons. Most defense nuclear activities are conducted in the Superblock complex, which includes the Building 332 Plutonium Facility and the Tritium Facility.

During 2002, the Board increased the scope and frequency of its health and safety reviews at LLNL. On September 26, 2002, the Board held a public hearing in Livermore, California. The Board focused its efforts on LLNL's support for Pantex Operations (see Section 2.2.1 above), the safety-class emergency power system (EPS) in the Plutonium Facility (Building 332), the deactivation of the Heavy Element Facility (Building 251), and the Decontamination and Waste Treatment Facility (DWTF) complex.

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. EPS reliability has been enhanced, and should meet commercial standards upon completion of the corrective actions currently in progress.

The Board reviewed LLNL's plans for the deactivation of the Heavy Element Facility (Building 251). In addition to the decontamination and removal of 48 gloveboxes and contaminated systems, this effort involves the removal of nearly 300 items of radioactive material, some posing a significant risk of external radiation exposure to workers and the release of contamination in the building. The project is being pursued on an accelerated schedule to achieve near-term risk reduction and avoid costly safety basis upgrades. 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 comprehensive planning methods, such as those contained in DOE Order 430.1A, *Life Cycle Asset Management*, was warranted. The use of an integrated and systematic planning approach results 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. The LLNL contractor has now adopted this approach.

LLNL intends to centralize transuranic (TRU) waste processing and storage operations within the DWTF area. Building 696R is a new facility within the DWTF complex that will be used to store much of the TRU waste presently stored in a tent and in Building 332. Operations in Building 696R began in October 2002. Moving TRU waste from less desirable storage locations to Building 696R will reduce the health and safety risks. Ultimately, however, the Board believes that the only way to truly reduce the risk associated with storing TRU waste at LLNL is to ship the waste to an approved disposal site. The Board is currently evaluating health and safety issues affecting the transfer of TRU waste from LLNL.

2.2.4 Nevada Test Site

The Nevada Test Site (NTS) is located in southern Nevada, about 75 miles northwest of Las Vegas. Stockpile activities at NTS include test readiness preparations, disposition of damaged nuclear weapons, and subcritical experiments. Underground testing of nuclear weapons is no longer being conducted at NTS. However, NTS is maintained in a state of readiness should national security requirements demand the resumption of underground testing. The Board seeks to ensure that if testing is resumed, it would be done safely. During 2002, the Board focused its attention on NTS's test readiness posture, capability to dispose of a damaged nuclear weapon, subcritical experiments, and TRU waste operations.

During its 2002 review of NTS's current test readiness posture, the Board found weaknesses that could affect NNSA's ability to conduct safely an underground nuclear weapons test. The number of personnel uniquely qualified to plan and conduct underground nuclear weapons tests was shrinking. There was no formal safety basis for an underground nuclear weapons test, nor was there a rigorous process to assess the safety of such a test. Subsequently, NNSA developed a plan to prepare a safety basis, address the loss of uniquely qualified personnel, improve the state of readiness of facilities and equipment, and develop a readiness review process compliant with NNSA requirements for nuclear and nuclear explosive operations.

The Board continued to highlight the need to develop the programs and infrastructure necessary at NTS to safely dispose of a damaged nuclear weapon or improvised nuclear device. During 2002, the Board reviewed infrastructure improvements, procedures, and exercises designed to train personnel and develop standards of practice. NNSA continued to make physical improvements to G-Tunnel, and conducted an extensive exercise to practice the full scope of disposition activities at NTS and identify further issues to be addressed. The Board pointed out that there was still no safety basis for these nuclear explosive and nuclear operations, and that the work planning, review and approval processes and the conduct of operations were not sufficiently rigorous for nuclear explosive and nuclear operations. To improve this disposition capability in 2003, NNSA plans to develop a safety basis, address organizational issues, improve the condition of G-Tunnel, and conduct several training activities.

After reviewing the Joint Actinide Shock Physics Experimental Research subcritical experiments at NTS, the Board concluded that the quantity of nuclear material in the targets would exceed the threshold values for a Hazard Category 3 nuclear facility.[9] However, NTS personnel had not developed safety controls appropriate for this level of hazard. As a result of a July 2001 letter from the Board, a visit by the Board to NTS in April 2002, and numerous other communications, the contractor designed controls adequate for the safety of this operation. NNSA is now assessing and improving the adequacy of the controls and configuration management prior to the start of the next series of experiments. The Board has found that NNSA's assessment process is adequately rigorous.

NNSA conducts Hazard Category 2 storage and Hazard Category 3 examination and repackaging of TRU waste at NTS. In a March 2002 letter, the Board informed NNSA that controls from the Safety Analysis Report and Technical Safety Requirements had not been incorporated adequately into facility operating and surveillance procedures. Further, the Board has found that NTS's support programs (such as maintenance, training, and qualification) are not adequate to support Hazard Category 3 nuclear facility operations. As a result, NNSA has added nuclear facility requirements to the contract with its primary contractor, improved the capability of the Nevada Operations Office to manage and assess nuclear facility operations at NTS, initiated a complete revision of the documented safety analysis of all waste activities at NTS, and encouraged the primary contractor to improve its capability to manage and operate nuclear facilities.

2.2.5 Sandia National Laboratories

SNL, which manages research and development installations at several DOE sites, including Albuquerque, New Mexico, and Livermore, California, has significant responsibility for the conduct of engineering research on nuclear weapon systems and components. SNL's major defense nuclear facilities, most of which are located in TA-V at the New Mexico site, include the Annular Core Research Reactor, the Hot Cell Facility, the Gamma Irradiation Facility, and the Sandia Pulse Reactor Facility.

In 2001, the Board had 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. NNSA committed to correct the deficiencies before approving the preliminary safety analysis. On November 12, 2002, however, NNSA canceled the project.

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[9] Hazard categories are defined in Appendix A to 10 CFR Part 830. A Hazard Category 3 facility is one where the hazard is of "only local [*sic*] significant consequences."

3. SAFE DISPOSITION OF HAZARDOUS REMNANTS OF WEAPONS PRODUCTION

3.1 STABILIZATION AND STORAGE OF REMNANT MATERIALS

3.1.1 Complex-Wide Program

In Recommendations 94-1, 96-1, 97-1, 2000-1, and 2001-1, the Board urged DOE to assess and take action on legacy nuclear materials remaining in defense nuclear facilities. Implementation of these recommendations has resulted in significant risk reduction. A large portion of the plutonium solutions and residues, special isotopes, and irradiated fuel and targets has been stabilized and placed into safe storage. In a major step forward, DOE began removing deteriorating spent nuclear fuel from the K-East Basin at Hanford after many years of preparation. However, significant hazards remain, some key stabilization activities have been delayed, and technical and programmatic difficulties threaten to cause further delays in risk reduction. The Board has continued to encourage DOE to promptly stabilize the materials and place them in a safe configuration for storage pending programmatic use or disposition.

The Board believes that DOE has established reasonable disposition paths and plans for most of the materials addressed by the Board's recommendations. However, the disposition of some materials remains problematic. For example, the schedule for addressing legacy plutonium materials at LANL continues to be delayed beyond the time the Board considers acceptable. Many of these items have not been opened for inspection for an extended period—more than 20 years in some cases. Likewise, the plan for stabilizing neptunium solutions at SRS is still uncertain.

The Board has begun to evaluate other materials in addition to those addressed by its existing recommendations that may require timely stabilization and disposition to prevent new hazards from developing. The Board has determined that NNSA is managing a substantial inventory of nuclear materials without identified programmatic uses. To avoid problems such as those prompting the issuance of the Board's previous recommendations, DOE must undertake a comprehensive evaluation of this inventory; stabilize materials and improve storage conditions; and improve life-cycle planning.

In addition to pressing for progress in reducing the risk posed by legacy nuclear materials, the Board has continued to assess the safety and adequacy of stabilization activities. In 2002, the Board conducted assessments of stabilization and disposition at LANL, Hanford, SRS, and RFETS. The Board evaluated the implementation of health and safety requirements in accordance with applicable standards (e.g., DOE-STD-3013, *Stabilization, Packaging, and Storage of Plutonium-Bearing Materials*), as well as safe startup of certain stabilization activities. The Board has paid particular attention to DOE's progress in providing a reliable methodology to verify that plutonium oxides are adequately stabilized prior to packaging for long-term storage. During the past year, the Board found inadequacies with stabilization activities and plans at Hanford, RFETS, and LANL.

The Board has closely evaluated DOE's management of SRS's nuclear chemical separation facilities, F-Canyon and H-Canyon. These facilities provide unique processing capabilities and have played a central role in DOE's nuclear materials stabilization program. 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, and suggesting the continued operation of both canyon facilities to ensure the timely completion of this mission. However, DOE has decided to halt chemical separation operations in F-Canyon, citing the need for cost savings, and has begun to deactivate the facility.

As a result of the suspension of F-Canyon operations, all materials that might have been processed in F-Canyon must now be processed in H-Canyon or disposed of by some other means. In a letter to DOE dated November 8, 2002, the Board asserted that DOE had not met the statutory requirements of Section 3137 of the National Defense Authorization Act for Fiscal Year 2001 (Public Law 106-398). The Board suggested that DOE identify clear and achievable disposition paths for materials present in F-Canyon and define how future requirements for disposition of fissile materials could be met without F-Canyon. The Board will continue its efforts to ensure that DOE's facility utilization decisions are based upon a sound evaluation of its processing needs.

3.1.2 Plutonium

In response to the Board's Recommendations 94-1 and 2000-1, DOE committed to stabilize and package its legacy plutonium materials. During the past year, DOE made significant progress:

- RFETS completed stabilizing all of its plutonium-bearing residues (a significant accomplishment involving more than 100 metric tons of material); eliminated all plutonium-bearing solutions; and packaged more than 60 percent of its plutonium metal and oxide into robust sealed containers in compliance with DOE-STD-3013.

- Hanford began stabilizing its inventory of plutonium-impregnated polystyrene cubes; stabilized or disposed of all its plutonium solutions; completed the thermal stabilization of plutonium alloys; continued packaging plutonium metal and oxide into sealed containers; and repackaged all ash residues and sand, slag, and crucible residues for disposal at the Waste Isolation Pilot Plant (WIPP).

- SRS restarted the plutonium oxide processing line in the HB-Line facility, completed the conversion of existing plutonium solutions to metal in the FB-Line facility, and continued dissolution of spent nuclear fuel in H-Canyon.

- LANL continued processing more than 300 items of plutonium residues and oxide, and eliminated several higher-risk material categories (cellulose rags, nitrides, and organic solutions) after the Board highlighted the risk they posed. Following repeated urging by the Board, LANL requested and received authorization to discard low-purity plutonium-bearing materials as waste, instead of processing them to recover the plutonium.

Establishing the capability to stabilize and package plutonium-bearing materials to meet the requirements of DOE-STD-3013 is a key element of the implementation of these recommendations. RFETS, Hanford, and LLNL have established this capability, and SRS has made significant progress. The Board has evaluated initial steps to establish the necessary capabilities at SRS, and questioned DOE's plan to allow the contractor to commence stabilization operations next year with no independent readiness assessment by DOE. The Board raised this issue with DOE, which now plans to perform an independent readiness assessment of the activity.

As the sites continue to stabilize and package plutonium-bearing materials, the Board evaluates these activities to ensure that they are safe and effective. The Board identified deficiencies in the processing at RFETS and Hanford that had complex-wide implications regarding approved methods for measuring moisture and other volatile substances in stabilized plutonium oxides. Such measurements are essential to ensure that the stabilization process results in a product that can be kept safely in a sealed container during long-term storage. The Board pointed out deficiencies in DOE's technical basis for authorizing the measurement methods now being used. As a result, DOE has revised the technical basis and in doing so has greatly enhanced its understanding of moisture measurement methods.

The Board questioned Hanford's plans for meeting a requirement of DOE-STD-3013 by setting aside representative samples of packaged materials as part of a long-term surveillance program for long-term storage. As a result of actions by the Board, DOE is independently evaluating the materials at Hanford and has initiated actions to provide guidance for the complex on how to satisfy this important requirement. Also at Hanford, the Board called into question the safety of the polycube stabilization process, which was experiencing regular shutdowns because of clogged off-gas filters. DOE responded by installing new equipment and modifying the stabilization process until the plugging can be eliminated.

At SRS, DOE and its contractor resumed the plutonium solution stabilization process in the HB-Line facility. The Board performed an extensive review of the HB-Line restart in late 2001, making several suggestions for improving the safety of that operation, and performed follow-up reviews during 2002. The contractor made improvements in the areas of fire protection and chemical processes, and strengthened administrative controls for hazards in the facility.

The Board reviewed the SRS H-Canyon ventilation system—a safety system important to the protection of workers and the public. This system has experienced degradation in the past and has not been repaired. In a letter to DOE dated June 26, 2002, the Board stressed the need for DOE to take more aggressive action to correct deficiencies in the ventilation system. DOE is now planning to make the needed repairs.

The Board reviewed the technical basis for stabilizing impure plutonium oxide materials at RFETS. The Board concluded that DOE's technical evaluation was flawed, and that DOE had not identified adequate controls to prevent a deflagration or explosion in the stabilization furnace. Following briefings provided to the Board, DOE implemented modifications to the stabilization furnaces and associated process parameters to ensure that these materials could be safely stabilized.

The Board has continued to review and evaluate changes to DOE's long-term plutonium storage standard, DOE-STD-3013, to ensure that material is safely stabilized and packaged. This past year, DOE proposed reducing the stabilization temperature for chloride-bearing plutonium oxides at RFETS. This change was requested by RFETS to reduce the likelihood of corrosion in the process equipment. The Board noted deficiencies in the technical basis for this change. As a result, DOE agreed to approve this change only for a subset of purer, better-characterized materials, and to continue to verify adequate stabilization using the existing requirements of the standard.

3.1.3 Uranium

Highly Enriched Uranium. DOE has entered an agreement with the Tennessee Valley Authority to supply low-enriched uranium from the DOE complex to make commercial nuclear fuel. DOE is readying facilities in the H-Area of SRS to purify highly enriched uranium solution, blend it down to low enrichment, and ship it to a vendor for fabrication into fuel. The Board conducted several on-site reviews of this activity and found inadequacies in work processes and criticality safety. DOE is working to correct these inadequacies. The Board continues to monitor DOE's efforts to commence blending and shipping operations in 2003.

Uranium-233. Uranium-233 (^{233}U) is a man-made radioisotope that contains uranium-232 (^{232}U) as an unavoidable contaminant; products of the decay of ^{232}U are highly radioactive. Most of the ^{233}U not in the form of fabricated fuel materials is stored at Oak Ridge National Laboratory (ORNL). In Recommendation 97-1, the Board urged DOE to characterize, stabilize, and ensure safe storage of its ^{233}U materials expeditiously, because there was significant uncertainty about the safety of storage conditions. During 2002, DOE made considerable progress in the ^{233}U inspection program at ORNL. Forty containers representing about 75 percent of the types of containers stored at ORNL were successfully inspected. The containers were in good condition, except for one package containing an unexpected corrosive material. ORNL transferred that container to a hot cell and stabilized and repackaged its contents.

DOE is also storing sodium fluoride (NaF) traps that contain ^{233}U in the form of uranium hexafluoride in Building 3019A at ORNL. These containers require remediation because they are becoming pressurized with fluorine gas produced by radiolysis of the uranium hexafluoride. On September 23, 2002, the Board issued a letter questioning DOE's program for dealing with these traps. In response to the Board's letter, DOE agreed to measure the pressure in several NaF traps and to depressurize them. DOE will use the results of this activity to develop plans for depressurizing the remaining NaF traps and disposing of the ^{233}U.

Depleted Uranium. More than 22,000 metric tons of depleted uranium is stored at SRS. The Board reviewed storage conditions for the material, as well as DOE and contractor guidance for its packaging, storage, and inspection. The Board also reviewed DOE's disposition plans for these materials. In a letter dated March 7, 2002, the Board criticized improper storage conditions, weaknesses in hazard analyses, inadequate inspection of containers, and an overall lack of a disposition plan for depleted uranium. The Board noted that most of the depleted uranium had been in storage for

an extended period and that the storage conditions were worsening with time. In response to the Board's letter, DOE and its contractor took short-term corrective actions and committed to the development of a long-term disposition strategy. DOE intends to dispose immediately of the material housed in the worst storage conditions, and to conduct a feasibility study to evaluate disposal of the remaining materials by fiscal year 2006.

3.1.4 Special Isotopes

Several thousand gallons of solution containing americium and curium (Am/Cm) stored in the SRS F-Canyon is being prepared for disposal in the SRS high-level waste tanks. The Board's review of the disposition plan uncovered several weaknesses that DOE is attempting to correct. 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.

As part of the Am/Cm disposal discussions, the Board expressed concern over the fate of Mark 18A targets stored in a spent fuel basin at SRS. These targets contain significant quantities of irreplaceable isotopes, and the Board has requested that DOE develop a firm path forward for the storage, processing, and recovery of these materials.

3.1.5 Inactive NNSA Nuclear Materials

The Board reviewed the packaging, storage, and disposition plans for inactive nuclear materials at LANL and LLNL. The Board found that NNSA has not been managing effectively its growing backlog of nuclear materials that have no identified programmatic application. Many of these materials lack adequate physical, chemical, or radiological characterization, and packaging of some items is inappropriate for extended storage.

The Board believes action is needed to improve the management of NNSA's inventory of inactive nuclear materials. In a letter dated May 20, 2002, the Board requested that NNSA examine the issues and outline measures to be taken to improve the safe management of these materials. NNSA's response of September 24, 2002, was not entirely satisfactory, but did acknowledge that improvement in the management of nuclear materials is needed and that the issues identified in the Board's letter will be addressed. The response identified the strategy by which NNSA will deal further with these issues, including the recent establishment of an Inactive Actinides Working Group to address inactive actinide issues. The Board will continue to press for improvements in this area.

3.2 STABILIZATION OF SPENT NUCLEAR FUEL

3.2.1 Hanford Spent Nuclear Fuel Project

The Board continued to perform comprehensive reviews of the Hanford Spent Nuclear Fuel Project (SNFP), which is presently retrieving deteriorating spent nuclear fuel from the K-East and K-West Basins, cleaning and drying the fuel, and packaging it for eventual repository disposal. The Board reviewed ongoing operations, as well as the design and installation of the remaining equipment needed to accomplish the project.

This year, DOE completed installation of the Fuel Transfer System (FTS) that transfers fuel from the K-East to the K-West Basin for cleaning and packaging. The Board's review of this system called into question the hoisting and rigging methods to be used for the fuel transfer cask. As a result, DOE modified the design of the equipment to limit the distance a dropped container 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 found weaknesses in the contamination control strategy for the fuel casks, leading DOE to implement improved controls.

The Board expended considerable effort in ensuring that DOE will adequately achieve and confirm the readiness of SNFP processes to operate safely. In 2001, operations at T-Plant—from which spent fuel was to be removed to make room for interim storage of sludge from the K-Basins—failed the DOE ORR, despite having passed the contractor ORR. The contractor resisted performing another ORR, but the Board persuaded DOE to require one. The facility failed this ORR as well. After corrective actions were taken to shore up both the contractor's readiness determination process and DOE line management's verification process, the facility passed both ORRs.

The Board evaluated the implementation of these corrective actions during the contractor's and DOE's ORRs for the K-Basin FTS. Again, the contractor failed to achieve an adequate level of readiness prior to beginning its ORR; however, DOE's line management review team appropriately assessed the level of readiness and ensured that corrective actions were complete prior to initiating the DOE ORR. These activities culminated in the start of fuel removal from the K-East Basin on November, 26, 2002, a major accomplishment that has been many years in the making. However, DOE failed to meet the commitments made in its Implementation Plan for Recommendation 94-1 to begin containerization of sludge in the K-East Basin in November 2002 and to initiate sludge removal from the basin in December 2002, primarily as a result of continued deficiencies in project management.

The Board also continued to study the poor equipment performance hindering the removal of fuel from K-West Basin. The Board found that the major causes of low reliability were inadequate conduct of operations, maintenance, and engineering evaluation of equipment failures. Efforts by the contractor to deal with these weaknesses led to substantially improved production rates, recovering several months of production schedule.

The fuel from the K-Basins is packaged into mechanically sealed multi-canister overpacks (MCOs). The MCOs were to be welded shut, but DOE allowed the contractor to delay this operation to apply more

resources to preparations for fuel retrieval and processing. The primary mechanical seals on several MCOs failed leak checks immediately following closure, leading the Board to challenge the adequacy of the MCO sealing process. In a letter dated February 15, 2002, the Board urged DOE to expedite preparations to weld closure caps on the MCOs as originally planned. As a result, the contractor improved the mechanical sealing process and is now completing preparations for welding operations.

3.2.2 Savannah River Site

In December 2001, DOE decided to suspend preparations to start up the L-Area Experimental Facility and cease pursuit of the planned full-scale facility to treat aluminum spent nuclear fuel for disposal. Since suspension of this activity, the Board has monitored DOE's efforts to consolidate spent nuclear fuel at SRS by transferring all fuel from the Receiving Basin for Offsite Fuel and the K-Reactor Basin to the L-Basin. The Board has expressed concern regarding the lack of a clear disposition path for the spent nuclear fuel at SRS, most recently in a letter to DOE on November 8, 2002, and will continue to press DOE on this matter.

3.3 WASTE MANAGEMENT

3.3.1 High-Level Waste

Tank Integrity. The Board has continued to press DOE to improve programs that protect and verify the integrity of the high-level waste (HLW) storage tanks at Hanford and SRS, particularly the double-shell tanks that must continue to provide reliable service for many years to come. Significant improvements in tank integrity programs have resulted, particularly at Hanford, including improved waste chemistry controls, addition of corrosion inhibitors to several tanks, development of improved capabilities for tank wall inspections, and progress toward implementation of more rigorous requirements to ventilate the tank annulus so as to help prevent corrosion of the primary tank wall. The Board has continued to urge DOE to address leak-tightness as well as gross structural integrity in its tank integrity program, and to thoroughly evaluate evidence that tank walls above the waste may be susceptible to corrosion despite the presence of corrosion inhibitors in the waste.

As part of its implementation of the Board's Recommendation 2001-1, DOE revised its in-service inspection program for the SRS HLW tanks. Based on guidance provided by the Board in a letter dated June 11, 2002, DOE modified the program to require ultrasonic inspection of all the double-shell tanks at SRS, instead of just a subset, and to inspect tanks early in the program if they are potentially at greater risk of corrosion. The Board continues to pursue acceleration of DOE's proposed 9-year schedule for inspecting all the double-shell tanks.

Accelerated HLW Cleanup at SRS. The Board reviewed the accelerated HLW cleanup initiative at SRS. As part of this initiative, DOE is exploring approaches to accelerate disposal of saltcake from the HLW tanks. DOE is pursuing disposal of dissolved saltcake on site as saltstone, with limited or no processing to remove radionuclides. This approach may increase the radioactivity in the saltstone beyond current permit limits, but is not expected to present a hazard to the public. However, the existing

Saltstone Production Facility at SRS is not designed for the radiation levels expected from processing untreated saltcake, and the Board is closely evaluating the associated hazards for workers. DOE is presently analyzing the modifications necessary to protect workers from the increased radiological hazard.

The SRS contractor performed a "waste incidental to reprocessing" determination in accordance with DOE Order 435.1, *Radioactive Waste Management*, to demonstrate that the dissolved saltcake represents no greater risk than that posed by traditionally defined low-level waste. In a letter to DOE dated June 27, 2002, the Board suggested improvements in the methodology and assumptions used in this analysis. The choice of method is complicated by a pending court case challenging DOE's determination. Recognizing these uncertainties, the Board has encouraged DOE to pursue development and demonstration of alternative methods of waste treatment, especially for cesium removal.

As a result of the selection of caustic-side solvent extraction (CSSX) as the baseline technology for salt solution processing and the extensive research performed on benzene generation in the In-Tank Precipitation (ITP) process, the Board closed Recommendation 96-1, *In-Tank Precipitation System at the Savannah River Site*, this year. However, the former ITP precipitation tank still contains significant quantities of tetraphenylborate from early tests of the ITP process, and CSSX will not be capable of treating this waste. The Board has stressed the need for DOE to remediate this tank, preferably using a technology that could also treat wastes from other HLW tanks.

Safety Analysis of SRS Tank Farms. To comply with 10 CFR Part 830, the SRS contractor prepared a Documented Safety Analysis (DSA) for the HLW tank farms and associated facilities. Although the hazard and accident analyses reported in the DSA are the most comprehensive performed to date for the tank farms, the Board detected several deficiencies and informed DOE of its findings in a letter dated November 4, 2002. The Board found that, contrary to applicable DOE directives, analyses of unmitigated consequences had not been performed for several accidents, and certain key input values and assumptions had not been shown to be conservative. Analyses of unmitigated consequences are needed to allow the proper selection of safety-class and safety-significant controls to adequately protect members of the public and site workers. In response, the SRS contractor performed additional sensitivity calculations and added specific administrative controls in the Technical Safety Requirements to ensure the continued validity of key input values and assumptions used in the accident analyses.

Hanford Tank Farms. The Board continued to perform extensive reviews of the health and safety of ongoing and planned operations at the Hanford HLW tank farms. The Board has also tracked the development of an upgraded safety basis and preparations to provide feed for the planned Waste Treatment Plant (WTP).

Saltwell Pumping—The readiness assessment (RA) for starting saltwell pumping at Tank U-111 at Hanford was suspended after the Board questioned the preparedness of the RA team members and the depth and breadth of the review. The RA resumed after these issues had been addressed.

Common Cause Analysis for Electrical Safety—The Board highlighted several cases in which work had been performed on energized systems without proper authorization and appropriate controls. Subsequently, DOE's tank farms contractor performed a common cause analysis for 27 events involving electrical hazards. As a result of this analysis, the contractor initiated a number of corrective actions and communicated lessons learned to its workforce.

Transfer Line Failure—In January 2002, HLW being transferred through a temporary hose-in-hose transfer line leaked from the primary hose into the secondary hose. The Board suggested that the leak might have been caused by water flushes using operating parameters more severe than those used during qualification testing. As a result, the contractor changed the test specifications for this type of hose and performed field proof tests before resuming operations of another existing hose. DOE plans to inspect the failed hose, as suggested by the Board, to determine its failure mechanism.

Waste Feed Delivery—The Hanford Waste Feed Delivery transfer system will deliver the first phase of HLW slurries from the tank farms to WTP. The Board reviewed the design of this safety-class system, and issued letters to DOE in May 2001 and September 2002, identifying flaws in the characterization of the physical properties of the waste and functional design requirements for the system, particularly the minimum design pressure rating. DOE performed additional waste characterization and system modeling, and convened an expert panel in October 2002. The panel assessed the adequacy of physical property data and the waste transfer analytical model, and provided recommendations for a path forward.

Tank Farms Safety Basis—The Board assessed modifications to the existing safety basis for the HLW tank farms and reviewed a new DSA written to comply with 10 CFR Part 830. The Board concluded that DOE's guidance to the contractor imposed an excessively high consequence threshold for implementing safety-significant controls for worker protection. Following a briefing provided to the Board, DOE sent a letter to the contractor altering the risk classification criteria in the safety basis document and the guidelines for selecting controls for the tank farms.

3.3.2 Low-Level and Transuranic Waste

Waste Isolation Pilot Plant. During 2002, the pace of operations at WIPP increased significantly. More than 900 shipments totaling more than 29,000 drum equivalents of TRU waste were received and disposed of underground. The Board continued its oversight of these operations to ensure that they proceeded safely at the dramatically increased rate. To that end, the Board evaluated an August 2002 dry run of newly installed systems and equipment to be used for future disposal of remote-handled TRU waste at WIPP. The Board found the equipment, systems, and procedures to be satisfactory overall; however, several areas for improvement were identified.

Idaho National Engineering and Environmental Laboratory. The Board reviewed waste disposal activities at the Idaho National Engineering and Environmental Laboratory (INEEL) including both TRU waste characterization and loading of drums in shipping containers for shipment to WIPP. These reviews focused on the implementation of ISM to improve worker health and safety for these activities,

and contributed to the successful completion of the project to ship the first 3,100 cubic meters of TRU from INEEL to WIPP.

The Board reviewed the design and construction of the Advanced Mixed Waste Treatment Project at INEEL, which will retrieve and process 65,000 cubic meters of TRU waste for shipment to WIPP. Since the 1970s, the drums stacked five-high have been stored in the TRU Waste Storage Area Retrieval Facility, on an asphalt pad, beneath an earthen berm, under a recently-erected weather enclosure. The contractor has been slow to address the potential plutonium inhalation hazard to workers handling aging and corroded drums that may fail or be damaged during retrieval. Based upon briefings provided to the Board in December 2002, it appears that the contractor has acknowledged this hazard and is working to identify appropriate controls.

Melton Valley Transuranic Waste Treatment Project. The Melton Valley Transuranic Waste Treatment Project at ORNL will process liquid and solid TRU waste and low-level radioactive waste for off-site disposal. Due to the high activity of substantial portions of the TRU and low-level wastes to be processed by this facility and the potential hazards for workers, the Board scrutinized the facility design process and the preparation of the facility's DSA. In 2002, an acceptable final design for the project was completed and the facility constructed. The Board will provide health and safety oversight of the startup of liquid processing in early 2003.

Hanford Central Waste Complex. Assessments conducted at Hanford in response to Recommendation 2000-2 resulted in the finding that dry pipe fire protection systems had not been inspected in accordance with National Fire Protection Association standards. These inspections were subsequently performed and revealed significant quantities of debris obstructing fire protection systems in the Central Waste Complex. These systems have been cleaned and restored to operability.

3.4 FACILITY DEACTIVATION AND DECOMMISSIONING

3.4.1 Safe Practices for Deactivation and Decommissioning

On March 19, 2002, the Board sent DOE a letter noting recent occurrences during deactivation and decommissioning that illustrated the health and safety hazards associated with cutting radioactively contaminated equipment using saws, cutting torches, and other tools. The Board pointed out that preventable mishaps, such as fires and lacerations, continue to occur despite DOE guidance on how such work can be performed safely. The Board suggested that a compendium of good practices would assist in the safe performance of such activities. More specific and detailed information would help support work planning, preclude duplication of effort, and minimize the repetition of errors.

3.4.2 Y-12 National Security Complex

The Board has persisted in urging DOE to reduce the hazardous materials inventory in Building 9206 at Y-12. These materials represent one of the most serious legacy health and safety issues at this

site. In 2002, stabilization of pyrophoric materials was successfully completed, and the pyrophoric uranium compounds were processed and shipped out of the facility. Progress also continues to be made in reducing the inventory of containerized highly enriched uranium solids. The Board will continue to press DOE to expeditiously pursue risk reduction and deactivation in Building 9206.

3.4.3 Rocky Flats Environmental Technology Site

Facility decommissioning constitutes most of the high-hazard nuclear operations at RFETS.[10] Sound activity-level work planning and effective DOE oversight of contractor work planning have particular importance for the safety of decommissioning at the site. However, the Board's review of several occurrences at RFETS revealed deficiencies in activity-level hazard analyses, as well as failures to identify controls for work being performed. The Board's review also revealed that DOE had not been systematically reviewing activity-level work planning by the RFETS contractor. In March 2002, the Board issued a letter to DOE requesting that corrective actions be taken. In response, DOE committed to improving activity-level work planning and oversight, including mentoring of work planning teams and regular assessments of work planning. RFETS has implemented the actions, and the Board is examining their effectiveness.

In February 2002, the Board reviewed radiological work practices for decommissioning at RFETS. In response to the observations provided during this review, RFETS has increased monitoring of airborne radioactivity, improved requirements and guidance for air flow testing following reconfiguration of room areas, and improved requirements and guidance for hand protection against cuts and punctures that could cause injection of radiological material.

Lack of proper safety management and conduct of operations had been evident in occurrences involving subcontractors' work at RFETS in 2001. During 2002, the Board evaluated plans for increased use of subcontractors in decommissioning activities in major defense nuclear facilities at the site. The Board found that actions being pursued by RFETS did not address the flowdown of health and safety requirements and work planning/control processes or strengthening of floor-level oversight of subcontractor work by the principal contractor, Kaiser-Hill. In August 2002, DOE informed the Board of several actions to be taken to address these issues.

3.4.4 Fernald Closure Project

The Fernald Closure Project has made significant progress in the deactivation and decommissioning of former uranium processing buildings, and in removal of radioactive waste materials

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[10] The Board is a party to a Memorandum of Understanding (MOU) that coordinates health and safety oversight at RFETS. The MOU, titled "Memorandum of Understanding Governing Regulation and Oversight of Department of Energy Activities in the Rocky Flats Environmental Technology Site Industrial Area," was executed by the Board, DOE, the Environmental Protection Agency, and the Colorado Department of Public Health and Environment on February 15, 1996. It can be viewed on the Board's website at: http://www.dnfsb.gov/pub_docs/rfets/mou_19960215_rf.html.

from the site. In 2002, the Board conducted reviews of the work authorization programs for each of the seven major closure projects and reviewed the health and safety oversight programs of DOE and its primary contractor. The Board found that both DOE and its contractor need to pay closer attention to worker health and safety and to proper conduct of operations on most site projects, especially those involving subcontractors.

The Board also reviewed the design and safety analysis work on the Silos project, which involves removing and treating radioactive waste (stored in three concrete silos for approximately 50 years) and shipping the material off site. The Board has provided technical comments to DOE on the structure and content of the safety basis for these activities. The Board also evaluated readiness reviews by DOE and the contractor for the startup of a new Radon Control System that will remove radon gas from the silos during waste removal and treatment. These readiness reviews were well-performed and revealed software problems in the distributed control system.

The Board evaluated additional health and safety problems at this site, including an April 2002 accident in which a worker was pinned between a railcar and a metal platform, and five separate accidents between February and August 2002 in which workers were exposed to nitrogen dioxide fumes. In light of this record, the Board continues to press DOE to supervise its contractors more closely at this site.

3.4.5 Mound Closure Project

The Board reviewed the work control program for decontamination and decommissioning at the Mound Closure Project, which has been revised to reduce its complexity. The Board found that the resulting work packages were simple to prepare and execute, but were less detailed and relied heavily on workers' familiarity with the facility. The work control procedure applied to all site work except maintenance, which was performed using a separate maintenance procedure. The Board noted discrepancies between the work control and maintenance procedures, which the contractor corrected. Many of the radiological control procedures have also been revised and streamlined to allow easier application and reduce the likelihood of errors.

4. COMPLEX-WIDE HEALTH AND SAFETY ISSUES

4.1 IMPLEMENTATION OF INTEGRATED SAFETY MANAGEMENT

4.1.1 Overview

ISM is a concept that evolved from the Board's Recommendation 95-2, *Safety Management*. The basic tenets of ISM provide the framework for safely performing all of the diverse hazardous activities in the defense nuclear complex.

ISM provides for a single safety management program rather than multiple, unintegrated programs. Nuclear safety is an important but not exclusive target of ISM. Nonradioactive hazardous materials and operations require attention in proportion to the risks they pose to the public, workers, and the environment. ISM builds upon standards of safe practice for nuclear, chemical, and other hazardous operations to ensure protection of the public, workers, and the environment.

Since the Board's initial recommendation, the implementation of ISM has progressed through three phases: (1) developing necessary guidance documents; (2) establishing the infrastructure for implementing ISM at individual sites and facilities, including instructing leaders and workers in the application of ISM; and (3) confirming that ISM Systems are effective and being applied to design and construction, startup, operation, and decommissioning of DOE's hazardous facilities. At the end of 1999, the implementation of ISM was well into the second phase. With the successful completion of ISM System Verification Reviews at all sites during 2000, the Board's focus on implementation of ISM shifted to the third phase. Throughout 2002, the Board stressed the need to look beyond initial implementation to ensure continued improvement. In addition to ensuring that ISM was implemented at all DOE sites, the Board focused on two key initiatives that are critical to the long-term effectiveness of ISM—the ISM annual update process and the implementation of the Board's Recommendation 2000-2, *Configuration Management, Vital Safety Systems*.

4.1.2 ISM Annual Update Process

The Board continued to oversee the implementation and effectiveness of ISM at defense nuclear facilities. Noting indications that efforts to continually improve ISM were faltering, the Board requested in a November 8, 2001, letter that DOE provide information on the schedule for ISM annual reviews, the review processes being used, and an evaluation of the adequacy of those processes. DOE forwarded the requested information on January 25, 2002. Analysis of the DOE response showed significant differences existed among the annual review processes being used to maintain and improve ISM. A May 2002 ISM Forum also revealed that broad variation in rigor and senior management attention existed with respect to annual reviews. In an August 8, 2002, letter the Board notified DOE of the results of its analysis and its concern regarding the variability in the conduct of annual ISM reviews. The Board pointed out that one outcome of the May ISM Forum—a commitment to conduct a workshop on maintaining and improving ISM systems—provided an opportunity to resolve some of the problems associated with the annual ISM

review process; the Board also offered suggestions for the workshop. DOE included all of the Board's suggested topics in the workshop agenda. The workshop's final report provided a series of recommendations for strengthening the annual ISM update process that will fully address the Board's concerns as expressed in earlier letters. If properly implemented, the Board believes these recommendations will greatly strengthen ISM implementation.

4.1.3 Reliability and Configuration Management of Vital Safety Systems

Unless proper protection is provided, the operation of many of DOE's defense nuclear facilities could pose significant hazards to the environment, the public, and workers. Typically the designs of these facilities include safety systems intended to control the hazards present. The availability, operability, and conditions specifying operational limits for these systems are included in the written agreements established by DOE with its contractors as conditions for authorizing the performance of work. Many of the facilities were constructed decades ago and are undergoing deterioration from aging. For that reason alone, it is essential that safety systems be maintained.

In Recommendation 2000-2, *Configuration Management, Vital Safety Systems*, the Board urged DOE to ensure the operability of these systems by (1) assessing their reliability and operability; (2) requiring that contractor personnel responsible for configuration management maintain the design basis and operating limits; (3) confirming that DOE's technical staff has the requisite number of qualified subject matter experts; and (4) inserting necessary legal requirements into DOE directives and contracts.

In response to the Board's actions, DOE has taken steps to ensure the operability of vital safety systems. DOE completed an initial assessment of each of the vital safety systems in high-priority defense nuclear facilities. Using the findings from this assessment, DOE conducted in-depth reviews of specific systems and programs (such as control of drawings and configuration management) known to be problem-ridden. These reviews uncovered significant weaknesses in the operability of several systems, leading to further evaluation and sometimes to repairs. DOE also revised its directives to include a requirement for contractors to identify system engineers. The sites have begun staffing these programs and developing the appropriate qualification and training programs. In addition, DOE issued the first draft of a major revision to the handbook on ventilation design.

Overall, improvements have been made in ensuring that vital safety systems remain fully operable. However, significant work remains to be accomplished by DOE and its contractors.

4.1.4 Site-Specific ISM Reviews and Improvements

In October 2001, the Board issued a letter to DOE that highlighted numerous deficiencies in the ISM system of the Oak Ridge environmental management contractor, such as inadequate facility hazard classification, missing DOE health and safety orders in the contract, and improper safety basis documentation. In response to the Board's letter, DOE and the contractor conducted a top-to-bottom review of their ISM programs and prepared a comprehensive corrective action plan. In 2002, DOE and the contractor completed more than 150 actions to strengthen the ISM system, including inserting 25 DOE

health and safety orders into the contract, conducting training in safety basis fundamentals for key personnel, and hiring additional technical staff. The Board believes that DOE and the contractor are making adequate progress toward rectifying the serious deficiencies in the ISM program.

In the fall of 2001, the Board noted that the feedback and improvement program of a Hanford contractor was weak and a corrective action plan had not been devised. Given these weaknesses and the significant changes being made to the ISM system, the Board suggested that DOE complete a focused ISM System Verification Review for the revised program. In September 2002, at the urging of the Board, a focused review of the ISM system of the Office of River Protection and the contractor was completed. The review team concluded that significant improvement had occurred, that the ISM system is now structured for continuous improvement, and that it is therefore adequate for safe tank farm operations.

At the end of 2001, the Board commended DOE's Rocky Flats Field Office (DOE-RFFO) for continuing to strive toward improving ISM at the site. That office performed a rigorous annual ISM update review that identified much-needed improvements in activity-level work planning and DOE-RFFO oversight. Subsequently, the Board observed that DOE-RFFO was making slow progress in undertaking the corrective actions resulting from the annual ISM update. After an on-site review in late February 2002, the Board requested that DOE report to the Board on actions needed to improve the response to annual ISM update reviews. DOE has developed suitable corrective actions. As a result of these actions by the Board, DOE-RFFO has strengthened the activity-level work planning process and oversight by DOE of activity-level planning. The Board's efforts also led DOE-RFFO to better implement and track needed corrective actions as identified in the annual ISM reviews.

4.2 HEALTH AND SAFETY DIRECTIVES

4.2.1 Improvement of Directives

During 2002, the Board received 28 new or revised drafts of health and safety directives and associated standards from DOE for review. Highlights of the Board's reviews follow:

- **Assignment of Authorities and Responsibilities.** The Board's comments on a revision to DOE Manual 411.1C, *Safety Management Functions, Responsibilities, and Authorities Manual,* helped clarify the roles of DOE's safety oversight offices that were either confusing or deleted entirely from this important directive. Documents subordinate to this directive will have to be revised to reflect the resulting changes.

- **Integration of Hazard Analyses**. The Board has urged DOE to integrate hazard and safety analyses more effectively in light of Recommendation 95-2 and DNFSB/ TECH-16. The integration of activities supporting the preparation of DSAs, emergency preparedness hazard assessments, fire hazard analyses, and environmental impact statements would increase consistency and effectiveness in the development of health and safety controls.

In response to the Board's actions, DOE has developed a draft handbook, *Integration of Multiple Hazard Analysis Requirements and Activities*. The Board provided comments on the handbook in a letter to the Secretary of Energy on November 4, 2002. Development of this guidance was a commendable effort that has the potential to address many of the Board's comments. However, the Board stated in its letter that while the current version may be of some benefit in performing hazard and safety analyses, a more comprehensive document in the form of a DOE guide or manual will be appropriate for the future. In its current form, the handbook lacks the detailed information in certain areas needed to ensure the comprehensive integration of hazard analyses and resulting controls.

- **Nuclear Air Cleaning Handbook**. In response to Recommendation 2000-2, DOE committed to publishing a revised *Nuclear Air Cleaning Handbook* by December 2002. A large number of comments were received by DOE on the April and June 2002 drafts. DOE's pace of work on these comments made unachievable a December 2002 publication date. Aggressive DOE attention is still needed to support publication by June 2003, the newly proposed deadline.

4.2.2 Implementation of Directives

A directive only contributes to health and safety if it is rigorously and competently carried out in the field. In 2002, the Board continued to scrutinize closely the implementation of health and safety directives. Examples of the Board's work include:

- **Systematic Review of Orders.** DOE initiated an internal review in 2001 to determine whether the requirements in DOE orders were consistent with its current intent to focus directives on "what" rather than "how." Teams were formed to review the orders and to provide their findings and recommendations to a senior management panel. The senior management panel reviewed the teams' reports and forwarded its recommendations to Program Secretarial Officers and support offices. The Board, in a March 29, 2002, letter to DOE, provided comments on those recommendations affecting safety-related orders. The Board cautioned DOE against "actions that would cause DOE's safety assurance program to be diminished or lead the public to perceive a decreased emphasis on safety in DOE operations." The Board also noted that "[T]he core safety practices retained in Rules, Orders, and Manuals, which have evolved throughout the years in response to lessons learned, should remain relatively constant and changed only for cause." Finally, the Board warned DOE to move slowly in replacing well-established safety practices developed by the national and international nuclear safety community with general, performance-based safety objectives in the name of eliminating "needlessly burdensome" requirements. As of the end of 2002, no significant changes had been made to the orders being reviewed.

- **Quality Assurance (QA) Including Software QA.** During 2002, the Board continued to seek improvements in DOE's QA program. In previous years, the Board had found weaknesses in DOE's implementation of existing QA requirements for safety-related

components and systems, as well as weaknesses in requirements and guidance on engineering practices for safety-related software. At the Board's urging, DOE issued a *Quality Assurance Improvement Plan* to strengthen the implementation of existing quality requirements for safety-related components and systems. The Board provided technical comments on this plan in a letter to DOE dated February 22, 2002. On November 22, 2002, DOE provided the Board with its approved *Quality Assurance Improvement Plan*. This plan describes DOE's actions to improve the implementation of quality assurance in the design, procurement, construction, operation, and maintenance of vital safety systems.

On the other hand, despite the Board's continuing emphasis on software QA, DOE was unable to develop and execute an acceptable plan to strengthen requirements and guidance on engineering practices in this area. To remedy this situation, the Board issued Recommendation 2002-1, *Quality Assurance for Safety-Related Software*, on September 23, 2002. On November 21, 2002, the Secretary accepted this recommendation, and an Implementation Plan is under development.[11]

! **Safety Basis Assumptions.** The development of a comprehensive safety basis and the identification and selection of an appropriate control set are essential cornerstones of safe operation at defense nuclear facilities. In 2002, the Board conducted numerous reviews of the safety bases throughout the DOE complex. The Board reviewed the critical assumptions used in the development of the safety bases, as well as the control strategies used to prevent and mitigate accident scenarios of concern. The Board pointed out a number of specific instances in which faulty assumptions and methodologies had been used in the development of safety bases. These included analyses that did not always use bounding input assumptions and that implicitly credited non-qualified plant indications and equipment in the development of the safety analyses. These deficiencies resulted in situations wherein the safety analyses may not have accurately bounded the actual hazard conditions for the facilities involved. Specific examples of such deficiencies were documented by the Board in letters to DOE dated May 13, September 23, and November 4, 2002. DOE and its contractors have implemented a number of corrective actions to correct the deficiencies.

! **Unreviewed Safety Question Procedures.** The USQ process is designed to identify proposed but unanalyzed changes to facilities or procedures that may affect the safety basis for a defense nuclear facility. Contractors must obtain approval from DOE before implementing a change determined to constitute a USQ. Since April 10, 2001, contractors have been required to submit their USQ procedures to DOE for approval and to follow approved USQ procedures thereafter. This year, the Board reviewed USQ procedures and samples of USQ documentation obtained from defense nuclear facilities throughout the nuclear weapons complex. Each procedure had been submitted to local DOE site offices for approval, and most had been approved prior to the Board's review.

[11] See Appendix A for the full text of this recommendation.

The Board found that the consistency of USQ procedures with written requirements and DOE expectations varied widely across the complex, even among procedures approved by DOE. Weaknesses identified by the Board included inadequacies in the safety analyses supporting USQ determinations. The Board provided technical advice to the cognizant DOE site offices to assist them in correcting the deficiencies. In consequence, many of the procedures have since been rewritten or revised. However, the adequate implementation of the USQ process will continue to require attention, particularly as documented safety analyses are revised and updated to fulfill the requirements of 10 CFR Part 830.

! **Maintenance Programs for Defense Nuclear Facilities.** The development and implementation of an effective equipment maintenance program is a critical element in ensuring safe and efficient operations at defense nuclear facilities. During 2002, the Board continued to place high priority on the review and assessment of maintenance programs and related activities conducted by DOE and its contractors.

In furtherance of this complex-wide initiative, in 2002 the Board conducted on-site reviews of maintenance programs at the Hanford Spent Nuclear Fuel Project and at Y-12. In each case, weaknesses in the maintenance program were found and communicated to DOE. As a result of these reviews, DOE and its contractors at these sites implemented measures that significantly strengthen this critical safety program. In addition to in-depth reviews of this kind, the Board's site representatives regularly assess maintenance activities at priority sites.

! **Criticality Safety.** The Board has continued to urge DOE to establish a stable source of funding for the development of nuclear criticality experimentation and safety analysis methods, as defined in the Implementation Plan for the Board's Recommendation 97-2, *Criticality Safety*. In 2002, DOE made good progress toward establishing a stable funding source when the Secretary determined that the Office of Defense Programs would fully fund and manage the Nuclear Criticality Safety Program (NCSP) in fiscal year 2003 and beyond. The Board has also encouraged DOE to integrate end-user needs, including criticality engineer training and qualification, and experimentation, with overall management of the NCSP. DOE has completed a Five-Year Criticality Safety Program that is responsive to these needs.

4.2.3 Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*

On December 11, 2002, the Board issued Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*. In this recommendation, the Board highlighted the fact that the prevention and mitigation of potential accidents inherent in the

mission activities at defense nuclear facilities require DOE and its contractors to identify accident scenarios and then establish effective and reliable safety controls to address them.[12]

The Board noted that engineered safety controls are preferred over administrative controls because, in general, engineered controls are more reliable and effective. In many applications, however, DOE and its contractors have concluded that discrete operator actions or administrative programs are required to address consequences of accidents that would otherwise be unacceptable. The Board has identified a number of flawed administrative safety controls that are proposed or in use at various defense nuclear facilities. In many cases, DOE and its contractors have asserted that the methods used to establish these administrative controls comply with existing DOE directives.

After further analysis, the Board concluded that the DOE directives system does not contain requirements adequate to ensure that the design, implementation, and maintenance of important safety-related administrative controls will be effective and reliable. As a result, the Board recommended that DOE promulgate a set of requirements for safety-class and safety-significant administrative controls to establish appropriate expectations for the design, implementation, and maintenance of these important safety controls. The Board also recommended that DOE take action to ensure that all existing administrative controls that serve as safety-class or safety-significant are evaluated against these new requirements and upgraded as necessary.

4.3 TECHNICAL COMPETENCE

4.3.1 Competence of DOE and Contractor Personnel

During 2002, the Board continued to examine the competence of key health and safety personnel at defense nuclear facilities. A number of years ago, DOE established a Federal Technical Capabilities Panel to respond to the Board's concerns in this area. Several initiatives resulted in marginal improvements, but not with enough substance to justify optimism that this issue was well in hand. In May 2002, the Board noted that the NNSA Administrator and the DOE Assistant Secretary for Environmental Management were enacting major personnel realignments that promised improved performance on the part of their organizations. Other actions in this area during 2002 included the following:

- The Board scrutinized the contractor's ORR for resumption of Wet Chemistry Operations in Building 9212 at Y-12. Based on observation of demonstrations during the ORR, the Board found that the preparations in the areas of conduct of operations and training were inadequate. Therefore, the ORR was suspended so that these deficiencies could be corrected.

[12] See Appendix A for the full text of this recommendation.

- The Board continued its efforts to ensure the availability of a criticality safety infrastructure in support of nuclear operations (see Recommendation 97-2, *Criticality Safety*). The Board stressed the need to provide stable funding for future criticality safety program elements, place dedicated emphasis on maintenance of criticality safety engineering training, and minimize the gap in criticality services during the relocation of the Los Alamos Criticality Test Facility.

- The Board reviewed the safety basis, supporting programs, and operational readiness of the Waste Examination Facility at the Nevada Test Site, a Hazard Category 3 nuclear facility. Many administrative support programs, such as the training and qualification program, had not been adequately developed or implemented to meet the requirements of nuclear facilities as set forth in 10 CFR Part 830. Training of facility operators and outside maintenance support personnel to perform surveillance activities or preoperational checks was inadequate. The Board's letter of March 7, 2002, transmitted these observations to DOE for further corrective action.

- The Board found that the Office of River Protection's (ORP) oversight of the WTP design process was seriously lacking in level of detail. In a letter to DOE dated December 16, 2002, the Board requested a report on DOE's plans to strengthen the design review process for WTP to avert future safety problems.

4.3.2 System Engineers and Federal Subject Matter Experts

Recommendation 2000-2, *Configuration Management, Vital Safety Systems*, urged DOE to develop formal requirements for training and qualification of competent subject matter experts in vital safety systems (system engineers) for both federal and contractor organizations. As part of its response to this recommendation, in 2001 DOE issued a significant modification to DOE Order 420.1, *Facility Safety*, defining responsibilities and training requirements for contractors' system engineers. DOE also revised Order 433.1, *Maintenance Management Program for DOE Nuclear Facilities*, to include requirements for establishing a system engineer program for the management of vital safety systems.

During 2002, the Board evaluated DOE's efforts to institutionalize the use of system engineers and federal subject matter experts for vital safety systems at defense nuclear facilities throughout the DOE complex. The Board's staff conducted reviews of DOE's implementation of this requirement at six DOE sites: SRS, ORNL, Pantex, LANL, ORP, and the Richland Operations Office. Staffing of system engineers and federal subject matter experts varied considerably from site to site; only SRS was able to satisfy most of the direction prescribed in DOE standards. The Board's staff found that the federal programs at the Amarillo Site Office, and the Los Alamos Site Office were understaffed and lacked adequate definition of roles and responsibilities for subject matter experts.

During the review at Hanford, the staff noted significant deficiencies in the implementation of Recommendation 2000-2. Specifically, the qualification and training programs for ORP's subject matter experts on vital safety systems lacked the rigor required for these individuals to provide effective

oversight of the contractors. The system engineering program at Fluor Hanford was weak, with few requirements for training and qualifying a system engineer. The site has since informed the Board that corrective actions are being taken to redress these deficiencies. The staff also found weaknesses in this area at RFETS. For example, the system engineers who were assigned to vital safety systems had not been required to participate in the work control processes for substantial modification, troubleshooting, and repair of the systems. This situation has been corrected.

In a September 2002 letter to DOE, the Board rejected DOE's list of federal personnel who are filling positions as subject matter experts in DOE's field and area offices. Numerous inconsistencies and gaps were noted in this list, including many vacant positions with no plans to fill them; vacant positions to be filled from within the current DOE organization for which no candidate had been identified; and safety system categories listed as non-existent, in conflict with information provided in the original report of January 2002. DOE is now in the process of resolving these discrepancies and establishing a plan to fill vital technical positions. The Board will continue to emphasize to DOE the importance of assigning qualified system engineers and federal subject matter experts to vital safety systems.

4.4 NUCLEAR FACILITY DESIGN REVIEWS

One of the Board's statutory responsibilities is review of the design and construction of defense nuclear facilities to ensure that adequate health and safety requirements are identified and implemented. These facilities must be designed and constructed in a manner that will support safe and efficient operations for 20 to 50 years. This in turn requires a robust design process to ensure that appropriate health and safety controls are identified and properly implemented early in the process. ISM provides the framework for this process. The Board's expectation is that the design and construction phases of defense nuclear facilities will demonstrate clear and deliberate implementation of ISM principles and core functions, clearly codified in manuals of practice and implemented on design and construction projects. The following are examples of the Board's design review work in 2002:

- **Tritium Extraction Facility.** TEF, currently under construction at SRS, will be used to extract tritium from target rods irradiated in commercial light water reactors. The extracted tritium is to be used to replenish tritium reserves for the nation's nuclear weapon stockpile. The Board reviewed the application of ISM to the TEF design process to ensure that hazards were identified and appropriate controls developed. There are two major hazards associated with TEF: uncontrolled release of tritium, a radiological hazard that can also cause fires or explosions and high gamma radiation from the target rods. In a letter dated July 19, 2002, the Board challenged the adequacy of design features intended to protect workers from the potential consequences of an earthquake. DOE's response of October 17, 2002, stated that a seismic monitor and alarm system would be added to the TEF design. Overall, the Board was able to resolve 46 potential health and safety issues associated with the project. These issues and their resolution are documented in DOE's November 18, 2002, letter to the Board.

! **Hanford Waste Treatment Plant (WTP).** The Board continues oversight of the design and safety basis for WTP at Hanford. The Board's activities focused on two major areas during 2002: adequacy of the structural design, and review of the Preliminary Safety Analysis Report. Review of the structural design focused on those elements completed early in the construction life cycle. This approach was taken to accommodate DOE's aggressive schedule, whereby construction is allowed to commence before the overall structural design has been completed. In July 2002, the Board reviewed the High-Level Waste (HLW) and Low-Activity Waste (LAW) basemat designs, and concluded that, although three seismic questions remained, sufficient margin existed in the design to allow construction to move forward. Subsequently, two of these three questions were satisfactorily answered. The remaining question is the spectral response associated with attenuation relationships.

This issue continues to be bounded by the design margins imposed upon the structural design. The Board remains interested in the management of these margins, to better understand any overall health and safety impacts from future changes in margin values. In a December 2002 letter, the Board requested that DOE provide a report describing how structural design margins will be managed as a function of design uncertainty. The response to this request is expected in early 2003. The Board also requested that summary structural reports for the HLW, LAW, and Pretreatment Facilities be prepared so that a full assessment of the structural design and supporting analysis can be completed. These reports will be used by DOE and the Board to understand each facility's structural response to seismic loads, and to detect important, yet subtle, modeling and computation anomalies that could affect safety. These reports are expected to be completed during calender year 2003.

The Board has also been maintaining oversight of WTP construction. When out-of-specification concrete was placed for the LAW basemat, the Board questioned the effect this could have on the structural integrity of the building under all design loading conditions. In response to the Board's inquiry, WTP developed a systematic approach to investigating and correcting the areas of weak concrete.

WTP has elected to implement a unique ISM review process to evaluate the design's adequacy and to ensure that all health and safety issues have been addressed. The Board reviewed this process and determined that systematic weaknesses might exist, among them a failure to identify conditions requiring safety-related controls and poor execution of supporting calculations. DOE's contractor had initiated but not yet completed corrective actions to address these deficiencies. Finally, the Board found that health and safety requirements delineated in DOE Order 420.1, *Facility Safety*, and DOE Standard DOE-STD-3009-94, Change Notice 2, *Preparation Guide for U.S. Department of Energy Nonreactor Facility Safety Analysis Reports*, were not being fully met. In this case, the design contractor used incorrectly DOE's evaluation guidelines for determining the adequacy of safety systems. The Board noted this deficiency in a letter to DOE dated November 4, 2002, and requested a letter report on corrective actions. DOE's response is expected in early 2003.

- **Highly Enriched Uranium Materials Facility (HEUMF).** HEUMF at Y-12 is being designed to provide long-term consolidated storage. Review of the conceptual design of the facility disclosed a number of design weaknesses. Although the facility must be capable of withstanding an earthquake, the Board determined that the proposed structural configuration would not safely resist seismic forces. Additional strengthening was provided. The Board also found design deficiencies that could threaten the criticality-safe configuration of uranium storage cans. As a result, the storage design was reconfigured to render it safe from seismic forces.

- **Pit Disassembly and Conversion Facility (PDCF).** The Board reviewed the preliminary design and the Facility Design Descriptions of PDCF, to be constructed at SRS. The Board's review revealed the need for further study of the geological soft zone in the area proposed for the foundation, and for improvements in the safety and hazard analyses for worker protection. The Board has noted several positive features of the PDCF design: a sand filter for building confinement, 3 to 4 hour fire barriers between major processing areas, two independent sources of emergency power, and a conservative seismic response spectrum.

5. INFORMING THE PUBLIC

The Board keeps the public informed of its work through public meetings, quick responses to public requests for documents, effective responses to public inquires into health and safety issues, outreach activities of the Board's site representatives, and an Internet website.

5.1 PUBLIC MEETINGS

During 2002, the Board conducted a public meeting in Pleasanton, California, near LLNL. This meeting focused on LLNL's implementation of Recommendations 2000-2, 94-1, and 2000-1, and the adequacy of LLNL's support for nuclear explosive operations at the Pantex Plant.

5.2 RESPONDING TO PUBLIC REQUESTS

The Board responded to numerous public requests for documents and information during 2002. The Board also responded to 16 requests filed under the Freedom of Information Act (FOIA). The average response time was 11 working days, as compared with the statutory requirement of 20 working days. The Board has posted on its website a complete list of FOIA requests processed since 2000.

5.3 ELECTRONIC ACCESS

The Board redesigned its website (www.dnfsb.gov) in 2002 to keep pace with rapid changes in Internet technologies, and to meet federal regulations and security requirements. Restructuring the site with state-of-the-art technology has made it easier to update with limited staff, thus ensuring timely posting of essential documents. The improved design has made the website more attractive and easier for the public to use, and has improved the process of recruiting for potential applicants. The redesigned website also enhances accessibility for individuals with disabilities, and offers convenient and thorough public access to the Board's oversight work.

The Board established a priority to comply with the Government Information Security Reform Act and other federal standards for information security. In furtherance of that objective, the Board subjected its information security systems to an independent audit. While the audit found no significant weaknesses, it identified ways to improve the Board's security policies and procedures. The recommendations from the audit are now being implemented to ensure that the Board's information security posture is capable of countering continual and changing cyber threats.

5.4 INQUIRIES INTO HEALTH AND SAFETY ISSUES

The Board often receives information regarding potential health and safety hazards from private citizens or from employees at defense nuclear facilities. The Board treats these matters with the utmost seriousness by assigning members of its legal and technical staff to investigate or inquire further. These inquiries, which may involve interviews, review of documents, and site visits, are continued until the Board

is able to reach a technical judgment on the issues raised. If the Board finds that a health or safety hazard exists, it takes prompt action to inform DOE and closely monitors DOE's corrective actions. When the Board receives information on matters outside its jurisdiction, such as alleged criminal activities or unlawful personnel practices, it refers the information to the appropriate federal agency for action.

During 2002, the Board directed inquiries into health and safety issues at DOE Headquarters, Hanford, LANL, Pantex, and Fernald. The Fernald inquiry resulted in improvements to hazard categorizations used in planning for the safe execution of cleanup. The headquarters inquiry resulted in increased attention to quality assurance in such areas as design and procurement. Additionally, the inquiry resulted in improved DOE and DOE contractor activities to prevent the introduction of suspect/counterfeit items into safety or mission-sensitive applications, and improved programs to respond to emergent problems concerning suspect/ counterfeit items. However, a recent Board staff review identified an erosion in DOE activities regarding suspect/counterfeit items and shortcomings in DOE's response to a Department of Defense notification of a suspect/counterfeit parts alert. Suspect/counterfeit parts, items, and equipment continue to be supplied to DOE and constant attention is required to detect, prevent the installation, and, where installed, to remove potentially discrepant items which could pose a threat to the health and safety of workers and the general public. The Board continues to devote substantial resources to assist DOE in implementing effective quality assurance programs and effective controls on suspect/counterfeit items.

5.5 SITE REPRESENTATIVE ACTIVITIES

The Board enhances its on-site health and safety oversight of defense nuclear facilities by assigning experienced technical staff members to full-time duty at priority DOE sites: Pantex, Hanford, RFETS, SRS, Y-12, and LANL. Site representatives conduct first-hand assessments of nuclear safety management to identify health and safety concerns promptly. They meet regularly with the public, union members, Congressional staff members, and public officials from federal, state, and local agencies. The Board receives regular briefings from its site representatives in person, and maintains continuous contact with them using all available media.

APPENDIX A

RECOMMENDATION 2002-1

RECOMMENDATION 2002-2

RECOMMENDATION 2002-3

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

[Recommendation 2002–1]

Quality Assurance for Safety-Related Software

AGENCY: Defense Nuclear Facilities Safety Board.

ACTION: Notice, recommendation.

SUMMARY: The Defense Nuclear Facilities Safety Board has made a recommendation to the Secretary of Energy pursuant to 42 U.S.C. 2286a(a)(5) concerning quality assurance for safety-related software.

DATES: Comments, data, views, or arguments concerning this recommendation are due on or before November 8, 2002.

ADDRESSES: Send comments, data, views, or arguments concerning this recommendation to: Defense Nuclear Facilities Safety Board, 625 Indiana Avenue, NW., Suite 700, Washington, DC 20004–2901.

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

Dated: October 1, 2002.

John T. Conway,

Chairman.

September 23, 2002.

Background

Two core Integrated Safety Management (ISM) functions evolving from the Department of Energy's (DOE) implementation of Defense Nuclear Facilities Safety Board (Board) Recommendation 95–2, *Safety Management* are: (1) Analyzing hazards; and (2) identifying and implementing controls to prevent and/or mitigate potential accidents. DOE relies heavily on computer software to analyze hazards, and design and operate controls that prevent or mitigate potential accidents.

DOE and its contractors use many codes to evaluate the consequences of potential accidents. Safety controls and their functional classifications are often based on these evaluations. Functional classifications establish the level of rigor to which controls are designed, procured, maintained, and inspected. The robustness and reliability of many structures, systems, and components (SSCs) throughout DOE's defense nuclear complex depend on the quality of the software used to analyze and to guide these decisions, the quality of the software used to design or develop controls, and proficiency in use of the software. In addition, software that performs safety-related functions in distributed control systems, supervisory control and data acquisition systems (SCADA), and programmable logic controllers (PLC) requires the same high quality needed to provide adequate protection for the public, the workers, and the environment. Other types of software, such as databases used in safety management activities, can also serve important safety functions and deserve a degree of quality assurance commensurate with their safety significance.

In some areas where there is at present no substantial activity in development of new software for safety applications, new calculations are usually based on existing codes, with data inputs and some logic chains often modified to fit the problems of the moment. It is therefore necessary to ensure that software so modified is not placed in general use in competition with generally validated and more widely useable software.

Software quality assurance (SQA) provides measures designed to ensure that computer software will perform its intended functions. Such measures must be applied during the design, testing, documentation, and subsequent use of the software, and must be maintained throughout the software life cycle. It is generally accepted that an effective SQA program ensures that:

- All requirements, including the safety requirements, are properly specified.
- Models are a valid representation of the physical phenomena of interest, and digital control functions are properly executed.
- Input and embedded data are accurate.
- Software undergoes an appropriate verification and validation process.
- Results are in reasonable agreement with available benchmark data.
- All internal logic states of PLCs and SCADA are understood, so that no sequence of inputs, even those due to component failure, can leave the controlled system in an unexpected or unanalyzed state.
- Computer codes are properly and consistently executed by analysts.
- Code modifications and improvements are controlled, subjected to regression and re-acceptance testing, and documented.

DOE identified inadequate SQA as a problem as early as December 1989, when its Office of Environment, Safety and Health (DOE–EH) issued ENVIRONMENT, SAFETY & HEALTH BULLETIN EH–89–9, *Technical Software Quality Assurance Issues*. This bulletin states, "Inadequate SQA for scientific and technical codes at any phase in their "life cycle" may not only result in lost time and/or excessive project costs, but may also endanger equipment and public or occupational sectors." The bulletin cites problems with all three types of software noted above (analysis, design, and operation). Likewise, a 1997 assessment performed by DOE's Accident Phenomenology and Consequence Assessment Methodology Evaluation Program determined that only a small fraction of accident analysis computer codes meet current industry SQA standards. SQA problems continue to persist, as documented in the Board's technical report DNFSB/TECH–25, *Quality Assurance for Safety-Related Software at Department of Energy Defense Nuclear Facilities*, issued in January 2000.

An integrated and effective SQA infrastructure still does not exist within DOE. This situation can lead to both errors in technical output from software used in safety analyses and incorrect performance of instrumentation and controls for safety-related systems. In a letter to DOE dated January 20, 2000, the Board identified these deficiencies and requested that DOE provide a corrective action plan within 60 days. On October 3, 2000, the Board received DOE's corrective action plan, but found that it did not sufficiently respond to the Board's concerns. On October 23, 2000, the Board asked for a new plan of action; DOE has never submitted a revised plan, although several deliverables under the original plan have been received.

During the Board's August 15, 2001, public meeting on quality assurance,

DOE proposed a revised set of actions to improve SQA processes and practices. Since then, DOE has attempted to develop a Quality Assurance Improvement Plan that includes SQA as a key goal. This action now appears stalled as a result of internal differences over objectives and funding. Thus, despite well over two years of effort, DOE has failed to develop and implement effective corrective actions in response to the Board's reporting requirement.

This situation is not acceptable. To improve SQA in the DOE complex, the Board recommends prompt actions to achieve the following:

Responsibility and Authority

1. Define responsibility and authority for the following: developing SQA guidance, conducting oversight of the development and use of software important to safety, and directing research and development as noted below. Roles and responsibilities should address all software important to safety, including, at a minimum, design software, instrumentation and control software, software for analysis of consequences of potential accidents, and other types of software, such as databases used for safety management functions.

2. Assign those responsibilities and authorities to offices/individuals with the necessary technical expertise.

Recommended Computer Codes for Safety Analysis and Design

3. Identify software that would be recommended for use in performing design and analyses of SSCs important to safety, and for analysis of expected consequences of potential accidents.

4. Identify an organization responsible for management of each of these software tools, including SQA, technical support, configuration management, training, notification to users of problems and fixes, and other official stewardship functions.

Proposed Changes to the Directives System

5. Establish requirements and guidance in the DOE directives system for a rigorous SQA process, including specific guidance on the following: grading of requirements according to safety significance and complexity; performance of safety reviews, including failure analysis and fault tolerance; performance of verification and validation testing; and training to ensure proficiency of users.

Research and Development

6. Identify evolving areas in software development in which additional research and development is needed to ensure software quality.

Appendix—Transmittal Letter to the Secretary of Energy Defense Nuclear Facilities Safety Board

September 23, 2002.

The Honorable Spencer Abraham, Secretary of Energy, 1000 Independence Avenue, SW., Washington, DC 20585–1000.

Dear Secretary Abraham: The Defense Nuclear Facilities Safety Board (Board) has been following closely the Department of Energy's (DOE) response to a reporting requirement dated January 20, 2000, which requested a corrective action plan to address deficiencies documented in the Board's technical report DNFSB/TECH–25, *Quality Assurance for Safety-Related Software at Department of Energy Defense Nuclear Facilities*. Although more than two years have since elapsed, DOE has been unable to develop and execute an acceptable plan to resolve these issues, some of which were identified as early as 1989. Since the Board's August 15, 2001, public meeting on quality assurance, DOE has been developing an overall Quality Assurance Improvement Plan that includes software quality assurance as a key element, but this effort has not yet produced any substantial results.

As a result, the Board on September 23, 2002, unanimously approved Recommendation 2002–1, *Quality Assurance for Safety-Related Software*, which is enclosed for your consideration. After your receipt of this recommendation and as required by 42 U.S.C. 2286d(a), the Board will promptly make it available for access by the public in DOE's regional public reading rooms. The Board believes that the recommendation contains no information that is classified or otherwise restricted. To the extent this recommendation does not include information restricted by DOE under the Atomic Energy Act of 1954, 42 U.S.C. 2161–68, as amended, please see that it is promptly placed on file in your regional public reading rooms. The Board will also publish this recommendation in the **Federal Register**.

Sincerely,
John T. Conway,
Chairman.

[FR Doc. 02–25488 Filed 10–8–02; 8:45 am]
BILLING CODE 3670–01–P

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

[Recommendation 2002–2]

Weapons Laboratory Support of the Defense Nuclear Complex

AGENCY: Defense Nuclear Facilities Safety Board.

ACTION: Notice, recommendation.

SUMMARY: The Defense Nuclear Facilities Safety Board has made a recommendation to the Secretary of Energy pursuant to 42 U.S.C. 2286a(a)(5) concerning weapons laboratory support of the defense nuclear complex.

DATES: Comments, data, views, or arguments concerning the recommendation are due on or before November 12, 2002.

ADDRESSES: Send comments, data, views, or arguments concerning this recommendation to: Defense Nuclear Facilities Safety Board, 625 Indiana Avenue, NW., Suite 700, Washington, DC 20004–2901.

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

Dated: October 7, 2002.

John T. Conway,

Chairman.

Background

In the past, the Defense Nuclear Facilities Safety Board (Board) has issued recommendations addressing the need for weapons laboratories to support the safety of nuclear explosive operations at the Pantex Plant. Specifically, Recommendation 93–6, Maintaining Access to Nuclear Weapons Expertise in the Defense Nuclear Facilities Complex, addressed preserving expertise in the defense nuclear facilities complex. Both the Board and the Department of Energy (DOE) have devoted significant resources to implementing this recommendation and to maintaining access to the unique knowledge of individuals who were engaged for many years in critical defense nuclear activities, such as weapons design and testing. The continued support by such individuals is necessary to avoid future safety problems in these and related activities, and to maintain the safety of activities with existing weapons.

The Board is encouraged by the initiatives undertaken thus far to ensure access to the capabilities and experience of such individuals while they are still available. Activities such as those at the Theoretical Institute for Thermonuclear and Nuclear Studies at Los Alamos National Laboratory and the Intern Program at Sandia National Laboratories provide excellent opportunities to introduce new personnel to the weapons programs.

However, after visiting each of the weapons laboratories (Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories) to discuss laboratory support for the safety of nuclear explosive operations at the Pantex Plant, the Board has become increasingly concerned that an additional problem regarding technical expertise must be addressed. The weapons laboratories have not taken adequate steps to ensure that experienced staff members who can employ their specialized knowledge are readily available to the defense nuclear complex, especially to operations at the Pantex Plant. While some new talent is being developed, it will be years before these new individuals can be shepherded adequately through the nuclear weapons complex, inculcated with the unique knowledge gained through years of dedicated weapons laboratory work, and mentored in those skills required to maintain the stockpile safely. In the meantime, highly experienced specialists responsible for individual weapon programs are leaving the complex and delays in addressing safety issues continue to occur.

Some of these delays were highlighted in a letter dated August 1, 2002, from the Board to the Acting Director of the National Nuclear Security Administration, which addressed a specific safety improvement at the Pantex Plant. In that letter, the Board emphasized the need to designate a single person who would serve as the point of contact for each weapon system at each appropriate weapons laboratory. That individual should be empowered to integrate and coordinate for his or her

laboratory all information needed to respond to questions concerning the system under his or her purview and to provide the technical support required by the defense nuclear complex with regard to that system. The significant responsibilities assigned to these individuals will require care in their selection. There should be an internal process in place that provides for training and mentoring to ensure that they fully understand their weapon system and can competently judge how and when to draw on appropriate laboratory resources for the support needed by the complex to ensure safety. DOE is not adequately addressing this issue.

The example highlighted in the Board's August 2002 letter also indicated the need for better coordination between points of contact. In the example, both internal laboratory and inter-site communications were necessary between personnel who had been developing a technical application for several weapon programs and those responsible for one of the weapon programs. Both lines of communication broke down. As part of its actions to establish adequate points of contact, DOE will need to address proper communications amongst groups working on cross-platform projects, and to ensure that the appropriate resources are prioritized to provide critical stockpile support.

In formulating its Recommendation 93–6, the Board recognized some of the difficulties DOE would face in its stockpile stewardship program. That recognition was implicit in the statement: "Although it may be relatively straightforward to maintain these capabilities in the near term, ensuring their availability 5 to 20 years in the future may be very difficult." The Board is concerned that, without attention to the near-term problems associated with supporting the stockpile, the gains achieved in addressing Recommendation 93–6 are in danger of being lost.

Further, since the size and scope of the nuclear weapons stockpile have been reduced, and research and development leading to new weapons has been restricted, it appears that there has been an increase in "work-for-others" programs. The focus of the nuclear weapons laboratories on the nuclear weapons complex as their number one priority has waned. The Board was encouraged by the Secretary's statement at DOE's October 2001 Quarterly Leadership Meeting that DOE's "overarching mission is national security." However, it appears that this message is still not being effectively implemented within DOE and its weapons laboratories.

Recommendation

To address the above issues, the Board makes the following recommendations to ensure safety in weapons programs:

1. That the Secretary of Energy update and reemphasize DOE policies and Orders (*e.g.*, DOE Order 5600.1, Management of the DOE Weapon Program and Weapon Complex) as needed to ensure that the nuclear weapons program is assigned the top priority among all activities at the weapons laboratories.

2. That a process be developed to ensure the assignment of a senior individual, as the point of contact for each weapon system under the purview of each weapons laboratory. This process should include:

(a) Adequate selection criteria;

(b) Appropriate training and mentoring programs (as necessary) to ensure that each individual selected is fully knowledgeable about the weapon system assigned to him or her, as well as internal weapons laboratory programs and procedures;

(c) Formal planning for succession of individuals when they retire or are replaced; and

(d) Periodic dissemination of updated listings of points of contact to the defense nuclear complex.

3. That the internal organizational structure, programs, and procedures of the weapons laboratories be aligned to ensure that these senior, technically competent individuals are empowered (*i.e.*, given the authority and the funding) to direct appropriate resources of their laboratories to provide the support needed to ensure the safety of operations in the nuclear complex related to the weapons under their purview.

4. That DOE establish a position at each DOE site office with responsibility for a nuclear weapons laboratory to ensure that requirements of the defense nuclear complex for support by that laboratory are tracked and met. These positions should be filled by personnel with the appropriate competence and experience who have the authority to resolve competing requirements for resources.

John T. Conway,
Chairman.

Appendix—Transmittal Letter to the Secretary of Energy

Defense Nuclear Facilities Safety Board

October 3, 2002.

The Honorable Spencer Abraham,

Secretary of Energy, 1000 Independence Avenue, SW., Washington, DC 20585–1000.

Dear Secretary Abraham: The Defense Nuclear Facilities Safety Board (Board) has been following the Department of Energy's (DOE) efforts to provide appropriate technical support to its defense nuclear facilities, particularly the Pantex Plant. The complexity and uniqueness of the technical safety issues that arise in the nuclear weapons complex require the concerted effort of a cadre of highly competent individuals with expertise not generally available in industry or academia. Most of the personnel with this training and experience are employed at Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories.

The Board is concerned that the number of nuclear weapons experts is declining and the focus of remaining experts is being diverted to other areas. Action is required to change this trend and to re-emphasize the primary role and obligation of the weapons laboratories to support DOE's nuclear weapon-related activities, including the formal training and development of new experts.

As a result, the Board on October 3, 2002, unanimously approved Recommendation 2002–2, Weapons Laboratory Support of the Defense Nuclear Complex, which is enclosed for your consideration. After your receipt of this recommendation and as required by 42 U.S.C. 2286d(a), the Board will promptly make it available to the public. The Board believes that the recommendation contains no information that is classified or otherwise restricted. To the extent this recommendation does not include information restricted by DOE under the Atomic Energy Act of 1954, 42 U.S.C. 2161–68, as amended, please see that it is promptly placed on file in your regional public reading rooms. The Board will also publish this recommendation in the **Federal Register**.

Sincerely,
John T. Conway,
Chairman.

[FR Doc. 02–25846 Filed 10–9–02; 8:45 am]

BILLING CODE 3670–01–P

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

[Recommendation 2002–3]

Requirements for the Design, Implementation, and Maintenance of Administrative Controls

AGENCY: Defense Nuclear Facilities Safety Board.

ACTION: Notice, recommendation.

SUMMARY: The Defense Nuclear Facilities Safety Board has made a recommendation to the Secretary of Energy pursuant to 42 U.S.C. 2286a(a)(5) concerning requirements for the design, implementation, and maintenance of administrative controls.

DATES: Comments, data, views, or arguments concerning the recommendation are due on or before January 21, 2003.

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

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

Dated: December 16, 2002.

John T. Conway,
Chairman.

Background

The implementation of an effective and reliable set of controls is one of the most important cornerstones of safe operation at defense nuclear facilities. In this context, the term "control" refers to those structures, systems, and components (SSCs) and administrative controls that prevent or mitigate undesirable consequences of postulated accident scenarios. The Defense Nuclear Facilities Safety Board (Board) has

compiled a set of observations that are particularly relevant to the development and implementation of administrative controls in the Department of Energy's (DOE) defense nuclear complex. The results of these reviews and observations are summarized in this recommendation.

It has been well recognized that administrative controls play an important role in establishing and maintaining overall safety of nuclear activities. Previous technical reports issued by the Board have underscored the need for heightened vigilance in the selection and implementation of task-specific administrative controls, as well as those of a more programmatic nature (e.g., criticality control programs). In particular, in DNFSB/TECH-28, Safety Basis Expectations for Existing Department of Energy Defense Nuclear Facilities and Activities (October 2000), the Board observed the need for DOE to promulgate additional guidance in this area. However, DOE has taken little action to provide the degree of specificity necessary to properly design, implement, and monitor the effectiveness of important administrative controls.

Administrative controls have been defined in the DOE Nuclear Safety Management rule as, "* * * the provisions relating to the organization, management, procedures, recordkeeping, assessment, and reporting necessary to ensure safe operation of a facility." 10 CFR 830.3(a). In practice, however, the concept of an administrative control is used more broadly in the context of hazard prevention and mitigation. In this regard, an administrative control can be viewed as an extension of a hazard control and defined accordingly. Thus from a broader and more operational perspective, some administrative controls should be treated similarly to engineered or design features that are used to eliminate, limit, or mitigate potential hazards.

DOE has promulgated guidance to assist facilities in the classification of controls. In general, controls necessary to prevent or mitigate significant consequences to the public are classified as "safety-class" and controls which contribute significantly to defense-in-depth or worker safety are classified as "safety-significant." However, this guidance has been directed primarily at engineered controls and has been largely silent with respect to the functional classification of administrative controls. The Board has observed a number of instances in which administrative controls have been implemented in situations where a corresponding engineered feature would warrant functional classification as either safety-significant or safety-class. A number of defense nuclear facilities have explicitly characterized certain administrative controls as either safety-class or safety-significant from a functional classification perspective in the context of existing DOE guidance.

In addition to controls involving discrete operator actions, a number of administrative controls are more programmatic in nature. Examples of such programmatic controls include combustible loading programs (associated with fire protection programs), operator training programs, and inservice inspection programs. The Board has observed a number of instances, similar to the examples involving specific operator actions, in which such programmatic controls are credited for the prevention and mitigation of specific hazard scenarios.

Weaknesses in the Implementation of Important Administrative Controls

The Board has observed that the development and implementation of important administrative controls have not always conformed to the expectations and quality standards that would be applied to corresponding safety-class engineered features. The following examples illustrate this point:

1. During a review of the process controls for a new aqueous recovery line for plutonium 238 (Pu-238) at Los Alamos National Laboratory (LANL), the Board found that the facility had placed heavy reliance on administrative controls in lieu of engineered controls. However, LANL had not planned to incorporate many of these administrative controls, some of which were safety-related, into Technical Safety Requirements (TSRs) prior to the startup of the Pu-238 recovery process. Examples include procedural controls on the makeup of strong acids used to elute ion exchange resin and procedural controls designed to monitor for resin dryout. Strong acids can react violently with the ion exchange resin, and resin dryout can also lead to energetic reactions. These concerns were communicated to DOE in a Board letter dated April 23, 2002.

2. During a review at the Y-12 National Security Complex, the Board noted that the fire protection program for Building 9212 B-1 Wing identified 21 administrative controls needed to protect the facility during testing and process restart. These administrative controls include operational considerations in the use of organic solvents, a transient combustible control program, control of ignition sources, and designated laydown areas for combustible materials. The Board determined that the various administrative controls were not always updated or modified to reflect changes in plans or equipment, and that there were significant deficiencies in the contractor's compliance with these controls. Most important, there was no program providing for a periodic review to verify that the administrative controls associated with B-1 Wing remained fully effective. Significantly, many of these administrative controls could be supplanted by the installation of an engineered control-a fire suppression system. These issues were communicated to DOE in a letter from the Board dated May 13, 2002.

3. At the Savannah River Site, the safety analysis for HB-Line Phase 2 operations contains requirements for strict control of combustibles in rooms 410N and 410S to protect the process tanks in the area. The controls limit the total quantity of combustibles to 400 pounds wood equivalent and specify separation distances between combustibles and tank supports. However, the transient combustible control procedure did not include this portion of HB-Line, indicating that this administrative control was not complete. Further, a review by Westinghouse Savannah River Company (WSRC) indicated that the quantity of combustibles in the area may actually be as high as 5,670 pounds wood equivalent, providing sufficient fuel to produce a high-temperature (1200°C) flashover fire in the area and boil off the tank contents. As a result, it was determined that combustible control was no longer a viable administrative control for this area. Instead, WSRC has implemented an additional administrative control to limit the concentration of plutonium in the tanks to 5.5 grams per liter to prevent unacceptable consequences of a fire in this area. The details of these issues were documented in a letter from the Board dated July 20, 2001.

Recommendation

The development, selection, and implementation of an effective set of hazard controls are among the most important elements of nuclear safety. At defense nuclear facilities, DOE has established a priority system that favors preventive over mitigative measures, and passive design features over active controls. The approved system recognizes that, where necessary or practical, administrative controls may play an important role in hazard prevention and mitigation.

In the Board's view, the activities associated with the development, implementation, and ongoing verification and validation of safety-class and safety-significant administrative controls should be conducted with the same degree of rigor and quality assurance as that afforded engineered controls or design features with similar safety importance. Therefore, the Board recommends the following:

1. DOE should promulgate a set of requirements for safety-class and safety-significant administrative controls to establish appropriate expectations for the design, implementation, and maintenance of these important safety controls. The requirements should address the following at a minimum:

(a) Specific design attributes to ensure effectiveness and reliability;

(b) Specific TSRs and limiting conditions of operation;

(c) Specific training and qualifications to ensure that the appropriate facility operators, maintenance and engineering personnel, plant management, and other staff properly implement each control;

(d) Periodic reverification that each control remains effective; and

(e) Root cause and failure analyses, similar to those required upon failure of an engineered system.

2. DOE should ensure that all existing administrative controls that serve the function of a safety-class or safety-significant control are evaluated against these new requirements and upgraded as necessary and appropriate to meet DOE's expectations.

John T. Conway,
Chairman.

Appendix—Transmittal Letter to the Secretary of Energy

Defense Nuclear Facilities Safety Board

December 11, 2002.

The Honorable Spencer Abraham,
Secretary of Energy, 1000 Independence Avenue, SW., Washington, DC 20585–1000.

Dear Secretary Abraham: The prevention and mitigation of potential accidents inherent in the mission activities at defense nuclear facilities is a fundamental objective of both the Department of Energy (DOE) and the Defense Nuclear Facilities Safety Board (Board). This objective requires DOE and its contractors to identify accident scenarios and then establish effective and reliable safety controls to address them. Engineered controls are preferred over administrative controls because, in general, engineered controls are considered to be more reliable and effective than administrative controls. However, in certain applications, DOE and its contractors have concluded that discrete operator actions or administrative controls are required to address consequences of accidents that would otherwise be unacceptable.

The Board agrees with DOE's overall guidance for a hierarchy of controls and agrees that administrative controls are sometimes appropriate to prevent or mitigate accident consequences—even those that exceed evaluation guidelines for risk to the public. However, the Board has identified a number of administrative safety controls, proposed or in use, at various defense nuclear facilities that are technically inadequate. In many cases, DOE and/or its contractors have asserted that the methods used to establish these administrative controls comply with existing DOE directives. After further analysis, the Board has concluded that the DOE directives system does not contain adequate requirements for the design, implementation, and maintenance of important safety-related administrative controls to ensure that they will be effective and reliable.

As a result, the Board on December 11, 2002, unanimously approved Recommendation 2002–3, Requirements for the Design, Implementation, and Maintenance of Administrative Controls, which is enclosed for your consideration. After your receipt of this recommendation and as required by 42 U.S.C. 2286d(a), the Board will promptly make it available to the public. The Board believes that the recommendation contains no information that is classified or otherwise restricted. To the extent this recommendation does not include information restricted by DOE under the Atomic Energy Act of 1954, 42 U.S.C. 2161–68, as amended, please see that it is promptly placed on file in your regional public reading rooms. The Board will also publish this recommendation in the **Federal Register**. The Board will evaluate the Department of Energy response to this recommendation in accordance with Board Policy Statement 1, Criteria for Judging the Adequacy of DOE Responses and Implementation Plans for Board Recommendations.

Sincerely,

John T. Conway,

Chairman.

[FR Doc. 02–32033 Filed 12–19–02; 8:45 am]

BILLING CODE 3670–01–P

APPENDIX B

Reporting Requirements			
Date of Letter	**Subject**	**Response Required**	**Response Due**
December 27	Address secondary confinement system design deficiencies and primary confinement systems at the Y-12 Highly Enriched Uranium Materials Facility	Report	90 Days
December 16	Management of structural design margins and plans to systematically review the Hanford Waste Treatment Plant design	Report	45 Days
November 13	Address criticality safety for operations in Building 9212 and actions taken to ensure the continued adequacy of the Y-12 criticality safety program	NNSA Report Contractor Report	60 Days 60 Days
November 13	DOE actions to ensure that controls, such as continuous air monitors and radiation alarm monitors, are afforded protection required by safety-significant designation at the Pantex Plant	Briefing	60 Days
November 4	DOE resolutions of safety and design deficiencies at the Hanford Waste Treatment Plant	Report	60 Days
September 23	Safe storage of sodium fluoride (NaF) traps stored in Building 3019A at the Oak Ridge National Laboratory	Briefing	60 days
August 9	Recommendations 94-1 and 2000-1 Implementation Plan, Revision 2, plans and schedules for stabilizing nuclear material at LANL	Briefing IP Rev. Date	30 Days No Time Specified
August 1	Design agency designation of a single integrated point of contact for each weapon system	Briefing	30 Days
July 19	Describe the seismic-detection and alarm system test program for the Savannah River Tritium Extraction Facility and identify the safety design feature to be incorporated in the event the aforementioned system proves impractical or ineffective	Report	60 Days
July 17	Outline specific actions DOE will take to implement recommendations of the DOE Commission on Fire Safety and Preparedness	Report	60 Days
July 12	Address issues concerning verification of plutonium oxide stabilization	Report	60 Days
June 27	Summarize DOE's plan for further development of alternative technologies for removal of cesium from salt wastes at SRS	Report	60 Days

Date of Letter	Subject	Response Required	Response Due
May 20	Measures taken to improve the safe management of inactive nuclear materials at sites managed by NNSA	Report	120 Days
May 13	Fire protection issues for Building 9212, B-1 Wing, at the Y-12 National Security Complex	Report	60 Days
April 23	Identified deficiencies in new Plutonium-238 Scrap Recovery Line at the Los Alamos National Laboratory	Report	60 Days
April 19	Emergency power system at the Lawrence Livermore National Laboratory's Plutonium Facility (Building 332)	Briefing	30 Days
March 29	Recommendations on the high-level waste operations at the Savannah River Site	Report	60 Days
March 21	Issues raised in DNFSB/TECH-32 on the Savannah River Site canyon utilization	Report	60 Days
March 7	Issues on depleted uranium storage at the Savannah River Site	Report	120 Days
March 7	Preliminary design of the Sandia National Laboratories Underground Reactor Facility	Report	60 Days
February 22	Design requirements and guidance and status of quality assurance improvement at the Los Alamos National Laboratory	Report	60 Days
February 15	Hanford's Multi-Canister Overpack (MCO) in relation to Recommendation 94-1	Report	60 Days

APPENDIX C
CORRESPONDENCE

The Board's 2002 letters are organized below in two ways, first by strategic plan area and second by site or facility. Some letters pertain to more than one strategic plan area or site; in these cases, the letter is listed only once.

I. STRATEGIC AREA LISTS

Strategic Area of Planning I: Complex-wide Issues

January 28 letter to the Deputy Secretary of Energy concerning the Nuclear Air Cleaning Handbook.

January 31 letter to Secretary Abraham responding to DOE's letter proposing closure of Recommendation 98-1.

February 15 letter to the Assistant Secretary for Environmental Management regarding Multi-Canister Overpack in relation to Recommendation 94-1.

February 22 letter to the Deputy Secretary of Energy on the Quality Assurance Improvement Plan.

March 19 letter to the Assistant Secretary of Energy for Environmental Management forwarding a staff issue report on feedback from deactivation and decommissioning activities.

March 22 letter to the Assistant Secretary for Environmental Management in reference to Recommendation 2001-1.

March 29 letter to the Assistant Secretary for Environmental Management on the expertise of industry groups.

March 29 letter to Secretary Abraham on the order review in progress.

April 19 letter to the Under Secretary for Nuclear Security on the calendar year 2002 master schedule of external NNSA assessments.

May 20 letter to the Deputy Administrator for Defense Programs forwarding a staff issue report on the review of inactive nuclear materials management at DOE nuclear weapons laboratories.

June 7 letter to Secretary Abraham commending the Facility Representative Program and the selection of Mr. Brian Harkins as the 2001 Facility Representative of the Year.

July 11 letter to the Deputy Administrator of Naval Reactors concerning receipt of the NNSA/Naval Reactors report on radiological waste disposal and environmental monitoring, occupational safety and health, and occupational radiation exposure.

July 12 letter to the Assistant Secretary for Environmental Management with an enclosed issue report regarding the approved guidelines for verifying thermal stabilization of plutonium oxide.

July 17 letter to Secretary Abraham on the recommendations of the DOE Commission on Fire Safety and Preparedness.

August 8 letter to Secretary Abraham on the Integrated Safety Management annual review process.

August 9 letter to Secretary Abraham on DOE's Implementation Plan for Recommendations 94-1 and 2001-1.

August 9 letter to the Honorable Baron P. Hill on the Waste Pits Remedial Action Project.

September 18 letter to Secretary Abraham on Recommendation 2000-2 actions.

September 23 letter to Secretary Abraham on Recommendation 2002-1.

September 23 letter to Secretary Abraham on safety and hazard analysis methodology at DOE defense nuclear facilities.

October 3 letter to Secretary Abraham forwarding Recommendation 2002-2.

November 4 letter to Secretary Abraham on Integrated Safety Management.

November 15 letter to the Assistant Secretary for Environmental Management requesting a briefing on the vapor-space corrosion program.

November 22 letter to Secretary Abraham approving DOE's request for an extension to respond to Recommendation 2002-2.

December 11 letter to Secretary Abraham forwarding Recommendation 2002-3.

December 19 letter to the Deputy Administrator for Defense Programs regarding the Tritium Extraction Facility at SRS.

December 31 letter to the Deputy Administrator for Defense Programs regarding DOE's September 20 response to the Board's May 20 letter on inactive actinide materials.

Strategic Area of Planning II: Safe Management and Stewardship of Nuclear Weapons Stockpile and Components

January 15 letter to the Acting Deputy Administrator for Defense Programs enclosing a staff issue report on verification of hazard assessment at LLNL.

January 18 letter to the Under Secretary of Energy, Science, and Environment on environmental management activities of DOE's Oak Ridge Operations Office.

February 22 letter to the Deputy Administrator for Defense Programs forwarding a report on design requirements and guidance and status of quality assurance improvements at LANL.

March 7 letter to the Deputy Administrator for Defense Programs forwarding a staff issue report on the safety basis and readiness of the Waste Examination Facility at the Nevada Test Site.

March 7 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on the preliminary design of the Sandia Underground Reactor Facility.

March 11 letter to the Deputy Administrator for Defense Programs enclosing a staff report on the deactivation of LLNL's heavy element facility.

March 25 letter to the Deputy Administrator for Defense Programs on compliance with procedures at Pantex.

March 25 letter to the Deputy Administrator for Defense Programs forwarding three staff issue reports on the Highly Enriched Uranium Materials Facility at Y-12.

March 25 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on the disposition of various radioactive and hazardous materials stored at Y-12.

April 19 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on the emergency power system at LLNL's Plutonium Facility (Building 332).

April 23 letter to the Under Secretary for Nuclear Security and Administration forwarding a staff report on the new ^{238}Pu Scrap Recovery Line at LANL.

May 8 letter to Secretary Abraham on DOE's Implementation Plan for Recommendation 99-1.

May 13 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on fire protection for B-1 Wing of Building 9212 at Y-12.

July 30 letter to the Under Secretary of Energy, Science, and Environment on the proposal for obtaining medical isotopes from the uranium-233 stored at Oak Ridge National Laboratory, and the shutdown of the Building 3019 complex.

August 1 letter to the Acting Administrator of NNSA concerning actions being taken to ensure support of safety initiatives at the Pantex Plant.

August 6 letter to the Deputy Administrator for Defense Programs forwarding a staff report on the status of lightning protection and electrical systems at Pantex.

August 6 letter to the Deputy Administrator for Defense Programs forwarding a staff report on lightning protections systems at LANL.

September 23 letter to the Assistant Secretary of Environmental Management forwarding a staff report on safe storage of sodium fluoride traps at ORNL.

September 23 letter to the Acting Administrator of NNSA forwarding a staff report on fire protection at Pantex.

October 3 letter to the Deputy Administrator for Defense Programs forwarding a staff report on conduct of operations and training preparations for a contractor's operational readiness review at Y-12.

November 13 letter to the Deputy Administrator for Defense Programs establishing a 60-day reporting requirement for addressing criticality safety at Y-12.

November 13 letter to the Deputy Administrator for Defense Programs establishing a 60-day reporting requirement on controls to protect against significant exposure to radiological hazards at Pantex.

November 15 letter to the Deputy Administrator for Defense Programs regarding the need to restart disassembly and inspection operations for the W84 Program.

December 19 letter to Secretary Abraham regarding the implementation of Seamless Safety for the 21st Century at the Pantex Plant.

December 27 letter to the Deputy Administrator for Defense Programs establishing a 90-day reporting requirement on the Highly Enriched Uranium Materials Facility at Y-12.

December 31 letter to the Deputy Administrator for Defense Programs on the Highly Enriched Uranium Materials Facility at Y-12.

Strategic Area of Planning III: Safe Disposition of Hazardous Remnants of Weapons Production

February 5 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on electrical and instrumentation and control systems at Hanford's Plutonium Finishing Plant.

February 15 letter to the Assistant Secretary for Environmental Management on Recommendation 94-1.

March 4 letter to the Assistant Secretary for Environmental Management on high-level waste salt processing capability at SRS.

March 19 letter to the Assistant Secretary for Environmental Management enclosing a staff issue report on activity-level work planning and feedback and improvement at RFETS.

March 21 letter to Secretary Abraham forwarding DNFSB/TECH-32, *Savannah River Site Canyon Utilization*.

March 29 letter to Secretary Abraham formally closing Recommendation 96-1, and requesting a report on DOE's approach for treatment and disposition of the waste in Tank 48 at SRS.

March 29 letter to Secretary Abraham on Recommendation 2001-1.

May 22 letter to Secretary Abraham on Recommendation 94-1.

June 5 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report reviewing maintenance at the Hanford Spent Nuclear Fuel Project.

June 11 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on Recommendation 94-1/2000-1 stabilization activities at the Hanford Plutonium Finishing Plant.

June 11 letter to the Assistant Secretary for Environmental Management on Recommendation 2001-1.

June 26 letter to the Assistant Secretary for Environmental Management enclosing a staff issue report on the H-Canyon ventilation system at SRS.

June 27 letter to the Assistant Secretary for Environmental Management requesting a summary of DOE's plan for further development of alternative technologies for the removal of cesium from salt wastes at SRS.

July 30 letter to the Assistant Secretary for Environmental Management on the seismic design of the Pretreatment, Low-Activity Waste, and High-Level Waste Facilities of the Hanford Waste Treatment Plant.

September 9 letter to the Assistant Secretary for Environmental Management on the Waste Feed Delivery Transfer System at Hanford.

November 4 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on safety and design basis activities at the Hanford Waste Treatment Plant.

November 4 letter to the Assistant Secretary for Environmental Management enclosing a staff issue report on documented safety analysis for the concentration, storage, and transfer facilities at SRS.

November 8 letter to Secretary Abraham on F-Canyon at SRS.

November 14 letter to the Assistant Secretary for Environmental Management forwarding staff observations on the Hanford High Level Waste Building "Load Path Report."

December 13 letter to Congressman Porter on the hazard categorization of the Waste Pits Remedial Action Project at Fernald.

December 16 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on the status of the Implementation Plan for Recommendation 2000-2.

December 16 letter to Secretary Abraham establishing a 45-day reporting requirement regarding safety issues at the Hanford Waste Treatment Plant project.

II. SITE/FACILITY LIST

Fernald Closure Site

December 13 letter to Congressman Porter on the hazard categorization of the Waste Pits Remedial Action Project.

Hanford Site

February 5 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on electrical and instrumentation/control systems at the Plutonium Finishing Plant.

February 15 letter to the Assistant Secretary for Environmental Management on Recommendation 94-1.

June 5 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report reviewing maintenance at the Spent Nuclear Fuel Project.

June 11 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on Recommendation 94-1/2000-1 stabilization activities at the Plutonium Finishing Plant.

July 30 letter to the Assistant Secretary for Environmental Management on the seismic design of the Pretreatment, Low-Activity Waste, and High-Level Waste Facilities of the Waste Treatment Plant.

September 9 letter to the Assistant Secretary for Environmental Management on the waste feed delivery transfer system.

November 4 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on safety and design basis activities at the Waste Treatment Plant.

November 14 letter to the Assistant Secretary for Environmental Management forwarding staff observations on the High Level Waste Building's "Load Path Report."

December 16 letter to the Assistant Secretary for Environmental Management forwarding a staff issue report on the status of the Implementation Plan for Recommendation 2000-2.

December 16 letter to Secretary Abraham establishing a 45-day reporting requirement on safety issues at the Waste Treatment Plant.

Los Alamos National Laboratory

February 22 letter to the Deputy Administrator for Defense Programs forwarding a report on design requirements and guidance and the status of quality assurance improvements.

April 23 letter to the Under Secretary for Nuclear Security and Administration of NNSA forwarding a report on the new ^{238}Pu Scrap Recovery Line.

August 6 letter to the Deputy Administrator for Defense Programs forwarding a staff report on a review of lightning protection systems.

Lawrence Livermore National Laboratory

January 15 letter to the Acting Deputy Administrator for Defense Programs enclosing a staff issue report on verification of hazard assessments.

March 11 letter to the Deputy Administrator for Defense Programs enclosing a staff report on the deactivation of LLNL's heavy element facility.

April 19 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on the emergency power system at the Plutonium Facility, Building 332.

Nevada Test Site

March 7 letter to the Deputy Administrator for Defense Programs forwarding a staff issue report on the safety basis and readiness of the Waste Examination Facility.

Oak Ridge/Y-12

January 18 letter to the Under Secretary of Energy, Science, and Environment concerning the environmental management activities of the Oak Ridge Operations Office.

March 25 letter to the Deputy Administrator for Defense Programs forwarding three staff issue reports on the Highly Enriched Uranium Materials Facility at Y-12.

March 25 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on the disposition of various radioactive and hazardous materials stored at Y-12.

May 13 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on fire protection for the B-1 Wing of Building 9212 at Y-12.

July 30 letter to the Under Secretary of Energy, Science, and Environment on obtaining medical isotopes from the uranium-233 stored at ORNL, and the shutdown of the Building 3019 complex.

September 23 letter to the Assistant Secretary of Environmental Management forwarding a staff report on safe storage of sodium fluoride traps at ORNL.

October 3 letter to the Deputy Administrator for Defense Programs forwarding a staff report on conduct of operations and training preparations for a contractor's operational readiness review at Y-12.

November 13 letter to the Deputy Administrator for Defense Programs establishing a 60-day reporting requirement on criticality safety at Y-12.

December 27 letter to the Deputy Administrator for Defense Programs establishing a 90-day reporting requirement on the Highly Enriched Uranium Materials Facility at Y-12.

December 31 letter to the Deputy Administrator for Defense Programs regarding the Highly Enriched Uranium Materials Facility at Y-12.

Pantex Plant

March 25 letter to the Deputy Administrator for Defense Programs on compliance with procedures.

May 8 letter to Secretary Abraham on DOE's Implementation Plan for Recommendation 99-1.

August 1 letter to the Acting Administrator of NNSA concerning support for the implementation of safety initiatives.

August 6 letter to the Deputy Administrator for Defense Programs forwarding a staff report on the status of lightning protection and electrical systems.

September 23 letter to the Acting Administrator of NNSA forwarding a staff report on fire protection.

November 13 letter to the Deputy Administrator for Defense Programs establishing a 60-day reporting requirement on ensuring controls to protect against significant exposure to radiological hazards.

November 15 letter to the Deputy Administrator for Defense Programs regarding the need to restart disassembly and inspection operations for the W84 Program.

December 19 letter to Secretary Abraham regarding the implementation of Seamless Safety for the 21st Century.

Rocky Flats Environmental Technology Site

March 19 letter to the Assistant Secretary for Environmental Management enclosing a staff issue report on activity-level work planning and feedback and improvement.

May 22 letter to Secretary Abraham on Recommendation 94-1.

Sandia National Laboratories

March 7 letter to the Deputy Administrator for Defense Programs enclosing a staff issue report on the preliminary design of the Underground Reactor Facility.

Savannah River Site

March 4 letter to the Assistant Secretary for Environmental Management on high-level waste salt processing capability.

March 7 letter to the Assistant Secretary for Environmental Management on the issues outlined in the forwarded staff issue report on depleted uranium storage.

March 21 letter to Secretary Abraham forwarding DNFSB/TECH-32, *Savannah River Site Canyon Utilization*.

March 29 letter to Secretary Abraham formally closing Recommendation 96-1, and requesting a report on DOE's approach for treatment and disposition of the waste in Tank 48.

March 29 letter to Secretary Abraham on Recommendation 2001-1.

June 11 letter to the Assistant Secretary for Environmental Management on Recommendation 2001-1.

June 26 letter to the Assistant Secretary for Environmental Management enclosing a staff issue report on the H-Canyon ventilation system.

June 27 letter to the Assistant Secretary for Environmental Management requesting a summary of DOE's plan for further development of alternative technologies for the removal of cesium from salt wastes.

July 19 letter to the Deputy Administrator for Defense Programs concerning the Tritium Extraction Facility.

November 4 letter to the Assistant Secretary for Environmental Management enclosing a staff issue report on documented safety analysis for concentration, storage, and transfer facilities.

November 8 letter to Secretary Abraham on F-Canyon.

December 19 letter to the Deputy Administrator for Defense Programs regarding the Tritium Extraction Facility.

APPENDIX D
ADMINISTRATIVE ACTIVITIES

INFORMATION TECHNOLOGY AND SECURITY

The Board has continued to make improvements to the information technology (IT) resources provided to its staff. Desktop hardware and software are continually upgraded to ensure that the Board has the latest tools available.

Improvements in IT resources have also allowed the Board to provide expanded services to the public. The Board's public website has been completely redesigned. The new format makes it easier for the public and other interested parties to locate documents. An expanded career opportunities section has been added so that the website can become one of the Board's primary recruiting tools. The redesigned website is also compliant with Section 508 of the Rehabilitation Act, making it possible for visually impaired persons to navigate the site.

The Board has also placed a heightened emphasis on IT security. Even before the terrorist attacks of September 11, the Board was evaluating IT security. Based on the results of an in-depth analysis of the existing IT security program, the Board has initiated numerous upgrades. These include updating the Board's existing perimeter defenses; enhancing and centralizing the Board's anti-virus capability; improving and integrating the Board's incident handling capability with those of other federal agencies, such as the Federal Computer Incident Response Center and the National Infrastructure Protection Center; and evaluating the use of two-factor authentication devices to provide stronger user authentication.

STAFF

As of December 31, 2002, the Board employed 95 full-time staff in addition to the three Board Members. The Board continued its aggressive recruitment program to attract the brightest engineering students from colleges and universities across the country, as well as experienced engineering professionals. This year, technical recruiters visited 10 campuses and 10 career fairs, and the Board continued its recruitment outreach program through the National Society of Black Engineers and Mexican-American Engineers and Scientists.

DISPUTE RESOLUTION PROGRAMS

The Board, like other federal agencies, is required by the Administrative Dispute Resolution Act of 1996 to provide an alternative dispute resolution program for use in resolving appropriate disputes. During 2000, the Board established such a program, making innovative use of cooperative agreements with other agencies to resolve disputes economically.

APPENDIX E
HUMAN RESOURCES

As clearly recognized by the Congress when evaluating the Board, the ability to effectively carry out an independent technical oversight program throughout the DOE weapons complex depends upon the technical capability of the Board Members and staff:

> The conferees believe that the DNFSB is a unique Federal agency, in that its mission [is] to oversee the activities of another federal department whose work is highly technical and potentially dangerous, and that to properly carry out its mission, not only the DNFSB members but also its limited staff must be technically competent in all major phases of nuclear safety.[13]

Simply stated, the Board's ability to fulfill its safety mission rests heavily on attracting and retaining top-caliber technical staff. The Board has been successful in creating a work environment that emphasizes excellence as the standard for staff performance, and rewards its staff accordingly. The pay banding and pay for performance programs developed and implemented by the Board have proven to be effective in hiring technical talent, holding employees accountable for their performance, and rewarding outstanding performance on the job.

The Board's success in accomplishing these goals has been recognized by independent audits conducted by the Office of Personnel Management (OPM) and the Institute of Public Administration. For example, OPM completed an extensive survey and review of the Board's human resources management programs in August 2000 and reported the following:

> [The Board's] employees believe that supervisors communicate job expectations, that performance appraisals are fair, and that awards are based on performance. High performance is continually recognized, both monetarily and non-monetarily. Employees recognize the award-achievement connection. [This] indicates how much the Board differs from the rest of the Government in terms of performance management.

The Board's enabling legislation grants authority for excepted service hiring and classification. Using this authority, along with recruitment and relocation bonuses, student loan repayments, and retention allowances, the Board has been successful in competing for scientific and technical staff in a competitive employment market.

The challenges involved in recruiting and retaining a high-quality, diverse workforce can be grouped into two categories: (1) competition from the private sector, and (2) fiscal constraints. Competition for top engineering professionals is intense. Even with the special hiring and pay authorities granted to the Board, private industry can easily promise higher salaries and benefits. The Board has also found that the federal

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[13] National Defense Authorization Act for Fiscal Year 1991, Conference Report, H.R. Conf. Rep. No. 923, 101st Cong. 2nd Sess. 767 (1990).

downsizing campaigns of the 1990s, coupled with the perception that the federal bureaucracy stifles creativity and fails to encourage and reward outstanding work, have damaged its recruiting campaigns. Recruitment and retention of recent college engineering graduates, especially women and minorities, is difficult in the current job market, and will become even more challenging with the renewed activity in the commercial nuclear industry.

Despite these problems, the Board has assembled a professional staff of exceptional technical capability. Staff members' expertise covers all major aspects of nuclear safety: nuclear, mechanical, electrical, chemical, and structural engineering, as well as physics and metallurgy. Most mid- to senior-level technical staff members possess practical nuclear experience gained from duty in the United States Navy nuclear propulsion program, the nuclear weapons field, or the civilian nuclear reactor industry. Both the Board and its staff include individuals experienced in environmental impact assessments and regulatory processes. Four of the Board's attorneys have technical degrees, and one is a licensed professional engineer.

Seven technical staff members are located at priority DOE sites. There is one site representative at the Pantex Plant near Amarillo, Texas; two at Hanford near Richland, Washington; two at SRS near Aiken, South Carolina; and one each at RFETS near Boulder, Colorado, and LANL in New Mexico.

The Board expects its engineers and scientists to maintain the highest level of technical knowledge, encouraging them to improve their skills continually through academic study. Currently, 87 percent of the staff hold advanced degrees, 29 percent of which are at the Ph.D. level. Younger technical staff members have been recruited through the Board's professional development program. Entry-level employees recruited into this 3-year program receive graduate-school education and intensive on-the-job training guided by experienced technical mentors. Currently, there are 11 entry-level employees in this program. Three completed their master's degrees in the summer of 2002 and are in their third-year field assignment. By the summer of 2003, 3 more of these individuals should be awarded a master's degree in an engineering discipline. The Board's professional development program remains extremely useful in attracting and retaining high-quality entry-level engineers and preparing them for challenging assignments in their fields.

APPENDIX F
LIST OF ABBREVIATIONS AND ACRONYMS

Am/Cm	Americium/Curium
Board	Defense Nuclear Facilities Safety Board
CSSX	Caustic-side Solvent Extraction
CFR	Code of Federal Regulations
DOE	Department of Energy
DNFSB	Defense Nuclear Facilities Safety Board
DSA	Documented Safety Analysis
DWTF	Decontamination and Waste Treatment Facility
EOC	Emergency Operations Center
EPS	Emergency Power System
FOIA	Freedom of Information Act
FTS	Fuel Transfer System
FY	Fiscal Year
GPRA	Government Performance and Results Act
Hanford	Hanford Reservation
HEUMF	Highly Enriched Uranium Materials Facility
HLW	High-level Waste
INEEL	Idaho National Engineering and Environmental Laboratory
ISM	Integrated Safety Management
IT	Information Technology
ITP	In-Tank Precipitation Facility
LANL	Los Alamos National Laboratory
LAW	Low Activity waste
LLNL	Lawrence Livermore National Laboratory
MCOs	Multi-Canister Overpacks
MOU	Memorandum of Understanding
NaF	Sodium Fluoride
NCSP	Nuclear Criticality Safety Program
NNSA	National Nuclear Security Administration
NTS	Nevada Test Site
OPM	Office of Personnel Management
ORNL	Oak Ridge National Laboratory
ORP	Office of River Protection
ORR	Operational Readiness Review
Pantex	Pantex Plant
PDCF	Pit Disassembly and Conversion Facility
PDP	Professional Development Program
QA	Quality Assurance
RA	Readiness Assessment
RFETS	Rocky Flats Environmental Technology Site
RFFO	Rocky Flats Field Office
SNFP	Spent Nuclear Fuel Project
SNL	Sandia National Laboratories
SRS	Savannah River Site
SS-21	Seamless Safety for the 21st Century
SSCs	Structure, systems and components
TA	Technical Area
TEF	Tritium Extraction Facility
TRU	Transuranic
USQ	Unreviewed Safety Question
WIPP	Waste Isolation Pilot Plant
WTP	Waste Treatment Plant
Y-12	Y-12 National Security Complex
^{232}U	Uranium-232
^{233}U	Uranium-233
^{238}Pu	Plutonium-238