NINTH ANNUAL REPORT

TO CONGRESS

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

FEBRUARY 1999

To the Congress of the United States:

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

During the Board's nine years of operation, DOE has been subject to numerous changes in its top leadership. Seven Secretaries or Acting Secretaries have served in that cabinet position. Also six different Deputies or Acting Deputy Secretaries (a seventh has been nominated) have been in office, and seven Under or Acting Under Secretaries have filled that office. Notwithstanding the inevitable disruptions and uncertainties that accompany such changes, DOE personnel responsible for nuclear weapons and defense nuclear facilities and their contractors, including the National Laboratories, continued to move steadily forward in DOE's program for improving safety management.

As required by statute, the Board's report summarizes activities during calendar year 1998, assesses improvements in the safety of DOE defense nuclear facilities, and identifies remaining safety problems.

While much has been accomplished, more needs to be done. The Board has played a vital role in this upgrade effort and in maintaining the pace of the path forward. Many of DOE's missions entail the use of hazardous materials. We support Secretary Bill Richardson's strong commitment to the safe handling of these materials and his support of integrated safety management in protecting the health and safety of the public, workers, and the environment.

The Board's core efforts during 1998 focused on institutionalizing sound integrated safety management practices and their implementation in design, construction, operation, and decommissioning of defense nuclear facilities. Priority attention and effort were devoted to activities involving the greatest risks to public health and safety. These are reported in detail in this report.

Respectfully submitted,

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Chairman

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Vice-Chairman

Joseph J. DiNunno
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PREFACE

The Atomic Energy Act of 1954 as amended (Section 316) requires the Defense Nuclear Facilities Safety Board (Board) to submit to the Committees on Armed Services and on Appropriations of the Senate and to the Speaker of the House of Representatives a written report each year concerning its activities. In addition to setting forth all recommendations made by the Board during the preceding year, the Annual Report is required to include an assessment of:

(A) the improvements in the safety of Department of Energy defense nuclear facilities during the period covered by the report;

(B) the improvements in the safety of Department of Energy defense nuclear facilities resulting from actions taken by the Board or taken on the basis of the activities of the Board; and

(C) the outstanding safety problems, if any, of Department of Energy defense nuclear facilities.

EXECUTIVE SUMMARY

During this past year, the Defense Nuclear Facilities Safety Board (Board) has seen significant progress by the Department of Energy (DOE) in upgrading its safety management program. The cumulative effects of the Board's initiatives and DOE's positive responses have been increasingly evident at defense nuclear facilities.

DOE's defense mission associated with stewardship of the nation's nuclear arsenal remained a prime effort during 1998. In addition, DOE continued to emphasize its ongoing work to stabilize hazardous materials remaining from previous operations and the decommissioning and decontamination of highly contaminated nuclear facilities. The Board gave priority attention to DOE's safety management of these major DOE activities.

Highlights of the Board's principal efforts in each of these areas during 1998 were as follows.

Complex-wide Health and Safety Issues

- Staff reviews, interactions with DOE, and the Board's public meetings helped DOE make progress in the implementation of sound integrated safety management (ISM) programs at priority facilities and sites in response to the Board's Recommendation 95-2:

  - As a result of the Board's December 1997 reporting requirement upon DOE, DOE and its site contractors evaluated the status of ISM at facilities beyond those initially selected for priority implementation under Recommendation 95-2. Many sites reported that a beneficial outcome of this effort was that it revealed areas needing improvement.

  - At the Board's urging, authorization agreements for the original 10 facilities considered priority under Recommendation 95-2 were developed and signed; an additional 43 facilities have been added to the priority list. In all, 44 agreements have been signed. The Board commends DOE for this progress.

- During the past year, the Board has maintained its momentum toward accomplishing congressional mandates to review and evaluate the content and implementation of standards related to the design, construction, operation, and decommissioning of DOE's defense nuclear facilities, and to recommend to the Secretary of Energy those specific measures that should be adopted to ensure that the health and safety of the public and workers are adequately protected. The Board's staff formally reviewed 45 new or revised DOE safety directives and supporting documents. As a result of the Board's reviews and interactions, DOE substantially improved the content of those safety directives.

- The Board and its staff conducted specific reviews of DOE organizational documents (e.g., *Manual of Safety Management Functions, Responsibilities and Authorities,* DOE M 411.1-1); DOE's efforts to recruit and retain safety management staff of exceptional quality, education, and experience; and operations at DOE Headquarters and in the field. Examples include the following:

  - The structure of DOE's program for responding to the Board's Recommendation 94-1 failed to identify cross-cutting authority and resources to provide adequate direction for the program. In response to a December 1997 letter from the Board on this subject, the Deputy Secretary assumed responsibility for resolving complex-wide integration issues.

  - The Board's reviews revealed that the safety roles, responsibilities, and interfaces between DOE and its contractor for the Capability Maintenance and Improvement Project at Los Alamos National Laboratory (LANL) in New Mexico were not clearly defined. In response to the Board's December 1997 reporting requirement on this matter, DOE and LANL management initiated key organizational changes and have made a commitment to resolve the issues identified by the Board.

  - In January 1998, with the Board's support, DOE's Richland Office was granted authority to hire 25 additional well-qualified technical personnel, including excepted service billets.

- The Board's staff provided oversight and technical assistance to DOE in identification and assessment of the effects of the possible introduction of suspect/counterfeit parts and semiconductor devices in national security and other applications. For example, the staff:

  - Spurred DOE to thoroughly inspect and technically evaluate possible applications of suspect/counterfeit semiconductor devices in applications which could compromise safety in national security applications.

  - Provided the impetus for DOE to formalize and institutionalize procedures for notifying activities of the possible introduction of suspect/counterfeit parts into DOE applications and to evaluate the technical consequences of possible nonconformances.

  - Spurred DOE to formalize responsibilities for matters relating to suspect/ counterfeit parts.

  The Board's oversight and timely intervention in dealing with suspect/counterfeit parts were pivotal in re-energizing DOE's quality assurance program, which is vital to ensuring public health and safety at DOE's defense nuclear facilities.

- Reviews conducted by the Board and its staff determined that line management's resolution of health and safety issues raised during evaluations by the DOE Office of Independent Oversight was often unresponsive or incomplete. The Board's Recommendation 98-1, *Integrated Safety Management*, called on DOE to take additional action by establishing clearer lines of authority and responsibility for resolution of the safety findings of its internal, independent safety organization. In November 1998, DOE accepted the Board's recommendation and at year-end was working to develop an associated implementation plan.

Management and Stewardship of the Nation's Stockpile and Nuclear Weapons Components

- The Board assisted DOE in improving the safety of Enriched Uranium Operations at the Y-12 Plant in Tennessee which led to the resumption of initial operations in support of a high-priority national security task. The Board helped DOE in upgrading system designs and in improving identification of safety controls, implementation of controls, and coordination between operations and maintenance personnel.

- The Board determined that the overall program of work planning and safety planning that had been developed by DOE for nuclear explosive operations at the Pantex Plant in Texas, partly in response to the Board's Recommendation 95-2, had been structured in such a complex manner that it was beginning to be undoable. As a result, the Board issued its Recommendation 98-2, encouraging DOE to seek simpler and more pragmatic ways of providing the necessary assurance. These were to ensure that the responsibility of line management in DOE and in the contractor's organization would function properly, with the responsibility for safety flowing with the responsibility for the work. DOE is progressing with changes in accordance with the Recommendation.

- In response to a 1997 Board initiative, DOE identified and implemented many additional protective measures to prevent or mitigate the threat of lightning to nuclear explosives at the Pantex Plant. These improvements included bonding metallic penetrations to facilities, installing surge protectors, and providing other electrical isolation.

- During the last year, the Board placed considerable emphasis on the safety management program at the Chemistry and Metallurgy Research (CMR) Facility at LANL. As a result, LANL reorganized its line management structure, revised the facility safety management system, and completed a rigorous activity resumption process. CMR is now operating with greater assurance that safety requirements are being met.

- The involvement of the Board and its staff throughout 1998 in resumption activities at the Plutonium Facility at Lawrence Livermore National Laboratory in California spurred DOE and the laboratory to improve the facility safety management process

significantly. Most specific operations resumed after implementing improvements such as upgraded procedures, improved safety controls, clarified responsibilities for safety functions and systems, and upgraded training of employees responsible for handling nuclear materials.

- The Board's ongoing effort to improve the safety of nuclear weapon dismantlement operations continued in 1998. The W69 dismantlement program, the first operation to undergo the full Seamless Safety process (developed in response to Recommendation 93-1, *Standards Utilization in Defense Nuclear Facilities*), exhibited not only significantly enhanced safety features, but also an accelerated productivity rate. The last W69 nuclear weapon was successfully dismantled on October 21, 1998, well ahead of schedule. The Board also supported the safe start-up of the W79 nuclear weapon dismantlement operations in June 1998 by helping to identify and resolve several safety issues concerning the flammability of the solution used to dissolve high explosives, controls for the hot water heating system, ignition sources (particularly electrostatic discharge), combustible loading and fire protection, documentation of controls, and change control.

- In 1998, DOE responded to an earlier inquiry from the Board concerning the suitability of the bays in Building 12-64 at the Pantex Plant for certain nuclear explosive operations by declaring that the W69 campaign would be the last nuclear explosive operation for these bays, other than weapon staging in sandbag bays. The bays in Building 12-64 are the oldest bays used for nuclear explosive operations in the DOE complex, and they have been determined to have some potential safety and operational deficiencies.

- In December 1997, the Board issued a classified report, *Surveillance of Nuclear Weapon High-Explosive Operations at Pantex*, which emphasized that DOE should consider making improvements in some elements of the surveillance program, such as increasing the high explosive sampling frequency for weapons awaiting dismantlement. In 1998, noticeable improvements were observed in the surveillance program in some of the areas highlighted in that report.

Hazardous Remnants of Weapons Production

- The Board's Recommendation 96-1 questioned process safety at the In-Tank Precipitation Facility at the Savannah River Site (SRS) and urged DOE to defer operations until more thorough research could better demonstrate the safety of the process. In 1998, the results of this research (which had been closely monitored by the Board) led DOE to stop preparations for restarting this facility and to pursue alternative technologies. The Board's staff is actively monitoring the screening and selection of these alternative processes, to confirm that a technically sound and safe process is selected.

- In response to a series of Board Recommendations (94-1, 94-3, 97-1), DOE has committed to the stabilization and safe storage of a broad spectrum of radioactive and chemically unstable residues and transuranic materials. At the Board's request, DOE developed a revised implementation plan for Recommendation 94-1 to reflect current priorities. Some of the schedules presented in the revised plan remain unnecessarily drawn out, and the Board will continue to apply considerable effort to ensure DOE attacks these problems aggressively and remediates hazardous conditions as expeditiously as possible. Under the close safety oversight of the Board, DOE has begun correcting hazards in the following areas:

  - At the Rocky Flats Environmental Technology Site, drained and processed the remaining solutions stored in tanks; stabilized the first 2 metric tons of plutonium-laden salt residues; repacked more than 4 metric tons of plutonium residues into robust pipe overpack containers; and made significant safety improvements to the structure, systems, components, and operations at the site's principal plutonium storage facility (Building 371).

  - At SRS, restarted the HB-Line to begin stabilization of plutonium scrap; restarted solvent extraction operations in H-Canyon to stabilize spent nuclear fuel; started repackaging plutonium metal in the bagless transfer system in the FB-Line; and completed the dissolution of Taiwan Research Reactor spent fuel and the SRS inventory of plutonium-bearing sand, slag, and crucible residues in F-Canyon.

  - At Hanford, conducted an extensive program review to identify alternatives for improving the plutonium stabilization schedule at the Plutonium Finishing Plant. This activity was undertaken in response to a reporting requirement that was issued by the Board in 1998 after reviews by the Board's staff and public meetings held by the Board determined that DOE was not aggressively pursuing means to accelerate Hanford stabilization activities.

  - Completed initial site assessments to begin characterizing the hazards of uranium-233 storage at Oak Ridge National Laboratory (ORNL), Idaho National Engineering and Environmental Laboratory, and Los Alamos National Laboratory; initiated construction of characterization facilities for uranium-233 at ORNL; and issued a draft version of a safe storage standard for uranium-233.

- DOE has made substantial progress in the sampling and characterization of the high-level waste tanks at the Hanford Site, in response to the Board's Recommendation 93-5, *Hanford Waste Tanks Characterization Studies,* and continued active Board oversight. Of the 177 tanks, 139 have been sampled and analyzed, leading to a significantly increased understanding of tank safety issues. In particular, the hazards arising from potential burning of flammable gases within the waste are much better understood, and upgraded controls to prevent and mitigate such burns have been implemented.

- The Board and its staff continued to spur improvement in DOE's design and construction projects through reviews of the early stages of the work. Examples of the results of such reviews include the following:

  - Shortcomings were identified in the Spent Nuclear Fuel Project at the Hanford Site, including a hydrogen explosion hazard in a battery room; the lack of sound project management; and an inability to address emerging technical issues in a timely manner, which was delaying the removal and stabilization of the deteriorating fuel. Continued Board pressure through correspondence, project reviews, and public meetings led DOE to address safety hazards, streamline the project's organization, and resolve issues associated with the design and fabrication of the primary containment vessel for spent fuel storage.

  - The scope of the geotechnical investigation for the proposed Actinide Packaging and Storage Facility at SRS was found to have insufficient coverage for the final siting. In January 1998, the Board successfully encouraged DOE to expand the scope of the investigation in order to confirm design inputs and resolve other safety issues associated with the condition of the soil at the site.

- Reviews by the Board's staff of DOE's readiness to perform hazardous operations led to improvements by DOE at several facilities. For example:

  - The Board's staff completed reviews of the Waste Isolation Pilot Plant (WIPP) and evaluated its readiness to operate safely. These reviews contributed to improvements in the formality of conduct of operations and in the quality and rigor of the WIPP safety basis. Based on these reviews, the Board transmitted a letter to the Secretary of Energy on June 3, 1998, stating its belief that: (1) WIPP can be operated safely, and (2) start-up of waste disposal should commence as soon as practicable, so that the backlog of transuranic wastes at defense nuclear facilities can be dispositioned.

  - The Board and its staff identified issues regarding the readiness to perform hazardous work in several facilities at the Hanford Site. Though improvements in Operational Readiness Reviews (ORRs) by the contractor and the DOE-Richland Office were observed by the Board's staff, more progress was seen to be needed. This observation led the Board to issue letters in April and June 1998, alerting DOE to the problem.

- During 1998, the Board led DOE to improve the safety of deactivation of former defense facilities by applying the tenets of ISM. For example, the Board's staff:

  - Identified vulnerabilities in Building 9206 at the Y-12 Plant, including the potential for a chemical reaction or explosion, inadequate characterization of contamination in the ventilation systems, and the potential for spills of highly enriched uranium during a natural phenomenon event. As a result, DOE

developed a plan for eliminating or reducing the backlog of combustibles and to determining actions needed to reduce vulnerabilities associated with the highly enriched uranium.

– Identified issues regarding the readiness to perform hazardous work in the 233-S Plutonium Concentration Facility at the Hanford Site. While improvements in contractor and DOE-Richland personnel were observed during the past year as a result of staff interactions, more progress is needed in this regard.

This Annual Report also contains a summary of the Board's response to a provision of the National Defense Authorization Act for fiscal year 1998 that required the Board to prepare a report and make recommendations as to the future role of the Board should Congress consider legislation for the external regulation of defense nuclear facilities (see Section 1 of this report). In its response, the Board concluded that external regulation of DOE defense nuclear activities could have an adverse effect on national security, would increase operating cost, and would have little or no improvement in safety or DOE's credibility with the public.

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1. INTRODUCTION

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1.1 BACKGROUND

In the late 1980s, a number of public health and nuclear safety issues at aging defense nuclear facilities operated by the Department of Energy (DOE) led Congress to create the five-member Defense Nuclear Facilities Safety Board (Board). The Board began functioning in late October 1989 with the swearing in of the charter Board Members, three of whom continue in office. To help ensure adequate protection of the health and safety of the public and workers, the Board is empowered to oversee DOE's programs for management of the health and nuclear safety of defense nuclear facilities. The Board believes its greatest imperative is to ensure that DOE safely carries out its mandate to maintain the nation's nuclear weapons stockpile.

1.1.1 Board Responsibilities

The Board is responsible for independent oversight of safety management by DOE of all defense nuclear and related activities. DOE continues to be actively engaged in the disassembly of numerous nuclear weapons while maintaining the remaining weapons in the stockpile in a safe and reliable condition, and in the conduct of research to ensure the continued safety of DOE's stewardship of the stockpile. DOE also pursues safe disposition of fissionable material removed from dismantled weapons and of hazardous material remaining in facilities that abruptly ceased production activities more than 9 years ago. As in recent years, many of DOE's current activities are associated with characterization, stabilization, and safe storage of special nuclear materials; facility deactivation; and safe handling of radioactive wastes.

The law establishing the Board, 42 U.S.C. § 2286, *et seq.*, requires the Board to review and analyze facility and system design, operations, practices, and events, and make recommendations to the Secretary of Energy that are necessary to ensure adequate protection of public health and safety. In making recommendations, the Board must consider the technical and economic feasibility of their implementation, while the Secretary must report to the President and Congress if implementation of a recommendation is impracticable because of budgetary considerations. If the Board determines that there is an imminent or severe threat to public health and safety, it must transmit its recommendations to the President and Congress, as well as to the Secretaries of Energy and Defense.

1.1.2 Powers of the Board

In the legislative history of the Board's enabling statute, Congress gave guidance on how the Board was expected to carry out its functions. Congress chose to provide the Board with action-forcing rather than regulatory powers. Congress anticipated that in exercising these powers, the Board would help ensure that DOE safely manages the production, use, and storage of defense nuclear materials and attendant nuclear waste streams, while providing adequate protection of worker and public health and safety. Congress was aware that the safety policies and standards issued by DOE needed upgrading, and that operations by DOE and its contractors had in the past left extensive residual contamination in buildings and their environs. Congress also expected the Board to help raise the technical expertise of DOE's staff and to assist and monitor the continued development of DOE's internal Environment, Safety and Health organization.

Its enabling statute empowers the Board to conduct investigations, issue subpoenas, hold public hearings, gather information, conduct studies, establish reporting requirements for DOE, and take other actions in furtherance of its review responsibilities. The law requires DOE and its contractors at defense nuclear facilities to give the Board their full cooperation.

The Board's review and advisory responsibilities apply throughout the life cycle of DOE's defense nuclear facilities, covering design, construction, operation, and decommissioning. The law explicitly directs the Board to review and evaluate the content and implementation of health and safety standards, including DOE's Orders, rules, and other safety directives pertaining to the design, construction, operation, and decommissioning of defense nuclear facilities. The Board is also required to recommend to the Secretary of Energy any specific measures, such as changes in the content and implementation of those standards, that it believes should be adopted to ensure that public health and safety are adequately protected. In addition, the statute mandates that the Board review the design of new defense nuclear facilities and modifications to older facilities before the start of construction, and recommend any changes found necessary to ensure adequate protection of the health and safety of the public.

1.1.3 Avoidance of Interference with DOE Functions

The Board recognizes that DOE must perform its essential national defense work without unwarranted delay. The Board has been able to keep its safety reviews synchronized with DOE

activities by timely assignment of its staff to monitor and review work involving design, construction, or preparations for readiness to operate, operations, and decommissioning. The technical staffs of the Board and of DOE and its contractors frequently resolve technical issues that arise during these reviews without the need for formal action-forcing measures by the Board. If the Board identifies safety issues that must be resolved before work may proceed, it can, and frequently does, formally define those issues and recommend that they be resolved by DOE. In the case of operations at the Rocky Flats Environmental Technology Site (RFETS), Congress required that before plutonium operations are resumed in specified buildings, the Board must determine to its satisfaction that DOE's response to specific recommendations by the Board adequately protects public health and safety.

1.1.4 Formal Mode of Communication

The Board communicates to DOE the most substantive of its findings using the formal recommendation process set forth in the Board's enabling statute. These recommendations describe safety matters meriting Secretarial attention and provide guidance on what the Board considers to be advisable solutions and as required by law are made public immediately after receipt by the public. The Secretary may reject a recommendation, requesting the Board to reconsider. However, to date no Secretary has found cause to do so. Following the Secretary's acceptance of a recommendation, a mutually acceptable plan of action is established. The Board monitors the progress of each step in implementation of the mutually agreed-upon plan until the planned actions have been completed. To date, the Board has issued 38 sets of recommendations containing 174 specific recommendations. DOE has completed the majority of these recommendations and is making progress in implementing the remainder.

1.1.5 Nature of the Board's Work

The Board's primary function is to assist DOE in upgrading its program for safety management of its defense nuclear facilities. The integration of work planning and safety planning is a fundamental objective. The Board remains closely attuned to the planning and execution of DOE's defense nuclear programs, gathering information from a broad range of sources. These sources include, but are not limited to:

- On-site technical evaluations, reviews, and observations by the Board and its staff;
- Critical review of DOE safety analyses and proposed safety control schemes by the Board, its staff, and competent technical experts;
- Public meetings at Board Headquarters and in the field; and
- Daily input from the Board's Site Representatives, as well as weekly summary reports that are placed on the public record.

The Board has optimized its resources by assigning Site Representatives to five high-priority defense nuclear sites. In addition, extensive travel by the Board and its technical staff to

defense nuclear facilities remains essential for the Board to accomplish its safety oversight mission.

In order to remain better informed about DOE's activities and initiatives, the Board also receives regular briefings by senior DOE officials. Information obtained by the Board from these briefings is used to keep the Board's oversight activities synchronized with DOE's priority programs, to gauge progress being made on safety, and to monitor upgrade programs to which DOE has committed.

Based on the information gained through the above sources, the Board chooses from the spectrum of action-forcing mechanisms granted to it by law to formally communicate its observations and to promote appropriate DOE corrective actions. These action-forcing mechanisms include the Board's recommendations to the Secretary of Energy (in the case of an imminent threat to public health and safety, recommendations would also go to the President and Congress), requests for reports from DOE, public meetings or hearings, technical exchanges and issuance of technical reports, investigations, and testimony to congressional committees. In addition, the Board often transmits reports prepared by its staff to DOE, thereby sharing the staff's observations and findings.

Individual Board Members and the Board's staff also engage in direct technical dialogue with DOE and its contractors on specific safety-related matters, and participate in technical workshops and conferences where information relevant to safety improvement and risk reduction is exchanged. The Board has directed its senior staff members to meet frequently with their DOE counterparts to ensure that the staff is able to brief the Board on the status of safety issues and programs and on key safety questions, and that DOE understands the Board's safety objectives and initiatives. This type of direct interaction conserves federal resources by ensuring that DOE and the Board understand each other's positions in depth. This understanding, in turn, permits the Board to focus its recommendations, letters, requests for information, and public meetings and hearings on the most important health and safety issues to be addressed. It averts the waste of resources of both DOE and the Board on false starts and contention over easily resolved side-issues. In many cases, the simple exchange of ideas is sufficient to motivate DOE to take appropriate actions without the Board having to make formal recommendations.

In addition to the broad scope of the Board's communications with DOE, the Board has exchanged information with other government agencies (e.g., Nuclear Regulatory Commission [NRC], the General Accounting Office, Office of Management and Budget [OMB], the Department of Defense [DoD], and Environmental Protection Agency [EPA]), as well as outside agencies (e.g., National Research Council and National Academy for Public Administration). Such interactions facilitate the exchange of knowledge, experiences, and factual information on matters of mutual interest with regard to the safety of DOE defense nuclear facilities.

The Board remains committed to this policy of enhanced communication in the belief that in the end, safety is best served by spending federal dollars on real improvements at defense nuclear facilities, not on correspondence. Direct communication and discussions with DOE in an open forum have proven to be a powerful, cost-effective tools for advancing the Board's nuclear

safety initiatives. The Board held eight public meetings in fiscal year (FY) 1998, each of which involved substantive interactions with senior DOE officials.

1.2 BOARD'S STRATEGIC PLANNING

In 1993, the Government Performance and Results Act (GPRA) was enacted, which requires federal agencies to develop strategic plans. These strategic plans are to include articulation of the agency's mission statement and goals, as well as proposed methods to achieve the goals. The first edition of each agency's five-year strategic plan was to be submitted by the end of September 1997. Furthermore, starting with FY 1999, agencies are required by GPRA to submit annual performance plans to OMB that establish target levels of performance for program activities.

Performance target levels are required to be defined in objective, measurable terms so that actual achievement can be compared against the targets. Agencies will be required to report their performance annually to the President and Congress, comparing program achievements with the targets specified in the performance plans. Whenever a target has not been met, these performance reports must explain why and describe the actions needed to achieve the unmet goals.

1.2.1 Board's Planning Goals

The Board has developed seven general outcome goals that describe the intended effect or consequence that will occur as a direct result of its oversight activities. Using its action-forcing powers, the Board seeks to effect the following goals:

1. The safety of nuclear weapons at DOE defense nuclear facilities will continue to be assured.

2. Events or practices at hazardous DOE defense nuclear facilities that have adversely affected or may adversely affect public health and safety will be identified, and, as needed, recommendations will be made to the Secretary of Energy identifying technically and economically feasible measures to address these hazards.

3. A flexible and adaptable DOE standards-based safety management program will be established that incorporates recognized good nuclear safety practices and allows for integration of work and safety planning for work that DOE and contractors perform at DOE's hazardous defense nuclear facilities.

4. DOE technical expertise will be improved to permit DOE to better manage the hazardous work associated with defense nuclear facilities.

5. Integrated safety management (ISM) programs will be implemented for operations at defense nuclear facilities, with processes and controls tailored to the hazards involved.[1]

6. New defense nuclear facilities under design or construction will meet current safety standards.

7. Facilities used in the past for defense nuclear purposes will be safely cleaned up and deactivated in such a manner as to permit safe eventual disposition.

These outcome goals serve as the primary drivers for all oversight activities planned for FY 1999 and beyond. The Board focuses its actions on those activities and facilities that have reached a development stage that is best suited to constructive safety oversight, and on those operations where safety improvements have the greatest potential for risk reduction.

1.2.2 Board's Strategic Plan

In accordance with the requirements of GPRA and OMB's guidance, the Board issued its first strategic plan in September 1997. That plan discusses the Board's mission and Congressional mandate, the nature of the Board's work, the Board's planning assumptions and external factors with potential impact on planning, and the oversight principles and general goals under which the Board's oversight mission is conducted. In addition, the plan identifies the Board's three strategic areas of concentration for the period of FY 1997–FY 2002 to be:

- Complex-Wide Health and Safety Issues;

- Management and Stewardship of the Nation's Stockpile and Nuclear Weapons Components; and

- Hazardous Remnants of Weapons Production.

In planning work for these three strategic areas of concentration, the Board and its staff have developed a set of seven strategic objectives and sixteen associated action plans that, in the aggregate, will support the implementation of the Board's general goals, as noted above. As required by GPRA, the Board and its staff further refined their planning efforts for the FY 1999 and FY 2000 budget requests to produce measurable performance goals that, when executed, will demonstrate progress toward the Board's strategic objectives in each focus area, and consequently toward its general goals. The first GPRA-required performance reports, addressing each agency's FY 1999 performance goals, are due to the President and Congress by March 31, 2000.

[1] ISM is the means by which DOE is institutionalizing the process of incorporating into the planning and execution of every major defense nuclear activity involving hazardous activities those controls necessary to ensure that environment, safety and health objectives are achieved.

During each annual performance reporting period, it is anticipated that DOE's mission and associated schedules for major actions will continue to change, and that the Board's independent evaluations will require adjustments accordingly. As this occurs, the Board may be required to redeploy resources within and among the primary areas of concentration addressed in the Board's strategic plan. The specified facility or activity that is the focus of a performance plan action may change; however, the same or an increased level of performance and output should be achieved in support of the general outcome goals.

In addition to DOE mission/schedule changes and the emergence of new safety concerns, there are other external forces that have the potential to influence the Board's execution of its strategic plan and annual performance plans. In particular, if a major accident or other safety-significant event occurs at a DOE facility involving special nuclear material, the Board's oversight priorities will be changed substantially. This priority shift may require an expeditious reallocation of resources and a substantive revision to the Board's performance planning goals, and potentially may impact the Board's strategic plan objectives and action plans.

This Annual Report is structured according to the above three strategic areas of concentration.

1.3 EXTERNAL REGULATION OF DOE'S DEFENSE NUCLEAR FACILITIES

On November 18, 1998, the Board issued *Report to Congress on the Role of the Defense Nuclear Facilities Safety Board Regarding Regulation of DOE's Defense Nuclear Facilities*. That report responded to a requirement in the National Defense Authorization Act for FY 1998 that the Board prepare a report and make recommendations to Congress as to what the role of the Board should be in the event that Congress considers legislation for external regulation of nuclear safety at DOE defense nuclear facilities. The Board's responses and supporting analysis considered information from both the NRC and DOE.

Based on available information, the individual experience of Board Members, and current analyses, the Board concluded that:

- Congress made the correct decision in 1988 when it adopted the recommendation of the Senate Committee on Armed Services for national security reasons to maintain responsibility for nuclear safety of DOE defense activities with the Secretary of Energy and to establish the Board as an independent advisory agency, not as a regulator.

- The most serious problem with any external nuclear regulation of DOE's defense program would be a potential for adverse effects on national security. Delay is a commonly encountered consequence of a regulatory process. The Secretaries of Defense and Energy and the directors of DOE's national laboratories are on record that significant delay in the conduct of DOE's weapons program could have serious

national security implications, including causing other entities to doubt or question the credibility of our nation's nuclear deterrent.

- While respectful of the views of those seeking change in the regulatory regime for DOE contractors, the Board believes such action is hardly justified by the costs likely to be incurred for any benefits that might accrue. This is particularly true for defense nuclear facilities because the costs include the real potential for undue intervention and delays that could effectively block interminably the construction and operation of new facilities or the upgrades of existing ones that are needed either for safety reasons or to support the national security mission. The potential for increased vulnerability of defense nuclear facilities to litigious proceedings and extended delays needs to be recognized as a potentially serious cost.

- There is no basis to assert that cost savings or even cost-neutral results are achievable. On the contrary, it is generally recognized that transition to external regulation of DOE nuclear safety will require a cost increase.

- Considerable complications—legal, technical, and fiscal—would accompany any attempt to change the Atomic Energy Act to require DOE defense nuclear facilities to be subject to external nuclear safety regulation.

- DOE's credibility with the public improves when it performs its responsibilities in a safe, efficient, and creditable manner, not when additional government regulatory agencies are layered on it. DOE has made notable progress with regard to cooperation and openness with the public, particularly in the formation and utilization of local citizen advisory boards.

The Board's accomplishments during the 9 years since its establishment clearly demonstrate that there are ways of achieving enhanced safety objectives without adding unnecessary regulatory layers and processes. Based on its review of the factors that would attend the external regulation of defense nuclear facilities, the Board concluded in its report to Congress that it does not believe additional external regulation of defense nuclear facilities is in the best interest of our nation.

2. COMPLEX-WIDE HEALTH AND SAFETY ISSUES

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The Board devoted a substantial portion of its resources during 1998, as well as in previous years, to advising and assisting DOE in the effort to upgrade its internal safety management program. This effort was focused on:

- Upgrading the safety content of DOE's substantial body of existing safety management directives;
- Implementing standards-based safety management programs that integrate work planning and safety planning and treat requirements for protection of the public, workers, and the environment in a holistic way; and
- Recruiting and retaining highly qualified technical personnel, and upgrading the technical competencies of DOE's workforce.

2.1 SAFETY MANAGEMENT UPGRADE PROGRAM

In establishing the Board in 1988, Congress in its Conference Report[2] stated that, "The Board is expected to raise the technical expertise of the Department substantially and to assist and monitor the continued development of DOE's internal ES&H organization, and to provide independent advice to the Secretary."

[2]S. Rep. No. 232, 100th Cong., 1st Sess. 10 (1987).

Every Secretary of Energy with whom the Board has interacted since 1988 has stressed the importance of performing DOE's missions safely. However, with respect to defense nuclear facilities under the Board's oversight jurisdiction, the Board observed during the intervening years that DOE's program for achieving this objective had been marked by (1) the uncoupling of work planning and safety planning; (2) the development of separate protective programs for the public, for workers, and for the environment; and (3) the use of separate programs for nuclear safety and for chemical safety (hazardous and toxic materials). This situation is not unique to DOE as evidenced by the substantial number of single-sector safety programs that regulatory agencies have required and the commercial industry has developed. Examples of these various initiatives for the different sector protection programs being implemented in DOE include:

Worker Protection

- Voluntary Protection Program
- Enhanced Work Planning
- DOE Chemical Safety Program

Environmental Protection

- ISO Standard 140001

Public Protection

- Total Quality Management
- Emergency Planning and Community Right to Know
- Responsible Care (Chemical Manufacturers Association)
- Integrated Emergency Management
- Quality Assurance

Given that the source of the hazards that all these programs are intended to address is frequently the same, addressing those hazards in an integrated way appeared to offer substantial benefit. Toward that end, the Board recommended in 1995 (Recommendation 95-2, *Safety Management*) a restructuring of DOE's safety management program to provide a more effective and integrated way for DOE to discharge its responsibilities for protecting workers, the public, and the environment. In support of this recommendation the Board issued DNFSB/TECH-16, *Integrated Safety Management*, which set forth a vision of what integrated safety management could offer.

Integrated safety management strives to provide a single safety management program rather than the multiple, unintegrated programs listed above. It is a structured, comprehensive, common sense approach to "doing work safely." Through ISM, the Board encouraged DOE to capture the essence of good practices developed for each of the sectors to be protected—public, workers, environment—and to administer them as an integrated whole. The Board recognized that DOE's missions involved widely varying degrees of risk and hazard and that a "one size fits all" requirements approach would not succeed. By combining work planning and safety planning and establishing in advance the controls necessary for protection of workers, the public, and the environment, however, DOE can address any type of hazard that is encountered in the defense nuclear complex.

Secretary of Energy Hazel O'Leary accepted the Board's Recommendation 95-2 and in collaboration with the Board, provided in April 1996 an implementation plan for moving forward. Her successor, Secretary Peña, reaffirmed DOE's commitment to the integrated safety management concept and issued DOE Policy 450.6, *Secretarial Policy Statement Environment, Safety and Health*, making the implementation of the concept a requirement for all DOE's hazardous activities in the complex, nuclear and otherwise. In 1998, Secretary Richardson reinforced these earlier initiatives by issuing strong statements in support of DOE's continuing efforts to upgrade its safety management program.

The basic tenets of ISM were expressed in the implementation plan for Recommendation 95-2 and captured in DOE Policy 450.4, *Safety Management System Policy*, as five core safety management functions and seven guiding management principles.

Core Safety Management Functions

1. Define the scope of work.

2. Analyze the hazards.

3. Develop and implement hazard controls.

4. Perform work within those controls.

5. Provide feedback and continuous improvement.

Guiding Principles

1. Line Management is responsible for safety.

2. Clear roles and responsibilities must be articulated.

3. Competence must be commensurate with responsibilities assigned.

4. Balanced priorities must be set.

5. Safety standards and requirements must be identified.

6. Hazard controls must be tailored to the work being performed.

7. Operations must be authorized.

These functions and principles are to be applied universally and systematically in the management of all hazardous activities, large or small, with control measures tailored to the specifics of the hazards involved.

The following sections present the progress DOE and the Board are making in upgrading DOE directives, institutionalizing ISM, implementing ISM at facilities in the complex, and establishing a growing number of specific sets of control measures (authorization agreements) at most major DOE sites.

2.2 INSTITUTIONAL SAFETY MANAGEMENT FRAMEWORK AND IMPLEMENTATION

In the Board's enabling statute, Congress directed the Board to review and evaluate the content and implementation of standards related to the design, construction, operation, and decommissioning of DOE's defense nuclear facilities, and to recommend to the Secretary of Energy those specific measures that should be adopted to ensure that public health and safety are adequately protected. Congress anticipated that the Board would be instrumental in helping DOE develop appropriate and operationally meaningful safety standards, and in ensuring their incorporation into clear and consistent requirements for DOE management and contractors.

2.2.1 Board Reviews of DOE Directives and Related Documents

DOE directives set forth requirements and guidance for the way DOE and its contractors are to perform activities throughout the entire facility life cycle; they are key inputs in the development and implementation of ISM programs at DOE facilities and sites throughout the DOE complex. The Board's reviews and those of its staff focus on whether the requirements and guidance in these directives are sufficient to adequately protect the health and safety of workers and the public.

In meeting its enabling statute during 1998, the Board reviewed numerous new or revised DOE safety directives.[3] Extensive reviews conducted by the Board's staff during this process led to substantial improvements in the content of a number of those directives, examples of which are as follows:

[3]Forty-five directives and supporting documents were formally logged and reviewed by the Board's staff. In addition, informal comments on a substantial number of early draft documents were furnished by the Board's staff to their DOE counterparts, who were authors of those documents.

- **Rule 62 Fed. Reg. 2482.** A significant milestone in the institutionalization of safety management programs, as the Board urged in Recommendation 95-2, was DOE's publication of a final rule (62 Fed. Reg. 2482) that, among other things, includes two new DOE Acquisition Regulations (DEAR) clauses related to ISM. These clauses are 48 CFR § 970.5204-2, *Integration of Environment, Safety, and Health into Work Planning and Execution*, and 48 CFR § 970.5204-78, *Laws, Regulations, and DOE Directives*. Key features of these clauses are requirements for information that contractors for major acquisitions must provide for DOE approval. These include (1) a list of the general DOE requirements that apply to the contracted work, and (2) a description of the ISM system (ISMS) the contractors agree to deploy. The Board focused on these two elements in 1998.

- **DOE Guide 450.4-1, *Integrated Safety Management Guide*.** During 1997, DOE issued Guide 450.4-1 which was developed largely as a result of DOE's initial experience in implementing ISM at priority facilities. The Guide was developed to assist DOE contractors in describing and implementing ISM. It also provides guidance to DOE line managers tasked with oversight of the contractors' ISM programs. The Board worked closely with DOE through the development of this guide. Updating of the Guide is a continuing process that benefits from the additional experience being gained from ISM implementation across the DOE complex. The Board has continued to work with DOE in the updating effort by reviewing the revisions to ensure that the document will continue to be effective and comprehensive.

- **DOE Order 251.1, *Directives System,* and Manual 251.1-X, *Directives System Manual.*** As a result of reviews by the Board's staff and extensive interactions between DOE and the Board during the latter part of 1997, DOE revised Order 251.1A, *Directives System,* and Manual 251.1-1A, *Directives System Manual.* Mutual agreement with DOE on the revised versions of both of these directives was achieved early in 1998.

- **Revision of DOE Order 430.1A and DOE-STD-1120-98 to cover Decontamination & Decommissioning.** The Board provided substantial input into the revision of DOE Order 430.1A, *Life Cycle Asset Management,* and the development of DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities.* These efforts concluded an 18-month period during which the Board's staff worked closely with DOE to develop a standard that comprehensively addressed methodologies for safe deactivation and decommissioning of nuclear facilities, consistent with the functions and principles of ISM.

- **10 CFR 835 and Associated Directives.** In November 1998, DOE published an amendment to 10 CFR Part 835, *Occupational Radiation Protection.* DOE's primary authoritative source for requirements on occupational radiation protection. This final rule corrected minor errors in the first version of the rule (issued in December 1993)

and clarified certain issues. The Board's staff reviewed and commented on various versions of the proposed amendment through one-on-one communication and interaction with DOE staff, and in some cases by Board correspondence. These activities led to needed improvements in health and safety requirements.

- **Directives Associated with Safety Analysis.** DOE-STD-3009-94, *Preparation Guide for U.S. DOE Nonreactor Nuclear Facility Safety Analysis Reports,* was issued in 1994. The guidance provided in that standard was inadequate to ensure that consistent and appropriately comprehensive safety requirements would be developed for existing facilities, or for new construction and major modifications. In response to comments from the Board and its staff, DOE prepared an appendix to the standard and revised the implementation guide associated with DOE Order 420.1, *Facility Safety.*

- **DOE-HDBK-XXXX-98, *Design Considerations Handbook***. When DOE Order 6430.1A, *General Design Criteria,* was replaced by DOE Order 420.1, *Facility Safety*, a significant amount of general design guidance from the old Order was transferred to the associated implementation guide. During 1998, the Board's staff aggressively pursued with DOE the need to ensure adequate scope and content for the Handbook. DOE's final resolution of comments from the Board's staff occurred in December; issuance of the Handbook is expected in 1999.

- **DOE-STD-3XXX-98, *Stabilization, Packaging, and Storage of Plutonium-Bearing Metals.*** A pending revision of DOE-STD-3013, *Criteria for Preparing and Packaging Plutonium Metals and Oxides for Long-Term Storage,* is intended to cover a wider range of materials and to be simpler to implement, with reduced thermal stabilization requirements for oxides, more flexibility in test methods for verifying oxide stabilization, and less restrictive limits for the temperatures of plutonium metal in storage. As a result of suggestions from the Board, DOE has developed additional technical support for the proposed requirements, has made revisions to the standard's scope and requirements, and is requiring more testing of the behavior of metals stored at elevated temperatures.

- **Draft DOE Order 461.X, *Defense Programs Packaging and Transportation,* and DOE Limited Standard DOE-DP-STD-XXXX-YR, *Defense Programs Onsite Packaging and Transportation.*** In October 1998, the Board's staff provided comments to DOE regarding these two documents, noting inconsistencies between the draft Order and the existing DOE Order 460.1A, *Packaging and Transportation Safety*, which is applicable to hazardous materials in general. DOE Order 460.1A requires at least an equivalency with Department of Transportation hazardous materials regulations; the draft Order appears to lower this expectation. In addition, the draft standard generally lacks appropriate criteria and implementation guidance. At year-end, these issues were still pending resolution.

! **DOE M 411.1-1A, *Safety Functions, Responsibilities and Authorities* (FRAM*).*** Following receipt of a proposed revision to the Level 1 (corporate) FRAM in October 1998, the Board's staff provided its comments to DOE in November, observing that the proposed revision did not incorporate several of the Board's earlier comments. Most notably, the revised Level 1 FRAM did not clearly require that subtier documents for DOE (headquarters and field office) incorporate the health and safety responsibilities of DOE personnel in applicable DOE Orders, including certain older Orders being canceled. At year-end, these issues were still pending resolution.

! **DOE Order 442.X, *Employee Concerns Program*.** DOE Order 442.X, *Department of Energy Employee Concerns Program,* provides protection to DOE and contractor employees who report health and safety problems to appropriate officials. During its review of this Order, the Board's staff suggested that the draft Order include explicit provisions to implement the DOE policy of "zero tolerance" for reprisals against those who raise concerns and urged that, in light of recent court decisions, the Order include provisions necessary to enforce settlements arrived at under 10 CFR Part 708, *DOE Contractor Employee Protection Program*.

! **Other Directives and Related Documents Reviewed.** In addition to the directives and related documents discussed above, the Board's staff reviewed a significant number of directives for which either the comments were minor in character and adopted by DOE prior to publication, or the review was completed late in the year and response was pending at year-end. These included:

– DOE Order 400.XDMD, *Safety of Accelerator Facilities*

– DOE Order 414.1, *Quality Assurance*

– DOE Order 420.1, *Facility Safety,* and Guide 421.1-1, *Criticality Safety Good Practices Guide for DOE Nonreactor Nuclear Facilities*

– DOE Guide 420.1-X, *Implementation Guide for Non-Reactor Nuclear Safety Design Criteria and Explosives*

– DOE Order 425.1, *Startup and Restart of Nuclear Facilities*

– DOE Order 435.1, *Radioactive Waste Management*

– DOE-STD-1066-97, *Fire Protection/Design Criteria*

– DOE-HDBK-1089-XX, *Guidance for Identifying, Reporting, and Tracking Nuclear Safety Noncompliance,* and related guidance

– DOE-STD-3007-93, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*

– DOE Guide 426.1-1, *Recruiting, Hiring, and Retaining High-Quality Technical Staff*

– DOE Policy 426.1, *Federal Technical Capability Policy for Defense Nuclear Facilities*

2.2.2 Complex-wide Integrated Safety Management Upgrades

Several key indicators for gauging progress in implementing ISM have been identified as a result of the Board's reviews:

- Incorporation of the DEAR clauses into contracts.
- Establishment of a DOE/contractor mutually agreed-upon requirements base as the foundation for the ISM program.
- Development of an ISMS Description that explains how the contractor will safely manage its hazardous activities.
- Performance of a DOE ISMS verification review.
- Establishment of work-specific safety control measures for high-hazard operations (i.e., authorization agreement).

Each of these areas received Board attention in 1998, not only at the 10 priority facilities called out in the implementation plan for Recommendation 95-2, but also in the 43 facilities designated in the Board's December 23, 1997 letter as "follow-on" facilities.

DOE Acquisition Regulations Clauses

During 1998, the Board confirmed that all major maintenance and operation contracts at sites with defense nuclear facilities have been modified to incorporate the key provisions of the DEAR requiring a description by contractors of the ISMS they agreed to deploy. DOE plans to release an additional DEAR clause in 1999, 970.5204-XX, *Conditional Payment of Fee or Incentives*, that calls for the establishment of performance measures relating to ISM implementation and the establishment of an awards fee structure regarding those measures. The Board will work closely with DOE on implementing this new clause that the Board views as an important reinforcement by DOE of its commitment to safety management.

Selection of Contractual Environment, Safety, and Health Requirements (List A/List B)

The DEAR clauses require contractors to use DOE-approved processes for determining appropriately tailored sets of environment, safety, and health standards, practices, and controls to govern hazardous work. Once approved by DOE, the resulting requirements become binding contract terms. During 1998, the Board reviewed the application of the DOE-approved Work

Smart Standards (WSS) process at the Lawrence Livermore National Laboratory (LLNL) and the Los Alamos National Laboratory (LANL). These reviews identified areas where improvements were needed, including the need to update DOE's guidance to bring the process more into consonance with ISM principles. The staffs of the Board and DOE are working towards such improvements.

System Descriptions

The Board has followed the development of ISMS Descriptions, required by the DEAR clause. These documents describe how the contractor will integrate ISM into work practices. Only the Savannah River Site (SRS), the Y-12 Plant, and RFETS have had their ISMS Descriptions approved by DOE. All other sites are developing their Descriptions or have submitted them to DOE for approval. A key step in their approval by DOE is the completion of a verification review.

Verification Reviews

In Recommendation 95-2 the Board recommended that a formal process be established for reviewing and approving contractors' safety management programs. In response to the Board's urging, DOE established a protocol for performing verification reviews, and in February 1998, issued the *Integrated Safety Management Systems Verification Process Team Leader's Handbook* (DOE-HDBK-XIX-98, February 1998). As with the *Integrated Safety Management System Guide*, DOE G 450.4-1, this initial version of the Handbook is scheduled for revision in a year to reflect additional lessons learned from the ISMS verification process.

There are two targets of verification reviews:

- The site-wide upgraded safety management infrastructure, and
- The state of implementation at hazardous facilities where agreed-upon safety control measures are to be clearly established.

During 1998, the Board's staff observed and constructively critiqued all DOE verification reviews conducted at defense nuclear facilities, including RFETS, SRS, Pacific Northwest National Laboratory, Sandia National Laboratories (SNL), the Y-12 Plant, the Pantex Plant, the Hanford Site, and the Waste Isolation Pilot Plant (WIPP). In a March 1998 letter, the Board informed DOE of important lessons learned that merited consideration as future verification review approaches were developed.

These verification reviews, led by senior technical staff of DOE and supplemented by outside subject matter experts, have been highly beneficial to both those performing the work (contractors) and those who provide the technical oversight (DOE management). These benefits accrue from an enhanced understanding of the work that results from the systematic application of the functions and principles of ISM. The results of these reviews have shown that, in general, all sites have a considerable site-wide safety management infrastructure in place, but all can

benefit from more manual-capture of good practices for planning and performing hazardous work. Such upgrade efforts are under way. (Site-specific status is reported in Section 2.2.3)

The Board has observed that verification reviews have improved, but the Board continues to find areas for further improvement, especially in team composition and qualification, review scope, and timing of the reviews. The Board intends to continue its oversight and constructive advisories on DOE's verification reviews in 1999.

Authorization Agreements

The Board has assigned great importance to the timely execution of authorization agreements covering hazardous work at defense nuclear facilities. An authorization agreement is a documented agreement between DOE and a contractor incorporating a statement of work to be done and the contractor's proposed means for conducting the work safely. An authorization agreement includes appropriate limits on safety-related parameters and activities and sets forth key terms and conditions under which the contractor is authorized to perform the work. Some restrictions may be identified as administrative controls, and specific technical requirements necessary for safety are specified as commitments, thereby making the use of certain procedures and practices contractually binding. Authorization agreements (similar to the licenses of commercial nuclear facilities) greatly facilitate the identification, implementation, and maintenance of safety controls needed to prevent an accidental release of radioactive materials in or from the work place, or mitigate the consequences of an accident if one should occur.

To assist DOE and its contractors in developing authorization agreements, the Board issued DNFSB/TECH-19, *Authorization Agreements for Defense Nuclear Facilities and Activities* (April 1998). In addition, Board Members and individuals of the Board's staff presented associated technical discussions at various meetings, participated in DOE workshops, and discussed authorization agreements at three public meetings. As a result of these and other efforts, more than 40 facilities or major activities are operating within the bounds of signed authorization agreements. This accomplishment by DOE is a notable outcome of the ISM effort and a substantive measure of successful implementation. It is particularly noteworthy that all 10 operating priority facilities that require authorization agreements have been approved. As presented in Table 1 below, 43 authorization agreements have been approved. This represents a substantial fraction of the authorization agreements that remain to be set in place for defense nuclear facilities. If this pace is maintained, authorization agreements for all operational Hazard Category 1 and 2 defense nuclear facilities and much of the ISM infrastructure should be in place at all defense nuclear sites by the end of 1999. Table 1 provides the current status of authorization agreements for these 53 facilities (10 priority and 43 follow-on).

Table 1 - Status of Authorization Agreements (AAs) for Priority Facilities and Follow-on Facilities

	PRIORITY FACILITIES	AA in Place	Approval Date/Status
DEFENSE PROGRAMS			
	Lawrence Livermore National Laboratory		
1	Superblock:		
	Building 332, Plutonium Facility implement	Yes	6/97
	Building 334, Weapon Design & Testing Facility	No	Not required for B334 and B331, but LLNL will develop as ISM is implemented
	Building 331, Tritium Facility	No	
	Los Alamos National Laboratory		
2	TA-55, Bldg.4, Plutonium Facility	Yes	1/99
3	TA-3, Bldg. 29, Chemistry and Metallurgy Research (CMR) Facility	Yes	1/99
	Oak Ridge		
4	Y-12:		
	Bldg. 9212, Wet Chemistry, Casting, Storage	Yes	5/15/98
	Bldg. 9206, Enriched Uranium Chemical Processing	No	6/99
	Bldg. 9720-5, Warehouse Operations	Yes	4/6/98
	Bldg. 9204-2E, Disassembly Operations	Yes	4/6/98
	Bldg. 9204-4, Quality Evaluation	Yes	4/6/98
	Bldg. 9215, Special Nuclear Materials (SNM) Processing & Fabrication	Yes	5/15/98
	Pantex Plant		
5	Zone 12, Nuclear Explosive Bays and Nuclear Explosive Cells	No	AAs will be approved for specific weapon activity, not for the facility. See follow-on facilities list.
	Hanford Site		
6	K Basins Facility	Yes	9/24/98
7	Tank Farms	Yes	7/24/98
	Rocky Flats Environmental Technology Site		
8	Bldg. 371, Plutonium Chemical Processing Facility	Yes	9/11/97
9	Bldg. 771, Plutonium Recovery Facility	Yes	12/31/97
	Savannah River Site		
10	Canyons		
	F Canyon	Yes	9/9/97
	FB Line	Yes	9/26/97
	H Canyon	Yes	8/1/97
	HB Line	Yes	3/19/98

Table 1 - Status of Authorization Agreements (AAs) for Priority Facilities and Follow-on Facilities (Continued)

	FOLLOW-ON FACILITIES	AA in Place	Approval Date/Status
DEFENSE PROGRAMS			
	Lawrence Livermore National Laboratory		
1	Building 231 Complex (Vaults)	No	Not required for Cat. 3 facilities.
2	Building 251, Heavy Element Facility	No	Not required for Cat. 3 facilities.
	Los Alamos National Laboratory		
3	TA-18, Pajarito Laboratory	No	2/99
4	TA-16, Weapons Engineering Tritium Facility	No	2/99
5	Defense Nuclear Activities at TA-15, Dual Axis Radiographic Hydrotest Facility	Not Applicable - Under Construction	
6	Defense Nuclear Activities at TA-53, Los Alamos Nuclear Scattering Center	No	2/99
	Nevada Test Site		
7	Abel Site, Area 27 (to be replaced by the Device Assembly Facility, Area 6)	Yes	1/14/99
8	U1a Complex	Yes	1/14/99
	Oak Ridge National Laboratory		
9	ORNL: Material Storage (Building 3019)	No	9/99
	Pantex Plant		
10	Building 12-116, SNM Staging Facility	Yes	7/98
11	Building 12-104A, Special Purpose Bays (New - not operational)	No	3/99
12	Dynamic Balancer (Bldg. 12-60)	Yes	11/97
13	Weapons Programs		
	W56	No	Spring 1999
	W69	Yes	7/97
	W76	No	FY 99
	W78	No	FY 99
	W79	Yes	7/98
14	Paint Bays (Bldg. 12-41)	No	3/99
	Sandia National Laboratories		
15	Sandia Pulse Reactor Facility	No	3/99
	Savannah River Site		
16	Tritium Facilities		
	Tritium Inventory Storage Area (217H)	Yes	8/26/97
	Tritium Isotope Separation/Purification Facility, Lines I/II (232H)	Yes	8/26/97
	Tritium Reservoir Finishing/Packing Facility (234H)	Yes	8/26/97
	Tritium Reservoir Loading/Unloading Facility (233H)	Yes	8/26/97

Table 1 - Status of Authorization Agreements (AAs) for Priority Facilities and Follow-on Facilities (Continued)

FOLLOW-ON FACILITIES		AA in Place	Approval Date/Status
	Tritium Burst Test Facility (236H)	Yes	8/26/97
	Tritium Byproduct Purification Facility (236H)	Yes	8/26/97
	Tritium Extraction Facility, Line III (232H)	Yes	8/26/97
	Tritium Reservoir Reclaiming Facility (238H)	Yes	8/26/97
	Tritium Storage/Spare Parts/Shipping (237H)	Yes	8/26/97
ENVIRONMENTAL MANAGEMENT			
	Hanford Site		
17	Waste Encapsulation and Storage Facility	No	3/99
18	Plutonium Finishing Plant	No	FY99
	Idaho National Engineering and Environmental Laboratory		
19	Underwater Fuel Storage (CPP-603-A)	No	3/99
20	Irradiated Fuel Storage Facility (Dry SNM Storage) (CPP-603-B)	No	3/99
21	New Waste Calcining Facility (CPP-659)	No	3/99
22	Underwater Fuel Storage (CPP-666)	No	3/99
23	Radioactive Waste Management Complex	No	3/99
24	Unirradiated Fuel Storage Facility (CPP-651)	No	3/99
	Nevada Test Site		
25	Radioactive Waste Management sites in Area 5, Area 3 and the TRU Pad	Yes	1/14/99
	Oak Ridge National Laboratory		
26	K-25 (East Tennessee Technology Park) HEU Remediation Deactivation)		
27	Depleted Uranium Tailings	Yes	11/30/98
28	Material Storage (Molten Salt Reactor Experiment)	No	To be determined
	Rocky Flats Environmental Technology Site		
29	Building 707, Plutonium Manufacturing Bldg.	Yes	8/15/97
30	Building 776, Manufacturing Bldg.	No	Anticipated 2/99
31	Building 559, Analysis Laboratory	Yes	3/1/98
32	Building 774, Waste Processing	No	Anticipated 2/99
	Savannah River Site		
33	FA-Line	No	No plans to operate.
34	HA-Line	Yes	Covered in H-Canyon AA
35	235-F	Yes	12/15/98
36	Defense Waste Precessing Facility	Yes	10/6/97
37	ITP/ESP	Yes	7/16/98
38	High Level Waste Storage Tanks	Yes	3/9/98
39	Receiving Basin for Offsite Fuel	Yes	9/17/97
40	K-Reactor Basin	Yes	9/17/97
41	L-Reactor Basin	Yes	9/17/97

Table 1 - Status of Authorization Agreements (AAs) for Priority Facilities and Follow-on Facilities (Concluded)

	FOLLOW-ON FACILITIES	AA in Place	Approval Date/Status
	WIPP		
42	Waste Isolation Pilot Plant	No	Draft AA prepared in July 1998. AA will be completed after legal challenges to facility start-up have been resolved.
	NUCLEAR ENERGY		
	Idaho National Engineering and Environmental Laboratory		
43	Advanced Test Reactor	No	3/99

Feedback and Improvement

A key function for achieving the objectives of ISM is feedback on operating experience to improve the safety of operations. During 1998, the Board focused considerable attention on DOE's efforts to implement an acceptable feedback and improvement function. In March 1998, the Board requested from DOE information about its feedback and improvement programs. Among the specific topics on which the Board sought more information was the status of safety assessments performed by contractors, by DOE line managers, and staff members responsible for independent oversight from DOE's Office of Environment, Safety, and Health (EH-2). The Board was particularly interested in the disposition of a list of specific assessments by EH-2, including obstacles posed by line organizations to effecting response.

Interactions between the Board and DOE on this topic, which included a public information session on June 24, 1998, led to (1) an agreed-upon set of initiatives volunteered by DOE to strengthen its feedback and improvement program and (2) the Board's Recommendation 98-1, advising DOE to establish clearer lines of responsibility and authority for resolution of findings of its internal, independent safety organization (EH-2). The Board and its staff will continue to work closely with DOE in 1999 as it improves its feedback and improvement programs.

2.2.3 Site/Facility-Specific Integrated Safety Management Upgrades

During the past year, DOE has been working to fully implement ISM at the priority facilities designated in DOE's implementation plan for Recommendation 95-2. These facilities were selected because of the importance of their mission or because they involved especially hazardous work. As noted earlier, they also serve as pilot facilities for the implementation of ISM across the defense nuclear complex, with the expectation that lessons learned at each of

these pilot facilities will make it possible to accelerate implementation in the remaining follow-on facilities.

The *Department of Energy Strategic Plan* explicitly states that DOE will "implement ISM Systems at DOE's ten priority facilities and in all major management and operations contracts in FY 1999." Throughout 1998, the Board urged DOE to continue its efforts to define and operate in accordance with explicit control measures at the priority facilities, and also expand its efforts to include all high and moderate hazard defense nuclear facilities.

Although the key indicators previously discussed show DOE is making progress implementing ISM, there still is a need to provide insight into the quality and effectiveness of the ISM programs involved. The Board and its staff have focused considerable resources on determining whether the requirements established in each contract are reflected in safety management processes or implementing procedures used in specific work activities covered by the ISMS. The staff has also continued reviewing whether the facilities are implementing the ISMS adequately. In general, the Board has found that most facilities have at least basic elements of an acceptable ISMS in place. However, much work remains to be done to embed the functions and principles of ISM deeply into the planning and execution of work at all levels of the organization in order to achieve the goal of enhanced safety for the public, workers, and the environment.

In general, more progress has been made in upgrading safety management programs for individual priority facilities than in modifying site-wide requirements, manuals, and procedures at sites where priority facilities are located. On the other hand, the site-wide ISMSs are progressing ahead of the development of facility-specific ISM programs at the follow-on facilities. This finding was neither surprising nor disturbing; in fact, it reflects the priorities the Board has encouraged. The following Sections provide specific insight into the progress at each site.

Pantex Plant, Texas

Pantex has taken positive actions to develop an ISMS in response to DOE's requirement to do so. As described earlier in this report, these actions represent an upgraded program, not a drastic course change. The Board's staff observed the conduct of ISMS verification reviews completed by DOE in September 1998, and provided insights to the verification review team leaders as the review progressed. The DOE team concluded that in general, the ISMS established for each of the two major Pantex missions—high explosives operations and special nuclear material storage—was sufficiently well defined and executed, but could still be improved. The team also concluded that the processes for executing safety management functions for the Pantex mission of nuclear explosive operations required further definition in the ISMS Description and implementing documentation. For example, improvements were needed in the flowdown from safety requirements to plant directives and/or plant standards and manuals. In addition, the team identified inconsistent execution of the ISM functions for nuclear explosive operations.

The DOE verification team recommended that DOE and the contractor complete their ongoing effort to formally define the processes unique to nuclear explosive operations that are intended to provide an evolved system of safety management, and that the ISMS reviews be repeated for the nuclear explosive mission area after an appropriate implementation period. In its final report in October 1998, the team acknowledged that participation by the Board's staff contributed to the success of the review.

Y-12 Plant, Tennessee

In early 1998, the Board's staff worked closely with Y-12 personnel as they began to define needed elements of an upgraded safety management program. These efforts resulted in substantial progress toward implementation of ISM in support of restart of enriched uranium operations (EUO) at Y-12. Subsequently, the Board and its staff observed DOE's efforts in performing a combined Phase I/Phase II verification review[4] at the Y-12 Plant as a whole, ending in September 1998. The DOE verification review team found the ISMS Description to be a good road map to the Lockheed Martin Energy Systems (LMES) implementing manuals and procedures. However, the team noted that the ISMS was in the early stages of implementation. Therefore, the team concluded that additional focused management assessment would be required to ensure a mature and consistent implementation of ISMS at Y-12. The team recommended that the Y-12 Site Office Manager schedule a subsequent verification of implementation at selected facilities after the site-wide program at Y-12 had time to progress.

Los Alamos National Laboratory, New Mexico

The current contract between DOE and the University of California for managing LANL became effective October 1, 1997. DOE's Work Smart Standards process was used to identify the safety standards and requirements that the university and DOE agreed to as terms of the contract. Based upon these requirements, LANL has proceeded systematically and aggressively to develop implementing procedures and manuals of practices tailored to the needs of its laboratory activities. The Board through its oversight role has endeavored to assist the laboratory's commendable efforts. Toward this end, in December 1997, the Board noted the absence of project management requirements such as those in DOE Order 430.1A, *Life Cycle Asset Management*, and the inadequacy of the chosen requirements relating to natural phenomena hazards. DOE was so advised.

In response, DOE and LANL instituted a continuous improvement process, referred to in a June 1998 letter from the Board to DOE. As a result, DOE and LANL are identifying project management requirements that need to be added to the contract. Some contractual changes have

[4]The Phase I Verification review is a DOE review of the contractor's site-wide safety management infrastructure (i.e., functions, responsibilities, system description requirements, procedures, policies, and manuals of practice). The primary goal of the review is to provide a recommendation to the DOE contracting officer as to whether the contractor's safety management plan should be approved. The purpose of the Phase II review is to verify that the contractor's ISMS Description submitted to and approved by DOE is in place at the site, facility, or activity.

been made, including the addition of the section of DOE Order 420.1, *Facility Safety,* concerning natural phenomena hazard mitigation, and the addition of DOE Order 4330.4A, *Maintenance Management Program.*

Senior management of the Technical Area-55 (TA-55) Plutonium Facility has played a leadership role in the development of the institutional site-wide infrastructure. This was done largely by a pace-setting application of the tenets of ISM in structuring a facility-specific safety management program for activities to be conducted in TA-55. In 1998, TA-55 reviewed its safety management program to effect improvements that would make its directives more consistent with the new institutional requirements. Moreover, TA-55 has developed and is implementing comprehensive safety control measures set forth in an authorization agreement approved by DOE. The Board applauds this achievement.

Lawrence Livermore National Laboratory, California

LLNL has long operated under a safety management program based upon safety requirements specified by rules and contract terms. The laboratory reflected these requirements in its Health and Safety Manual and its Environmental Compliance Manual. However, in the early period of the Board's oversight of LLNL's weapons-related activities, the Board and its staff noted that there was no formal mandate that these manuals be used to plan and perform work, nor was there a clear correlation of work practices and procedures with the safety requirements specified by contract. Early attempts by LLNL to address what appeared to be significant shortcomings revealed the need to better select from DOE's generally applicable requirements specified by contract those requirements most suitable for laboratory-type activities and the research environment. The laboratory was challenged by the Board to do so. As LLNL undertook this challenge, the Board and DOE developed the concept of ISM (DOE Policy 450.4), with its core framework built around the five functions and seven principles enumerated earlier that can be universally applied to integrated work planning and safety planning for any potentially hazardous activity.

While continuing to operate its nuclear facilities under its current contractual safety requirements, LLNL is moving to transition its management programs to the ISM framework, tailoring its program to best fit a laboratory environment. During the past year, this effort focused on:

- Resumption of nuclear operations in the Superblock facilities after systematic reassessment of all hazardous activities under way there, and affirmation of the adequacy of safety measures.

- The systematic review of safety standards and requirements and selection of those deemed most appropriate for performing the laboratory's weapons-related missions.

Nevada Test Site, Nevada

DOE faces a unique challenge in tailoring a safety management program to the functions and principles of ISM for the Device Assembly Facility (DAF) and subcritical experiments at the Nevada Test Site (NTS). These operations are conducted, and even managed, by national laboratory personnel who are not under contract to DOE-Nevada. This makes it difficult for DOE-Nevada to enter into contractually binding agreements with the laboratories regarding safety expectations. The operations at DAF and for subcritical experiments are conducted under a memorandum of understanding. One aspect that mitigates the current difficulties at NTS is that the hazardous activities conducted by the laboratories at NTS are discrete and relatively infrequent such that they can be controlled through an activity-specific ISM approach. The Board and its staff have reviewed this approach during assessments of DAF and subcritical experiment operations. These operations are conducted in accordance with DOE-Nevada Orders that reflect the functions and principles of ISM. The NTS program for safety management of experiments to be conducted at the site will be assessed by an independent DOE team in early 1999. The Board's staff will interact with the participants.

Sandia National Laboratories, New Mexico

In 1998, the Board's staff continued to assess safety management improvements at SNL and at the Sandia Pulsed Reactor Facility (SPRF). In October and November, the Board's staff observed DOE's SNL site-wide combined Phase I and Phase II ISMS verification review. DOE found that the ISMS Description for the entire institution had not been fully developed. It is anticipated that most of the corrective actions will be completed during 1999. The Board's staff will continue to monitor SNL's progress in this area.

On the other hand, the DOE review team found that, in general, SPRF has a well-developed Safety Analysis Report and a defined set of safety controls. A rigorous experiment proposal and review process ensures that the safety basis of the facility is maintained for all reactor operations. The Board's staff agreed with these findings. During a visit by the Board's staff, SPRF managers acknowledged that some difficulties exist with integrated control of the work of all personnel at the site. The staff also noted substantial improvement in the DOE-Kirtland Area Office Facility Representative program previously assessed during a staff review in 1996.

Savannah River Site, South Carolina

SRS has implemented one of the more mature ISM programs in the DOE complex. The Board worked closely with SRS during the development of the integrated safety management system for the site and during its first DOE verification review, which served as the pilot for verification reviews elsewhere across the DOE complex. SRS updated its ISMS Description in 1998 according to the provisions of the DEAR clause, and DOE approved it on June 3, 1998. The priority Environmental Management facilities at SRS and most of the follow-on facilities now have authorization agreements in place. SRS deserves considerable credit for its success in this endeavor.

In 1998, the Board's staff evaluated whether it was appropriate to conduct Phase II facility-specific ISM program verification reviews using SRS's existing Facility Evaluation Board (FEB). The staff observed the pilot facility-specific verification review at the Defense Waste Processing Facility. The Board's staff agreed with DOE's assessment that the FEB is a viable mechanism for performing facility-specific verification reviews, provided that the FEB process is modified to specifically include the ISMS fundamentals, additional team training is provided on ISMS verification techniques, and continued DOE oversight is applied. In 1999, the Board intends to continue to observe and critique SRS's management self-assessment activities and the actions taken to resolve issues identified by these reviews.

Rocky Flats Environmental Technology Site, Colorado

At RFETS, ISM is a site-wide process focused on work activities. Many of those activities are unique, one-time efforts; therefore, focusing on individual work activities is appropriate. The site historically has had difficulties with identifying hazards and safety controls, and incorporating those controls into work procedures. These functions showed marked improvement this past year. The Board's staff has continued to encourage RFETS to define and implement more rigorous safety controls for the activities performed.

During 1998, the Board's staff observed DOE verification reviews for activities in Buildings 371 and 771 at RFETS. The team concluded that activities at both facilities can be conducted safely and noted that many of the procedures required to safely perform the mission of site closure were in the process of being revised and formalized.

As a result of the DOE verification review, revised work control procedures were implemented to bring most aspects of safety management under a single work control document. The Board's staff has reviewed this document and believes it can help improve the identification and implementation of safety controls needed for work activities, and should partially address weaknesses in ISM mechanisms noted by the DOE verification team. Additionally, RFETS had developed an acceptable ISMS Description for the site. Following the verification review, DOE approved this ISMS Description, signifying its agreement with the contractor's plan for conducting work safely at RFETS. RFETS has made substantial progress in implementing ISM at the site, and the Board commends RFETS for this effort.

In 1999, the Board's staff will continue to assess preparations for and conduct of work activities, and to encourage the continued rigorous application of ISM as described in the site's ISM Description.

Hanford Site, Washington

Several processes are in place at the Hanford Site for identifying and controlling work and hazards as part of ISM implementation. These processes provide a minimum level of safety necessary to accomplish work at the site; however, many are not institutionalized to ensure their consistent use. The Board's staff observed ISM verification reviews for the Spent Nuclear Fuel Project (SNFP), the Pacific Northwest National Laboratory, and the Tank Waste Remediation

System (TWRS). In addition, the Board's Hanford Site Representative conducted detailed reviews of ISM implementation in work control systems within SNFP and TWRS. Through face-to-face feedback and formal letters, the Board prompted DOE and its contractors to make improvements in ISM implementation, particularly in work control and job hazard analyses. Particular improvement is required at the activity level, where job hazard analyses are performed inconsistently at the various facilities.

Waste Isolation Pilot Plant, New Mexico

The Board and its staff have been following closely the efforts to open WIPP. In 1998, the staff observed the ISMS verification review for WIPP. Based on the results of these reviews, it appears that ISM implementation at WIPP is adequate. An ISMS Description has been submitted by the contractor for DOE approval. The DOE Carlsbad Area Office is expected to issue an authorization agreement in 1999.

Idaho National Engineering and Environmental Laboratory (INEEL), Idaho

INEEL is in the early stages of implementing ISM at the Idaho Nuclear Technology and Engineering Center (formerly the Idaho Chemical Processing Plant), at the Test Reactor Area, and at the Radioactive Waste Management Complex. On April 22, 1998, the Board forwarded to DOE a staff report on the INEEL work planning process and ISM implementation. The existing work control and planning process, which contains some elements of ISM, appeared to be weak. DOE's Type A investigation into a worker death at INEEL confirmed this finding. In an October 1, 1998 memorandum to all DOE employees, the Secretary of Energy stated that the "accident could have been prevented had we effectively implemented the principles of Integrated Safety Management." A Board member visited INEEL to review its plans for accelerating implementation of ISM and to offer guidance and advice with respect to its upgrade efforts. In 1999, the Board will observe the ISMS verification review and work closely with DOE to see ISM implemented at all INEEL facilities under the Board's purview.

Oak Ridge National Laboratory, Tennessee

In 1998, the Board and its staff reviewed the implementation of ISM at the Oak Ridge National Laboratory (ORNL) to confirm that lessons learned from Y-12 would be shared with follow-on facilities, including the Molten Salt Reactor Experiment and Building 3019; and depleted uranium tailings not only at Oak Ridge, but also at Paducah, and Portsmouth. At the Board's public meeting in September 1998, the Board's staff reported on the results of its review of the implementation of ISM at these facilities. Overall, progress has been slow. ISM has not been fully implemented at the institutional level or in the facilities. ORNL is developing ISMS Descriptions, but firm plans for verification reviews are not complete. Several facilities have authorization agreements based on existing safety management programs; however, they will require updating following ISM implementation.

2.3 RAISING DOE TECHNICAL COMPETENCE COMPLEX-WIDE

2.3.1 Implementation Status

Accomplishment of DOE's missions in a manner that protects the health and safety of workers and the public depends heavily on the technical qualifications of DOE personnel who are assigned safety-related responsibilities. Congress, the Board, and other external agencies have emphasized a need for raising the technical competence of both federal and contractor personnel in the defense nuclear complex. In June 1993, the Board focused DOE's attention on this issue through issuance of Recommendation 93-3. An implementation plan was provided by DOE in November 1993. DOE had made measurable progress on several aspects of its 93-3 implementation plan, including (1) development of a standardized technical qualification program for approximately 1,800 federal employees, (2) identification of 251 senior technical safety management positions required for continued safe operation of defense nuclear facilities, and (3) acquisition of excepted service hiring authority for an additional 200 positions beyond the 200 positions allowed under the DOE Organization Act.

By early 1997, however, many of the specific commitments in the implementation plan for Recommendation 93-3 had not been met or had not achieved the desired effect. Missions, resources, and personnel constraints affecting DOE had changed considerably since 1993. As a result, the Board requested in a letter of April 1997 that DOE revise its 93-3 implementation plan to reflect revised DOE initiatives and provide more realistic milestones. DOE commenced working with the Board toward this objective in mid-1997. However, progress stalled in the summer of 1997 when a reduction in personnel was seriously threatened in response to reduced FY 1998 funding levels proposed by Congress. DOE informed the Board that a number of technically qualified DOE employees hired in response to Recommendation 93-3 might be terminated to comply with regulations governing reductions in force. The final FY 1998 budget levels for DOE, however, allowed major reductions in force to be avoided.

In an October 1997 letter to DOE, the Board stressed that DOE needed to prepare in advance to avert the loss of technically competent safety personnel in the face of likely future budget reductions. The Board stressed that while DOE must comply with government regulations as they affect downsizing, it is also essential to preserve the technical expertise needed to perform those functions that protect public and worker health and safety. Any actions to preserve technical expertise should include staff in key health and safety positions at defense nuclear facilities, competent personnel in senior technical safety management positions (identified during the implementation of Recommendation 95-2), and critical technical expertise developed under the DOE Technical Qualification Program in response to Recommendation 93-3. Progress in this area is discussed further below.

In the ensuing months, the Board and its staff worked closely with DOE managers in developing a revised implementation plan for Recommendation 93-3. In May 1998, the Secretary of Energy submitted a revised plan, which was subsequently accepted by the Board in June 1998. This plan focused on line management ownership for development and preservation of DOE's essential technical capabilities.

Using its revised implementation plan, DOE had formed a panel of senior line managers to ensure successful implementation of efforts to recruit, develop, deploy, and retain technical capability at defense nuclear facilities. Regarding concerns about the effects of downsizing on technical capabilities, most of the DOE organizations with responsibility for defense nuclear facilities had completed an interim workforce analysis. Based on this interim analysis, the panel identified approximately 740 critical technical positions, including 175 Senior Technical Safety Managers and 201 Facility Representatives, and took administrative action on nearly all of these positions to reduce the potential impact of further downsizing. Additionally, workshops on administrative flexibilities in the recruiting, hiring, and retention of high-quality technical staff were conducted in the field and at Headquarters by panel members in the fall of 1998. In December 1998, a new DOE Policy on Federal Technical Capability and a DOE Handbook entitled *Recruiting, Hiring and Retaining High Quality Technical Staff: A Manager's Guide to Administrative Flexibilities* were issued through the DOE Directives System. Throughout this period, the Board and its staff closely followed the functions and deliberations of the line management panel and provided comments on the development of the related DOE policies, procedures, and processes.

The Board is aware of the difficulty of the task it has asked DOE to accomplish in the face of potential reductions in total manning levels. As a result of such downsizing activities, however, the need to preserve and improve DOE's pool of unique technical expertise becomes all the more imperative. The senior management of DOE recognizes the importance of recruiting and retaining highly qualified staff, and the Board sees in DOE's 1998 efforts added impetus toward such ends. The Board intends to follow closely the leadership and actions of DOE's senior management in developing and preserving the key DOE technical expertise required to ensure safety.

2.3.2 Upgrading of Criticality Safety Expertise

In its implementation plan for the Board's Recommendation 97-2, DOE committed to developing criticality safety training requirements and qualification standards for technical personnel at defense nuclear facilities. DOE made meaningful progress in 1998 toward defining the technical competencies for a comprehensive nuclear criticality safety qualification standard. Throughout the past year, the Board's staff has been providing feedback on the development of this functional-area qualification standard. DOE is on a satisfactory path forward.

DOE also made adequate progress this year in conducting the basic hands-on criticality safety training at the Los Alamos Critical Experiments Facility. However, an expanded training course is late in both its development and implementation, in part because of a suspension of operations at the facility. The Board's staff will continue its oversight and constructive critique of this program. The funding of the program rests on shaky grounds, because the benefits are DOE-wide, and support of the activity is not a mission objective of any single Program Secretarial Officer.

2.3.3 Facility Representative Program

A significant contribution to the safety of DOE defense nuclear facilities is made by Facility Representatives (FRs), who are required to have detailed knowledge of their assigned facilities and the daily operations conducted therein. The success of the FR program is largely the result of major improvements recommended by the Board in its Recommendation 92-2, *DOE's Facility Representative Program at Defense Nuclear Facilities.* The Board considers Recommendation 92-2 to be one of the most successfully implemented Board recommendations.

Since closure of Recommendation 92-2 in 1996, the Board's staff has continued to monitor the operation of FR programs across the complex. The Board's actions in 1998 led to improved FR programs at the Fernald Environmental Management Project and at WIPP.

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

CONTENTS OF THIS SECTION

The Board has a unique role in overseeing the safety of operations in the DOE nuclear weapons complex. These vital national security activities include assembling, disassembling, and verifying nuclear components; conducting research and experiments in connection with stockpile stewardship; and providing replacement components and materials. A major thrust of the Board's oversight has been to review and assess safety management programs for these activities to ensure that they are conducted in a manner that adequately protects public health and safety.

The defense nuclear complex has changed considerably since the charter Board Members were appointed in 1989. As a matter of national policy, production of new weapon systems has stopped, and dismantlement of a large fraction of the nuclear weapons stockpile is under way. With the Administration's commitment to the Comprehensive Test Ban Treaty, all underground testing of nuclear weapons has ended as well.

Existing nuclear weapon systems are likely to remain in the nation's stockpile longer than in the past, potentially much longer than their original design lifetime. It will be necessary to ensure that nuclear weapons within DOE custody remain safe. In the absence of underground nuclear testing, alternative means to confirm the safety and reliability of weapons throughout their life cycle are being developed. DOE's strategy for dealing with this challenging new

mission is embodied in its Stockpile Stewardship and Management Plan.[5] This plan provides for continuation of the ongoing defense missions at eight DOE sites, and includes appropriate adjustments consistent with post-Cold War national security policies.

The facilities for assembly and disassembly of nuclear weapons were constructed in the period between the late 1940s and 1960s, and they are now quite old. DOE is refurbishing facilities intended for continued use and is changing the functions of other facilities. DOE's plans also call for construction of some facilities with enhanced experimental capabilities at the nuclear weapons laboratories. Manufacturing capabilities at some existing plants are to be maintained, but their capacity will be reduced. The last tritium production reactor was closed a decade ago at SRS, and DOE has initiated a project to secure a new source of tritium that will likely require new defense nuclear facilities at SRS. In addition, a limited capability for manufacturing components of plutonium pits is planned for a weapons laboratory.

DOE must also institute Life Extension Programs for specific weapon systems. Life Extension Programs will likely result in increased activity at the Pantex Plant and the Y-12 Plant. The Board accordingly posted a full-time Site Representative at the Y-12 Plant in June 1998. Board Site Representatives have been located at the Pantex Plant since July 1992.

3.1 STOCKPILE MANAGEMENT OF NUCLEAR WEAPONS

Stockpile management is a term used by DOE to describe the industrial aspects of maintaining the nuclear weapons complex. A program of research and development to develop improved ways of ensuring safety and reliability in the absence of underground testing of nuclear weapons has also been started; this is called stockpile stewardship. Activities at the major sites with defense nuclear facilities that are engaged in stockpile management activities are discussed below.

3.1.1 Pantex Plant

The Pantex Plant, located outside Amarillo, Texas, plays a central role in the stockpile management program. Operations at Pantex include the assembly, disassembly, and surveillance of nuclear weapons. Pantex also serves as an interim storage site for strategic reserve plutonium removed from retired weapons.

Recommendation 98-2*, Safety Management the Pantex Plant*

In response to the Board's Recommendation 93-1, DOE had developed and began implementing an upgraded work planning/safety planning process, called Seamless Safety for the 21st Century (SS-21), to guide the development of safety bases, procedures, and tooling for

[5]*The Stockpile Stewardship and Maintenance Program*, U.S. Department of Energy, Office of Defense Programs, May 1995.

nuclear explosive operations at the Pantex Plant. The SS-21 process has yielded excellent results where it has been used, by integrating safety planning and work planning for dismantlement operations. However, the SS-21 process has been executed for only a few programs because of its reported complexity and labor-intensive requirements.

The SS-21 process was meant to ensure that surveillance and dismantlement of nuclear weapons take place in an orderly fashion that profits from input by all appropriate organizations. This process is relied on for assurance of safety at all stages. In 1998, the Board observed that the process was so cumbersome that it could not be followed simultaneously for all the types of weapons to be dismantled or surveilled at once, and the assurance of safety had begun to suffer. Recommendation 98-2 was issued in response to this observation. It called for redesign of the management process to simplify it and to reinstitue line responsibility for actions, which had suffered in the existing process. The recommendation was not prescriptive; it proposed that DOE and the Pantex contractor develop the new system.

The Board believes that line management must control and be responsible for the safety of hazardous operations. However, the roles, responsibilities, and accountability for nuclear explosive operations at Pantex have been weakened. Nuclear Explosive Safety Study Groups were found to be regularly imposing specific remedies for safety deficiencies they identified, rather than charging line management to develop and resubmit appropriate corrective actions for the work its workforce was ultimately to execute. This situation compromised the role of the Nuclear Explosive Safety Study Group (NESSG) as an additional review body, independent from line management. Furthermore, an effective process for change control by line management, related directly to the approved safety basis, did not exist.

Specific Weapon Programs

W69 Dismantlement Program. The W69 is the retired warhead from a short-range attack missile. The W69 dismantlement program was the first nuclear explosive operation to undergo the full SS-21 process. The Board and its staff conducted an extensive review of the proposed W69 dismantlement operation in 1997 and found it acceptable for start-up, while identifying a number of areas meriting further improvement. DOE's successful resolution of the W69-specific safety issues, including those identified by the Board, resulted in approval by DOE of the first authorization agreement for a nuclear explosive operation. This integrated work planning/safety planning program resulted in installation of a series of added engineered safety features for lightning protection and fire protection. The W69 dismantlement program proceeded, with enhanced safety, in a highly efficient and productive manner. The last W69 was successfully dismantled ahead of schedule in October 1998. The W69 dismantlement operation has been widely characterized by both DOE and the Board as the best nuclear weapon dismantlement process designed and implemented to date.

W56 Dismantlement Program. The W56 is a retired Minuteman II warhead. The full SS-21 process was also employed in the development of the W56 dismantlement operation. The Board and its staff closely reviewed preparations for this major dismantlement program, including the identification and on-the-floor implementation of safety controls derived from the

SS-21 process. A review of the Hazard Analysis Report (HAR) for the W56 conducted by the Board's staff revealed relatively few issues and determined that the analysis was methodical and generally comprehensive. The HAR initially identified numerous specific controls to ensure the safety of the operation. When the results of the HAR were fed back to the process designers, they were able to improve the procedures and tooling. For example, lifts (which provide the opportunity for accidental drops that threaten the high explosive in the weapon) have been eliminated, including crane lifts of the warhead in any configuration. In addition, the tooling used in dismantlement has been designed to better protect the weapon and its components by removing or reducing hazards wherever possible.

In 1998, the Board's staff questioned how the W56 dismantlement program intended to identify, implement, and preserve the important controls that are relied upon to prevent inadvertent detonation of the high explosive components in the weapon. In the original drafts of the Activity-Based Control Document, there was little to differentiate these vital controls from the many other safety controls identified for the W56 dismantlement operation. In response to this issue, DOE revised its approach and committed to clearly identifying the controls most important in this respect, defining the bases for these controls, mandating appropriate requirements to maintain the functionality of these controls, and dictating actions to be taken should a control be compromised. This effort represents a real improvement in DOE's management of nuclear explosive operational safety, since it contributes to the preservation of those controls most relied upon to prevent a high-consequence accident.

The Board's staff observed the Nuclear Explosive Safety Study (NESS) for the W56, as well as a Readiness Assessment for the W56 that was completed in December 1998. The common purpose of these two different forms of readiness reviews by panels of experts is to assure DOE that the contractor is ready to begin work safely. Briefings to the NESSG were an improvement over those in earlier studies, as they were appropriately interspersed with physical demonstrations of the dismantlement procedures by the Production Technicians (i.e., the hands-on operators). The importance of adding such realistic demonstrations has been noted repeatedly by the Board and its staff, since it allows the reviewers to make better associations between the assessed hazards and actual operations. At year's end, Pantex was working to address several important issues raised during the W56 NESS and Readiness Assessment. The Board and its staff will continue their oversight of these safety planning activities. Start-up of the W56 dismantlement program is expected in early 1999.

W79 Dismantlement Program. The W79 is an artillery-fired atomic projectile. The dismantlement operations for the W79 began in April 1998 after a year of Readiness Reviews and demonstrations of the process, tooling, and equipment. Design and development of the W79 dismantlement process started before the concepts of SS-21 and current expectations for a weapon system had been completely formulated in a HAR. Therefore, the W79 process was not designed to the full SS-21 requirements.

The Board and its staff positively influenced the identification, review, and resolution of several potential safety issues related to W79 dismantlement. These issues were related to the flammability of the dissolution solvent, safety controls needed for the hot water heating system,

potential ignition sources (particularly electrostatic discharge), combustible loading and fire protection, lightning protection, the review process, documentation of controls, and change control. In response, a DOE-led project team solicited an independent peer review of the safety of the systems for dissolution of the high explosive, improved the safety controls for the hot water heating system, and revised dismantlement procedures to address the remaining issues.

The Board and its staff also reviewed and provided feedback on the NESS, Safety Evaluation Reviews, and Readiness Reviews for the W79. When the NESSG and review teams appeared to lack technical expertise in specific areas and to accept presentations without adequate questioning, the Board's staff posed additional questions. Overall, however, the work planning/safety planning process for the W79 was an improvement over previous reviews. Issues identified by the Board were satisfactorily addressed.

W62 Disassembly and Inspection (D&I) Program. The W62 is an enduring stockpile warhead used in the Minuteman III missile system. The NESS authorization for dismantlement and inspection of the W62 expired in 1997. DOE decided to revalidate the expired W62 NESS in June 1998 (i.e., use of the same tools, controls, and procedures previously used), rather than pursue a tailored SS-21 approach to develop an improved set, which would then be the subject of a new, full-scope NESS review. The revalidation process is allowed under the DOE nuclear explosive safety Orders, but sometimes it is not advisable from a safety perspective. The Board noted that, at this stage, the W62 was one of those cases. This observation was a principal reason for issuance of Recommendation 98-2. As of the end of 1998, DOE had agreed that an additional hazard analysis and other actions will be needed to support safe D&I operations for the W62. These actions include reviews of the W62 authorization basis, a walkdown of the W62 operations, and development of a HAR and an Activity-Based Controls Document.

W87 Life Extension Program and D&I Operations. The W87 is an enduring stockpile warhead used on the Peacekeeper missile system. Throughout 1998, DOE has been preparing to begin a life extension program for the W87. A HAR for Life Extension Program (LEP) operations that will take place at the Pantex Plant has been completed, and safety controls have been identified through a HAR and an Activity-Based Control Document. The W87 LEP First Production Unit is anticipated in early 1999.

In a November 1998 letter to DOE, the Board identified several issues associated with planned W87 LEP operations. One of these was the need to designate clearly the most important controls that are relied on for preventing inadvertent detonation of the high explosives. There was little in the initial draft documents to differentiate these controls from the many other safety controls identified for the W87 LEP. Additionally, the Board's letter noted that the authorization basis for the ongoing W87 D&I operations was not based on a documented hazard analysis.

As a result of interactions with the Board and its staff, DOE has decided to include the W87 D&I operations within its ongoing hazard analysis and identification of controls for the W87 LEP operations. This will provide the W87 D&I program with a documented safety basis. DOE efforts to evaluate and improve the W87 hazard analysis and the set of controls are being

strengthened and can be improved even further when the final HAR and the Activity-Based Controls Document are issued.

Additional Pantex Safety Management Issues and Advances

Throughout the year, the Board and its staff identified or followed up on a number of additional matters that pertain more generally to the safety of weapons system operations at the Pantex Plant. The discussion that follows highlights actions taken by the Board to address these matters.

Facility Selection. Bays at Pantex available for dismantlement operations involving conventional explosives in proximity to nuclear materials are of different vintages. The older ones, in general, were built to less stringent seismic design requirements and less quality control on bonding of the reinforcing steel. The latter affects the capability of the structure to divert lightning strikes to ground, should they be experienced. Because explosives safety is highly dependent upon exclusion of energy sources, nuclear explosive operations involving older, less safe systems should be carried out in the most robust and safe facilities. The Board observed that the relevant safety features of the bays did not appear to have been considered in the selection of the facility for performing dismantlement.

In a letter dated August 8, 1997, the Board questioned the selection of the older bays in Building 12-64 for the W69 dismantlement campaign. The Board specifically observed that this building has weaknesses compared with other facilities at the Pantex Plant that might have been chosen for such dismantlement activities. DOE's response, in February 1998, was that the process for facility assignment used prior to the introduction of current procedures did not evaluate the relative hazards of operations against the preventive and mitigative capabilities of facilities. Accordingly, in early 1998, DOE and Mason and Hanger Corporation (MHC) developed a formal procedure for facility selection that more appropriately addressed safety considerations. DOE has continued to make improvements in facility selection as further lessons have been learned. DOE has subsequently completed the nuclear explosive operations in Building 12-64 (except for weapon staging) and is now considering the possible modification of these bays for less hazardous operations, such as pit repackaging.

Upgrades of the Site-wide Basis for Interim Operations (BIO). Initiatives of DOE and MHC to upgrade the Pantex BIO, which began in 1997 primarily as a result of the Board's urging during the last several years, continued in 1998. The Pantex BIO contains analyses of common operations at the Pantex Plant, identifies hazards from a facility perspective or hazards that are common to more than a single weapon system, and demonstrates that work can be done safely. The safety basis will remain interim until systematic safety analyses have been completed for all activities and an ISMS has been fully developed. With technical input from the Board and its staff, DOE switched to a plan for upgrading the site-wide BIO in a modular fashion by subject areas (lightning protection, on-site transportation, fire protection, etc.), rather than defer implementation of new controls and safety improvements until all analytical work has been completed and approved. Updating the BIO in a modular fashion ensures that additional safety

improvements will be made in the most expeditious manner. Examples of the Board's activities related to the BIO upgrades are as follows:

- **Lightning Protection**—In 1997, the Board requested that DOE prepare a technical report addressing a comprehensive analysis of the hazards posed by lightning to nuclear explosive operations at the Pantex Plant and the controls necessary to prevent and mitigate those hazards. In response, DOE established a project team to address the lightning protection issue. DOE and MHC have already begun to identify and install additional protective measures, including electrically bonding metallic penetrations, surge protectors for communications circuits, transportation carts that are effective at mitigating lightning hazards during movement of nuclear explosives, and isolation requirements to prevent electrical energy from being inadvertently applied to explosive circuits.

- **On-site Movements of Nuclear Explosives**—The Board and its staff have emphasized the safety of weapons movements at the Pantex Plant. With the aid of the Board and staff discussions, DOE and MHC have come to recognize that this activity is one of the least well analyzed nuclear explosive operations at Pantex. Work on the on-site movement module of the BIO is now one of the highest priorities at the plant.

Pit Storage at Pantex

Integrated Pit Storage Program Plan. The Board continues to evaluate the safety implications of projected long-term storage of plutonium pits at the Pantex Plant. From an ISM standpoint, the proposed pit storage system at Pantex can be viewed as a combination of interrelated barriers to radioactive release (i.e., the pit cladding, the container, and the facility) and associated controls needed to maintain these barriers. However, for most pits the pit cladding is the only reliable confinement since the containers are unsealed and subject to corrosion, and since current storage facilities lack confinement features. On December 31, 1997, the Board formally transmitted to DOE its report DNFSB/TECH-18, *Review of the Safety of Storing Plutonium Pits at the Pantex Plant*, urging that activities recently initiated to improve pit storage be completed in a thorough and well-considered manner. The Board emphasized that accomplishing this would necessitate attention by high-level DOE management, logical development of an integrated program plan, and sensible allocation of resources.

During 1998, DOE proceeded with activities aimed at improving pit storage conditions, including the development of a pit storage specification and the selection of MHC's AL-R8 Sealed Insert as the preferred storage container, replacing the existing container (the AT-400A). Qualification of the AL-R8 Sealed Insert is ongoing, with repackaging scheduled to begin in March 1999 and end in 2004.

Development of the Integrated Pit Storage Program Plan (IPSPP) has proceeded in parallel with the AL-R8 Sealed Insert development. The first draft of the IPSPP was issued in November 1998. The Board found that this draft plan incompletely defines activities needed to repackage pits into the AL-R8 Sealed Insert, and indefinitely defers discussions related to the

systematic integration of pit storage activities to a future revision. As of year's end, these issues had not been resolved.

Special Nuclear Material Component Storage Facility (Building 12-116). Building 12-116 is a new Pantex facility for consolidated storage and nondestructive testing of strategic reserve components (pits, reservoirs, and secondaries). Construction was largely completed in 1993, but operations did not start until 1998. The protracted period before start-up resulted from a shift in the facility's primary mission—from staging pits for weapon assembly to providing longer-term storage of strategic reserve components. This shift led to roughly a five-fold increase in the intended pit inventory. To accommodate this increase, DOE plans to load the building in phases to increase the number of pit vaults from two to four and nearly double the effective stacking height of container pallets.

During 1998, the Board reviewed the progress toward start-up. In August 1998, the Board issued a letter to DOE forwarding its staff's observations on the DOE Operational Readiness Review (ORR) of Building 12-116. The Board noted the need for improvements in planning, operations, and authorization basis controls; better maintenance of safety systems; identification of safety controls for components with safety-related temperature restrictions; improved planning for future upgrades; and designation of pit containers as safety systems. The Board observed that many similar issues had been identified in its letter of December 1997 transmitting DNFSB/TECH-18. The Board and its staff intend to follow closely and constructively critique the efforts of DOE and MHC to resolve these issues, and their planning and progress in implementing the required work.

3.1.2 Y-12 Plant

The Y-12 Plant, near Oak Ridge, Tennessee is designated as the site for conduct of the secondary component and weapons case fabrication mission. The Y-12 mission also includes fabrication, surveillance, inspection, and testing of weapons components.

Enriched Uranium Operations Restart

Enriched Uranium Operations at the Y-12 Plant involve a system of metallurgical operations (casting, rolling, forming, and machining), waste processing operations (thermal, solution, and wet chemistry processes), and metal production operations. EUO, like other nuclear activities at the Y-12 Plant, was suspended by the contractor in 1994 following the identification of numerous criticality safety problems. Since that time, Y-12 has been working to resolve the fundamental safety issues identified in the Board's Recommendation 94-4, *Deficiencies in Criticality Safety at the Oak Ridge Y-12 Plant*. At the beginning of 1998, all nuclear facilities except those unique to EUO had resumed normal operations. The restart of the metallurgical operations, designated Phase A1, and waste processing operations, designated Phase A2, was planned in 1998. Y-12 successfully started Phase A1 in June 1998. Restart of Phase B metal production operations is planned for 1999. Resumption of these operations, conducted in Buildings 9212 and 9215, is needed to support high-priority national security missions.

Phase A1. During the first part of 1998, the Board and its staff evaluated Phase A1 preparations for restart. In a January 1998 letter, the Board identified several design and equipment deficiencies related to electrical and fire protection systems, such as emergency lighting, instrumentation and control systems, and dry vacuum systems. Additionally, the Board identified a lack of appropriate identification and implementation of safety controls for the ventilation systems and the system for detecting water in the casting furnace. The following are examples of Board/DOE interactions that led to safety upgrades.

- **Fire Protection**—The Board and its staff found that the method by which action items from Fire Hazards Analyses (and other external reviews and audits) were tracked and dispositioned was inadequate and ineffective. Resolution of the findings significantly improved fire protection safety for the facilities.

- **Ventilation Filtration Systems**—The accident assessments in the BIOs for Buildings 9212 and 9215 rely heavily on filtration in ventilation systems operating at peak efficiency to mitigate postulated exposures from credible accidents. A review by the Board's staff found that appropriate controls to ensure preservation of the capability of the ventilation systems' filtration had not been identified. In response, DOE and LMES identified new surveillances of the ventilation system to test appropriate operating parameters, and included them as key safety basis controls.

- **Emergency Lighting**—The adequacy of emergency lights and the status of compliance with the Life Safety Code had not been verified, even though compliance with this standard is assumed in several accident analyses. In response, DOE and LMES installed new emergency lights in Buildings 9212 and 9215.

- **Dry Vacuum Systems**—A review by the Board's staff of the systems used for removing particulates in various areas revealed that safety interlocks could be bypassed and that a single failure of one relay could prevent any of the three safety interlocks from shutting down the system. In response, DOE and LMES redesigned and modified operations of the dry vacuum systems to resolve these issues.

Efforts to address the fundamental safety control issues discussed above coincided with the desire of both DOE and LMES to complete required ORRs on a predefined schedule. The ORR conducted by LMES for Phase A1 was started prematurely in March 1998, with numerous safety issues not resolved, safety controls not fully implemented, and equipment not fully ready. These deficiencies were recognized by LMES' ORR team, which suspended the ORR. After 6 weeks of additional preparations, LMES' ORR and later DOE's ORR were successfully conducted.

ORRs by both the LMES and DOE resulted in findings indicating continued deficiencies in the identification and the implementation of safety controls and preparation of procedures. The nature of the findings, along with clear problems with the LMES process for addressing findings/issues from various assessments, was such that both ORR teams recommended independent verification of the development and completion of corrective action plans for the

ORR's prestart findings. After this period of erratic preparation for restart, Phase A1 operations were resumed in June 1998 and continued to support DOE operations through the remainder of 1998.

Phase A2. In a June 1998 letter to DOE, the Board identified issues such as the need for systematic assurance that all safety basis controls be identified and implemented, and that issues be properly closed prior to conducting an ORR. The Board believed that resolving these issues would aid restart preparations and improve the safety of the EUO operations in Phases A2 and B. In response, DOE and LMES committed to several improvements for the Phase A2 and Phase B restart, including more deliberate, disciplined preparations for restart.

The Board and its staff reviewed the preparations for restart of Phase A2, including a detailed review of controls. The Board issued a letter to DOE in October 1998 forwarding staff observations. In particular, the staff identified numerous differences between National Fire Protection Association (NFPA) codes and the way in which a furnace was installed, tested, operated, and maintained. In response, LMES performed a rigorous review of adherence to the NFPA codes and identified even more noncompliances. By the end of 1998, LMES had addressed the identified noncompliances through several equipment and procedural modifications.

The Board's staff observed the ORRs conducted by LMES and DOE for Phase A2 operations in October and November 1998, respectively. Overall, the conduct of operations and readiness demonstrated for these ORRs were much improved as compared with the ORRs for Phase A1. Phase A2 operations were resumed in December 1998.

Phase B Restart Preparations. Metal production in Phase B includes chemical recovery/extraction, conversion, and reduction operations to produce enriched uranium metal from a number of material forms. In mid-1998, LMES proposed preliminary plans indicating that an ORR might not be performed to confirm the readiness of the Phase B activities. This would have been counter to the requirements of DOE Order 425.1, *Startup and Restart of Nuclear Facilities*, calling for ORRs for restart of such activities after an extended shutdown. The Board noted this issue in a letter to DOE in June 1998. In response, DOE informed the Board in July 1998 that an ORR will be performed to confirm the readiness of these operations.

Y-12 is in the process of constructing a new anhydrous hydrogen fluoride (HF) delivery system to support metal production. HF is an extremely corrosive gas, and a sound pressure boundary in the HF delivery system is critical to worker and public safety. After a DOE Facility Representative from the Y-12 Site Office discovered defects in completed welds in the HF system pressure boundary, the Board's staff called attention to this breakdown in weld quality assurance on the HF system. Additionally, the staff found that the process hazard analysis performed for the HF system was ambiguous and was not used in the process to design engineered features; safety controls were not systematically developed with an appropriate level of detail.

The Board presented these observations on the HF system in a letter to DOE in August 1998. Subsequently, DOE and LMES decided to perform field radiographic inspections of completed HF system welds to ensure proper weld quality. DOE and LMES also decided to perform a new hazard analysis of the HF system to ensure that proper safety controls are identified. In December 1998, DOE initiated field radiography of HF system welds. Of the first four welds radiographed, one was defective and required replacement. This weld had passed the previously required inspections. Short of this radiography, a failure of this pressure-containing weld could have occurred upon placing the HF system into service.

Control of Maintenance Activities

At the Y-12 Plant, most maintenance activities, including maintenance on safety systems, are accomplished by the Facilities Management Organization—an organization distinct from the operations management organizations, such as EUO. In early 1998, the Board found that there was a lack of operations management awareness and control of the maintenance of safety systems at the Y-12 Plant, as evidenced by several off-normal events or occurrences. These were viewed by the Board as symptomatic of a fundamental problem with control of maintenance at the Y-12 Plant. In June 1998, the Board issued a reporting requirement to DOE, asking that DOE review these occurrences, identify the root causes, and determine corrective actions. In August 1998, DOE and LMES responded with actions to address the root causes and identified corrective actions that should substantially improve operations control of maintenance of safety systems.

Overall, the Board has been favorably impressed with the receptivity of both DOE and LMES to constructive critiques of their work planning/safety planning and the progress being made in effecting a continuing upgrade program.

3.1.3 Los Alamos National Laboratory

LANL has a unique mission as compared with other nuclear-weapons-related research and development laboratories—to provide a small-scale capability for producing pits for enduring stockpile weapons to replace existing pits taken out of service for destructive testing or other reasons. This mission is related to stockpile management, even though activities at DOE's weapons laboratories usually emphasize stockpile stewardship.

The Capability Maintenance and Improvement Project (CMIP), as originally conceived, was intended to develop the capability to manufacture pits at LANL. In a December 1997 letter to DOE, the Board identified weaknesses in the manner in which technical project management for CMIP was being conducted. Those weaknesses included a lack of adequate safety design criteria; the need for technical personnel experienced in the management of major projects that are complex and hazardous; and the need to implement suitable technical project management processes. The Board requested a report providing an evaluation of actions aimed at improving project management for CMIP. Subsequently, DOE began to redefine the CMIP mission and the near-term development of a limited pit manufacturing capability at LANL, now being called Transition Manufacturing and Safety Equipment. DOE and LANL have acknowledged that the

project management problems identified by the Board were systemic and extended to several other stockpile management projects at LANL in addition to Transition Manufacturing and Safety Equipment. DOE committed to addressing these issues and correcting the associated deficiencies that impact both DOE's and LANL's ability to effectively manage and execute major projects.

DOE's response, in June 1998, identified corrective measures to be implemented by the Nuclear Construction Projects Office within the Albuquerque Operations Office. The plan's provisions included the development of a technically competent organization that is responsible, has authority, and is accountable for safe execution of projects. From May to October 1998, the Board and its staff met with DOE to review the implementation of these commitments. Significant improvements were observed in project management by DOE and LANL at the senior management and project levels. Although DOE's plan was not fully implemented at year-end, the revised strategy for technically managing major projects at LANL is sound. The Board will continue to closely follow DOE's and LANL's efforts and to provide advisories as appropriate to assist LANL in its attempts to upgrade its project management capabilities and performance.

3.1.4 Savannah River Site Tritium Operations

The tritium facilities at SRS, located near Aiken, South Carolina, are vital to support the nation's capability to replenish certain weapons components with tritium gas and to process and store the gas. Tritium, a radioactive isotope of hydrogen, has a relatively short half-life (12.3 years) and must be replaced periodically. Tritium was last produced in the K-Reactor at SRS, which was shut down in 1988. DOE does not have current capability to produce tritium, but is planning to acquire this capability.

Tritium Production Options

On December 6, 1995, the Secretary of Energy issued a Record of Decision announcing that DOE would pursue a dual track on tritium supply alternatives: (1) the use of a commercial light water reactor, and (2) the development of an accelerator system. On December 22, 1998, the Secretary of Energy selected the commercial reactor alternative as the primary alternative and indicated that development and design of the accelerator would continue as a backup alternative.

During 1998, the Board and its staff communicated comments directly to DOE and its contractor on the safety aspects of the preliminary design of the tritium extraction facility, which will be used to extract tritium from special rods irradiated in a commercial reactor. This facility will be built within the existing tritium complex at SRS, and will be operational by 2006. The Board and its staff have focused their safety reviews of the accelerator alternative mainly on the tritium-producing target, which is expected to have a high inventory of radioactive spallation products. The Board expects to continue safety-related reviews of the tritium extraction facility in 1999, to ensure that appropriate engineered safety features are incorporated in the final design. Key design features associated with safety of the accelerator itself will be reviewed as the design evolves.

Ongoing and Existing Tritium Operations

The Board and its staff have dedicated substantial effort to overseeing the safety of the installation and start-up of new tritium activities at SRS for surveillance testing of tritium reservoirs. In 1998, the Board's staff reviewed the design and safety analyses for the environmental conditioning chambers. These chambers subject tritium reservoirs to conditions they may experience during deployment. In response to issues raised by the Board regarding the likelihood and consequences of accident scenarios involving explosion of tritium, DOE improved the safety analyses and supporting documentation for operating these chambers. Through further staff interactions, the formality of readiness was significantly strengthened. Several safety issues were identified, resulting in fire protection upgrades, pressure protection improvements, and enhanced operating procedures to support safe operations of the environmental conditioning chambers.

In 1995, the Board called DOE's attention to the possibility that certain natural phenomena could cause an adjacent ventilation stack to fall on Building 217-H, which houses a large number of filled tritium reservoirs and hydride storage vessels. Such an event could cause release of large quantities of tritium. As a result, DOE and Westinghouse Savannah River Company (WSRC) designed and installed highly invulnerable encased safes (HIVES) in the Vault of Building 217-H. These safes are designed to maintain their structural integrity in the event of collapse of either the building or an adjacent ventilation stack. Installation of the HIVES has been completed, and all reservoirs and hydride storage vessels in the 217-H Vault were to be located in the HIVES by early 1998. However, the Board's staff noted that a large number of reservoirs were still being stored in the old-style storage cabinets in the 217-H Vault. As a result, DOE and WSRC committed to eliminating storage of reservoirs outside of HIVES by March 1999. Additional HIVES have been installed, and WSRC is now on schedule to meet its commitment.

3.2 STOCKPILE STEWARDSHIP OF NUCLEAR WEAPONS

Stockpile stewardship is the term used by DOE to refer to activities carried out in the absence of nuclear testing to assure confidence in the safety, security, and reliability of the weapons in the stockpile. Stockpile stewardship includes using past nuclear test data in combination with future non-nuclear test data and aggressive application of computer modeling, experimental facilities, and simulations. Activities at the major sites engaged in stockpile stewardship are discussed in turn below.

3.2.1 Lawrence Livermore National Laboratory

LLNL, located 45 miles southeast of San Francisco, California, is a DOE 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. Its most significant defense nuclear

facilities are in the Superblock complex, e.g., the Building 332 (B332) Plutonium Facility and Tritium Facility.

Resumption of Operations at the Plutonium Facility

LLNL halted operations at the B332 Plutonium Facility in July 1997 as a result of concerns with safety management, criticality safety, and conduct of operations.

Throughout 1998, the Board and its staff reviewed efforts and activities to upgrade the safety management program at the B332 Plutonium Facility and the remainder of the Superblock, as part of efforts to restart this facility. The Board's staff reviewed and assisted in the development of the Plutonium Facility Resumption Plan, and reviewed and provided feedback on efforts and activities to resume operations. In general, the staff's efforts were focused on assisting the nuclear facilities in developing and improving programs and procedures for the identification of hazards and implementation of controls for operations and storage of special nuclear and radiological materials.

The resumption of operations in B332 was an evolutionary process. The process resumed operations in stages, provided for iteration of improvements in work practices in subsequent work, and gradually developed standing work practices. The process required rigorous compensatory measures to ensure that the work was thoroughly defined, hazards were identified and analyzed, controls were identified and implemented, workers were trained and qualified, work was executed as prescribed, and lessons learned were fed back into the process. The compensatory measures included consistent review of the work descriptions, hazards, and controls; verification of readiness to begin work; performance of work as prescribed; maintenance of controls; and review to ensure that the full scope of operations for an activity was effectively demonstrated before the workstation was approved for further operations. The combination of increased laboratory management attention, DOE mentoring and assistance, and strong oversight by the Board has resulted in most of the activities in the facility being restarted with substantial safety improvements. Moreover, this effort has not diminished support to important missions, such as stockpile stewardship and material disposition.

3.2.2 Los Alamos National Laboratory

LANL, located in northern New Mexico, is the DOE weapons laboratory with the largest number of defense nuclear facilities and weapons-related activities. It is the main site for ongoing research and development on the means for certifying the safety and reliability of nuclear weapons in the absence of nuclear testing. As noted earlier, it is also to be the location of DOE's limited-scale manufacturing capability for replacement pits for nuclear weapons.

Chemistry and Metallurgy Research Facility. CMR has had a long history of problems relating to safety management. In the fall of 1997, LANL chose to temporarily suspend operations at CMR. On February 2, 1998, responsibility for operating CMR was transferred to the Nuclear Materials Technology Division, which also manages the TA-55 Plutonium Facility. CMR was subsequently restarted, following extensive review of safety

management for each of its activities. The CMR safety management program is being patterned after the TA-55 ISMS where possible, and it is still under development. Basic safety management functions are in place to ensure that work can be performed safely. A BIO for CMR was approved by DOE on August 31, 1998. Technical Safety Requirements for CMR have been drafted and are expected to be finalized shortly.

TA-18, Pajarito Laboratory. In May 1998, a member of the Board's staff attended the LANL Safety Review Committee's review of operations at the Pajarito Laboratory, which is the only hands-on nuclear criticality safety training facility in the DOE complex. The review uncovered numerous deficiencies. The Board's staff member noted some additional issues that underscored the need for improved conduct of operations. On August 12, 1998, LANL placed TA-18 in a stand-down mode as a precautionary safety measure following a criticality safety violation and other recent safety infractions. Based on its own subsequent review, LANL correctly identified the root causes of safety issues at the Pajarito Laboratory as inadequacies in the work planning aspects of ISM (define work, analyze hazards, develop controls, and implement controls) and in formality of operations. DOE's Los Alamos Area Office has been interacting extensively with LANL to improve safety management at this facility. The Board's staff is continuing to monitor the development of the ISM program at the Pajarito Laboratory.

Hydrodynamic and Dynamic Experimentation

Experiments for studying the performance of nuclear weapon components are to be conducted on mockups of the components and on simplified structures in specially designed vessels. LANL has been planning a series of such tests to compare the performance of aged weapons components with that of new ones. The Board has been reviewing documentation and plans for the ORR to verify that rigorous controls are in place before testing proceeds. In November 1998, the Board issued a reporting requirement to DOE in order to stimulate better planning, thus ensuring that sufficient time and expertise will be available to conduct the necessary technical reviews prior to start-up.

Seismic Hazard at Los Alamos National laboratory

For several years, DOE has been actively evaluating the seismic hazard at LANL. A major milestone in this effort was completion of the Woodward-Clyde seismic hazard report in February 1995. One issue identified by the Board resulting from the Woodward-Clyde investigation was that the seismic capabilities of the nearby Pajarito fault were not adequately understood because, in contrast with two other nearby faults, geologically recent (i.e., Holocene, or less than 10,000 years ago) movements on the Pajarito had not been evaluated. These three faults, known collectively as the Pajarito Fault System, are close to LANL and are the main contributors to the seismic hazard at the site. As a result, the seismic hazard projections at LANL are extremely complex to account for incomplete data and a high reliance on expert opinion. To address this issue, DOE initiated additional field investigations to identify the expected Holocene movements. Complete results are expected in 1999, and the new information should lead to a more robust assessment of the LANL seismic hazard.

Another seismic-related matter raised by the Board is the possibility that the Rendija Canyon fault (another of the three faults) extends into the LANL Technical Areas and could pose a potential surface rupture hazard during an earthquake. To address this uncertainty, LANL initiated a program to survey the mesa side walls and possibly identify recent fault displacements. While results from this survey have eliminated the concern for TA-55, they now point to the possibility of the fault trending toward TA-3, particularly CMR. A further bore-hole investigation supported the existence of two small, closely spaced, faults under CMR. Human activity and disturbance of the area will make it exceedingly difficult to determine the seismic capability of this fault.

The Board's staff and consultants are interacting regularly with DOE and its contractors on these matters.

3.2.3 Nevada Test Site

Underground testing of nuclear weapons is no longer being conducted at NTS. However, NTS is required to maintain readiness to allow resumption of underground testing within a certain timeframe if required by the President to do so. In 1993, the Board issued Recommendation 93-6, which addressed, among other things, the need for DOE to retain access to and capture the unique knowledge of individuals who have significant experience in nuclear testing, and the need for DOE to identify and preserve the knowledge necessary to resume testing operations safely. Since 1993, DOE-Nevada and the weapons laboratories have made substantial progress toward completing commitments under Recommendation 93-6.

Device Assembly Facility

DAF is a new facility at the Nevada Test Site. In previous years, the Board closely monitored preparations for start-up of DAF, ensuring that many elements of a satisfactory ISM program were in place. DAF successfully started up in 1998 and has supported several activities related to the subcritical experiments. The Board and its staff reviewed these activities and found them to be well within the authorization basis for DAF operations. The Board continues to monitor operations planned for the DAF.

Subcritical Experiments

DOE's subcritical experiments program is a vital materials research component of its stockpile stewardship and management program. Subcritical experiments involve devices containing both high explosives and special nuclear material. The experimental configurations are designed, however, to preclude the possibility of nuclear criticality.

During 1998, the Board and its staff reviewed the proposed operations for the STAGECOACH, BAGPIPE, CIMARRON, and CLARINET experiments. The Board called DOE's attention to a number of specific matters with regard to the hazard analyses prepared for these experiments and emergency management. At the encouragement of the Board, LANL

updated the bounding hazard analysis for the U1a Complex, where subcritical experiments are performed, to address the hazards during these operations.

The Board has encouraged DOE to take actions to capture lessons learned from each experiment to continue to enhance the safety of these experiments.

3.3 DEFENSE PROGRAMS-WIDE TOPICS

3.3.1 Recommendation 93-1/Nuclear Explosive Safety Study Corrective Action Plan

For several years, the Board has worked with DOE to improve the directives governing the safety of nuclear explosive operations. In implementing the Board's Recommendation 93-1, *Standards Utilization in Defense Nuclear Facilities*, and the Nuclear Explosive Safety Study Corrective Action Plan, DOE has produced a revised and expanded set of safety-related Orders, standards, and guides that, taken together, significantly improve the definition of what DOE expects of its contractors to ensure the safety of operations. The implementation of the 452-series Orders and the development and implementation of the SS-21 process have yielded excellent results where they could be applied, by integrating safety planning and work planning for dismantlement operations. The following discussions outline DOE's progress during 1998.

Implementation of Nuclear Explosive Safety Orders

In July 1998, DOE notified the Board that many of the requirements of the Orders had, in fact, been implemented for the Pantex Plant. The 452-series Orders were added to the MHC contract in May 1998. One of the DOE-Albuquerque supplemental directives, which provides operations office direction for implementing the Orders, is in final draft form; several other supplemental directives are nearing completion. DOE-Nevada and the national laboratories plan minimal additional efforts to implement the nuclear explosive safety Orders at NTS, primarily because of the absence of any ongoing nuclear explosive operations there. The safety analysis for test preparation and the training and qualification of personnel for those tasks would be included in the three-year preparation time to conduct a nuclear test.

Headquarters Roles and Responsibilities

DOE has assured the Board that all necessary actions will be taken to ensure that its Office of the Deputy Assistant Secretary for Military Application and Stockpile Management (DP-20) is able to carry out its responsibilities under the new directives. DOE has agreed to ensure that any adjustments to DOE Headquarters staffing will not result in inadequate staffing related to the nuclear explosive and weapons surety function. To this end, DOE will utilize technical support contractors, certified in accordance with the requirements of the DOE standard for NESS, to support the NESS process; national laboratory personnel who have been detailed to DP-20; and excepted service appointment authority.

Hazard Analysis Report Standard

Publication of a DOE standard providing guidance on the preparation of HARs for nuclear explosive operations was one of the last DOE commitments in response to the Board's Recommendation 93-1. DOE published this important standard in January 1999, after incorporating changes responding to a substantial number of comments from the Board and its staff. This standard is referenced in the revised set of DOE nuclear explosive safety Orders and defines an adequate set of operation-unique controls to ensure the safety of nuclear explosive operations.

3.3.2 Collection and Analysis of Safety-Related Information

Board Recommendation 93-6

In 1993, the Board noted that individuals possessing essential weapons information were being lost from the defense nuclear complex in large numbers. To address this concern, the Board issued Recommendation 93-6, *Maintaining Access to Nuclear Weapons Expertise in the Defense Nuclear Facilities Complex*, which urged DOE to capture safety-related design and operational knowledge from these individuals. In response to this recommendation, Defense Programs (DP) initiated several programs for preserving and archiving information at the nuclear weapons laboratories, NTS, the Pantex Plant, and the Y-12 Plant. In April 1998, DP initiated a weapons complex-wide assessment of existing programs for preserving and archiving knowledge. The scope of this assessment went beyond the safety focus of the Board's Recommendation 93-6 to include preservation of all critical weapons program data and information.

In late May 1998, senior DP management briefed the Board on the assessment's preliminary findings and recommendations. The preliminary findings validated many of the concerns expressed by the Board in 1997. In particular, the assessment revealed that there was "no comprehensive, strategic plan in place to deal with the capture of data, information, and knowledge." The recommendations called for the establishment of strategic policy and plans for "enterprise-wide information management." As of the end of 1998, a Nuclear Weapons Information Management Strategic Plan for Defense Programs had been drafted, and a senior manager responsible for information management policy, plans, and priorities had been appointed. On December 22, 1998, the Board received a letter from the DOE Assistant Secretary for Defense Programs, which stated that "the strategic plan and the appointed senior manager's involvement will meet the intent of the Board's Recommendation 93-6 and allow it to be closed." Based on review of the strategic plan and the information to be provided in early 1999, the Board will determine whether DOE's program management strategy for knowledge preservation resolves the remaining issues still impeding the closure of Recommendation 93-6.

3.3.3 Status of System-Specific Weapon Safety Specifications

Weapon Safety Specifications are intended to record the hazards of each existing nuclear weapon, including historical information and interviews with current and retired program

personnel. These documents, developed in response to a Board initiative, are vehicles for capture and channeling of the knowledge of laboratory personnel into the hazard analyses for each weapon system and use of that knowledge to increase the involvement of design agency personnel in the efforts to ensure safety at Pantex. By the end of 1998, DOE had completed WSSs for all weapon systems, with only one WSS not yet formally released. In addition, DOE has decided to enhance the utility of the WSSs by asking the design laboratories to specify, where possible, the weapon response expected if a weapon is exposed to specific abnormal environments.

3.3.4 Weapon Surveillance Program

Weapon surveillance is the responsibility of DOE's Albuquerque Operations Office. The weapon surveillance program has two major components—the Core Surveillance Program and the Enhanced Surveillance Program. These programs assess the viability of the nuclear weapon stockpile through sampling, testing, and analysis. The purpose of the Core Surveillance Program is to discover defects, if any, in the safety and reliability of weapons systems and to verify compatibility of DOE and Department of Defense weapon system interfaces. The purpose of the Enhanced Surveillance Program is to develop cutting-edge methods and models that can be incorporated into the Core Surveillance Program, and increase DOE's ability to predict the effects of aging on weapons in order to determine whether these effects will impact weapon function or safety. The Board is monitoring these activities to confirm that safety issues are given adequate attention in both programs.

DOE surveillance programs are focused, in part, on ensuring the continuing performance and safety of the explosive components of nuclear weapons. In early 1998, the Board issued a report to DOE entitled *Surveillance of Nuclear Weapons High-Explosive Operations at Pantex*, which raised concerns about the sampling frequency for the selection of components for testing and the process for initiating detailed investigations based on preliminary surveillance findings.

4. HAZARDOUS REMNANTS OF WEAPONS PRODUCTION

CONTENTS OF THIS SECTION

As DOE attempts to close facilities and sites that are no longer needed for weapons production, it is faced with many new challenges. Myriad activities must be accomplished safely to ensure adequate protection of the public, workers, and environment. The Board has consistently encouraged DOE and its contractors to undertake these activities in a methodical and controlled manner; that is, they must understand the hazards presented by the activity and materials involved, control those hazards, perform the work using appropriate safety controls, and learn how the activity could be performed better. These are fundamental tenets of the Board's Recommendation 95-2 on Integrated Safety Management.

Following the shutdown of many nuclear weapons production facilities in the late 1980s, much of the special nuclear material in the complex—most at the Rocky Flats Environmental Technology Site, the Hanford Site, and the Savannah River Site—was not stored in conditions considered safe for the long term. For example, solutions of plutonium remained in tanks and bottles at RFETS and the Hanford Site where they happened to be located when shutdown orders were given. In addition, at SRS, the Hanford Site, and INEEL, spent nuclear fuel was in transfer basins not designed for long-term storage. Although DOE had tentative plans for correcting some of these conditions, there was no sense of urgency regarding the need for stabilization and repackaging of those materials for safer storage.

In Recommendations 94-1, 95-1, 96-1, and 97-1, the Board urged DOE to take action to correct the storage problems in a timely manner, recognizing that unsafe conditions would become worse with time. Since then, DOE has taken action to mitigate some of the most immediate concerns, but much of the material has yet to be stabilized or packaged for long-term storage or ultimate disposition. This need to stabilize unsafe material is seen by the Board as having the utmost urgency.

During the processing of material for stabilization, packaging, and storage, the fundamental tenets of ISM must be satisfied. Such control remains essential as DOE facilities no longer needed for the weapons mission make the transition to deactivation and decommissioning. In many cases, greater hazards, particularly to workers, arise during deactivation and decommissioning of these facilities than existed when the facilities were in operation.

In the discussion that follows, the Board reemphasizes the importance of stabilizing and packaging legacy materials on an expedited basis and providing the necessary resources to accomplish this objective. This is not a matter of preference; rather, it is an issue of public health and safety that must be dealt with aggressively. The Board intends to assist DOE in this regard through its strong focus on the safety of defense nuclear facilities and activities and through its analysis of issues deserving high-priority attention.

4.1 STABILIZATION OF LEGACY MATERIALS

The Board issued Recommendation 94-1 in May 1994, stating, “The halt in production of nuclear weapons and materials to be used in nuclear weapons froze the manufacturing pipeline in a state that, for safety reasons, should not be allowed to persist unremediated.” At the time, fissile materials and related materials required treatment on an accelerated basis to be converted to forms more suitable for safe interim storage, and it was even more unclear how these materials should be dealt with for the long term. The Board expressed concern with the then current slow pace of remediation, and stated its belief that additional delays in stabilizing these materials would be accompanied by further deterioration of safety and unnecessary increase in risks to workers and the public. DOE accepted the Board’s recommendation on August 31, 1994, and submitted its implementation plan on February 28, 1995. DOE broadened the scope of its response to propose safe interim storage of additional liquids and solids containing fissile

materials and other radioactive substances in spent fuel storage pools, reactor basins, reprocessing canyons, and processing lines.

Significant risk reduction and material stabilization were accomplished during the following two years, and much of the plutonium solutions, special isotopes, and plutonium residues have been stabilized by the end of 1998. However, stabilization of about 8 metric tons of plutonium metals, 6 metric tons of plutonium oxides, and more than 200,000 liters of uranium solutions has not yet been started. Stabilization of spent nuclear fuel is in progress at the SRS canyon facilities, but has not yet begun at the Hanford Site, which accounts for more than 90 percent of the 94-1 inventory. Additionally, substantial quantities of americium, curium, and neptunium at SRS remain to be stabilized. In late 1997, it was apparent to the Board that the plan for most of the remaining stabilization activities was outdated and needed to be revised to ensure an aggressive but realistic path forward.

In December 1997, the Board requested that DOE develop and submit a revised implementation plan. During the preparation of this revision, the Board raised many questions about the impact of proposed changes and compensatory measures being taken as a result of the proposed delays. In addition, the Board considered that some proposed delays were not justified by the evidence provided. As a result, DOE delayed submittal of a revised plan, and instead, on September 2, 1998, provided the Board with an update to show progress toward completing a revised plan, as well as the current status of Recommendation 94-1 actions and DOE's then current estimates for completion of those actions.

In a letter dated October 8, 1998, the Board expressed concern about the rate of progress in stabilizing the remaining materials. The Board's letter indicated that, to be meaningful, the implementation plan needed revision to provide aggressive paths forward for the remaining materials and mitigation of the risks caused by continued delays. During the last quarter of 1998, the Board engaged DOE management on several significant open issues requiring resolution to support a necessary and acceptable revision. Only after sustained, intensive, interaction by the Board and its staff did the issues get addressed and resolved. In particular, development of a plan for stabilizing the plutonium-containing materials at Hanford's Plutonium Finishing Plant (PFP) required repeated Board attention. On December 28, 1998, a revised implementation plan for Recommendation 94-1 was issued by the Secretary of Energy. The revision provides the following:

- Plans and schedules for the completion of remaining stabilization activities;
- Specific commitment dates for completion of stabilization activities; and
- Assessment of the safety risks associated with delayed stabilization activities and compensatory measures being taken to minimize those risks.

In particular, DOE's revised plan for stabilizing the plutonium-bearing materials at the PFP at the Hanford Site represents a significant improvement to DOE's September 1998 technical update. It provides more aggressive recovery schedules; reflects an enhanced

understanding of the technical logic and safety risk associated with each activity; and plans for the preparation and execution of major activities in parallel.

Most of the questionable material is scheduled to be stabilized before the end of 2003. Depending on DOE's success in accelerating the operation of the HB-Line at SRS to stabilize plutonium and neptunium solutions in H-Canyon, some activities may continue for a few more years. Additionally, construction of the Actinide Packaging and Storage Facility (APSF) at SRS may be delayed for as much as two years, which will result in corresponding delays in the stabilization and storage of plutonium metals and oxides.

The success of the 94-1 program is dependent on aggressive execution of the activities defined in the revised implementation plan, which will ensure timely stabilization of the remaining nuclear materials covered by the recommendation. The Board will continue to closely monitor these activities to ensure that DOE management provides the resources and commitments needed to accomplish the actions in the revised plan on schedule.

4.1.1 Plutonium

Plutonium Finishing Plant

Throughout 1998, the Board urged DOE to restart plutonium stabilization at PFP and to plan for meeting Recommendation 94-1 commitments in a timely manner. PFP has a relatively large inventory of plutonium-bearing materials in unstable forms and packaging exhibiting degradation. The Board intends to exert pressure on DOE to get these materials safely stabilized using demonstrated technologies on an aggressive schedule.

Fissile material handling at PFP had been halted in 1996 because of repeated instances of poor conduct of operations. In April 1998, fissile material movements for laboratory and vault operations were finally approved, but plutonium stabilization had not yet been restarted. This lack of progress led to increased Board scrutiny, which has led to some improvements. The Board issued letters to DOE on April 15, 1998, and July 13, 1998, containing requirements to report on key problems at PFP. Problems included the lack of aggressive recovery plans for meeting Recommendation 94-1 commitments, the need for a properly scoped Operational Readiness Review to ensure the safe restart of plutonium stabilization operations, and the need to consider more aggressive risk reduction through accelerated stabilization options. At year-end, stabilization had not yet been restarted.

While response has been slow, the Board appears to have stimulated change at PFP. For example, PFP initially had failed to supply meaningful input for the proposed change to the implementation plan for Recommendation 94-1. As a result of pressure from the Board, the facility chartered a team in November 1998 to develop such input. In addition, in November and December 1998, PFP carried out a focused Operational Readiness Review to verify the plant's ability to safely handle and stabilize plutonium oxides in muffle furnaces. This process did start up in early 1999.

In early 1998, the PFP contractor decided to defer thermal stabilization activities for plutonium oxides and metals until 1999. The Board was not satisfied with this slow approach, and communicated its concerns to DOE. As a result, the PFP contractor now intends to implement several of the Board's suggestions for accelerating stabilization activities during 1999. These include completing the installation of three additional muffle furnaces for thermal stabilization, restarting the prototype vertical calciner to continue development work and to stabilize some plutonium solutions until the production calciner is operational, and pursuing an alternative precipitation process used at RFETS for stabilizing impure plutonium solutions. The Board has also stressed the need to stabilize plutonium-bearing polycubes, which are a high hazard for plutonium dispersal. The PFP contractor now intends to reestablish interactions with LANL to procure a pyrolysis unit during 1999 for polycube stabilization.

Stabilization of Plutonium Metal and Oxide

In Recommendation 94-1, the Board urged DOE to place plutonium metal and oxide in storage configurations that meet DOE's standard for long-term storage (DOE-STD-3013). The Board and its staff have continued to actively follow each site's preparations for stabilizing and packaging plutonium metal and oxide to this standard. Some progress on stabilizing plutonium metals and oxides is continuing. However, little progress has been made in packaging material to DOE-STD-3013, and delays in construction of the APSF at SRS will further delay DOE's progress in this area. DOE has continued efforts to make the requirements of the long-term storage standard less rigorous. The Board has discouraged such attempts and has insisted that DOE provide strong technical bases for the adequacy of any proposed changes to the standard.

DOE is procuring automated systems for packaging material to meet the long-term storage standard. A prototype unit was procured for RFETS. During 1998, DOE had mixed success with this prototype. Operation of the packaging system was successfully demonstrated, but difficulties with the stabilization system led DOE to decide not to install this portion of the unit. Manual stabilization furnaces are planned to be used instead. The prototype unit was accepted by DOE, and post-acceptance testing has begun and is expected to continue into 1999. The Board's staff plans to continue its oversight of this testing, as well as preparations for installation of the system in 1999. The Board's staff has actively encouraged DOE to incorporate lessons learned from the prototype unit into the procurement of follow-on units for SRS, LLNL, and the Hanford Site.

DOE had considered not packaging material at RFETS and the Hanford Site to meet the long-term storage standard before shipment to SRS for extended storage. The Board did not believe this was the best option for safe storage of the material. In part because of involvement in this issue by the Board and its staff, DOE has now decided to package the material to the standards specifications before shipment.

Stabilization of Plutonium Solid Residues

Since the Board issued Recommendation 94-1 in May 1994, DOE has made progress in reducing the risks and uncertainty associated with "possibly unstable" residues. Of particular

note is progress being made at RFETS. On January 29, 1998, the Board wrote to the Secretary of Energy, encouraging DOE to revise its plans to emphasize timely removal of solid residues to a final repository, rather than stabilizing most residues. The Board noted that the more hazardous residues have now been treated and are relatively benign for the near future, and that expeditious burial of low-risk residues at WIPP without further processing would satisfy the intent of Recommendation 94-1. Based upon the results of the RFETS residue characterization program, DOE expects many residues to be reclassified from high to low risk. To resolve plutonium dispersibility issues under the Board's Recommendation 94-3, DOE plans to repack dispersible residues into more robust containers (e.g., pipe overpack containers) pending their shipment to WIPP.

After years of preparation, residue processing and repacking began at RFETS in 1998. Pyro-oxidation of high-risk salts began in January 1998, after the Board had determined that this operation could be safely started. Approximately 2 metric tons of high-risk salts was oxidized in 1998. Multiple process lines also began repacking ash, dry, and combustible residues in compliance with the Interim Safe Storage Criteria; more than 4 metric tons of these packaged materials is now awaiting shipment to WIPP. RFETS modified its combustible repacking strategy after the Board's staff identified packaging configurations that did not comply with the Interim Safe Storage Criteria. The bulk of the remaining work at RFETS involves repackaging the low-risk residues into pipe overpack containers, stabilizing a small subset of residues as dictated by characterization, and ultimately removing the residues from RFETS to support earlier site closure.

The Board has consistently noted that many residues could be better processed at facilities other than those where they are currently stored. During its public meetings on Recommendation 94-1 in mid-1998, the Board noted that only SRS currently had the capability to stabilize RFETS sand, slag, and crucible residues and encouraged DOE to stabilize these residues at SRS. During 1998, RFETS repackaged approximately 1.5 metric tons of sand, slag, and crucible residues into shipping containers. Shipment of this material to SRS for processing began in December 1998 after the residue Record of Decision had been issued.

Stabilization of Liquid Plutonium Residues

RFETS has continued to make progress in stabilizing plutonium-bearing solutions. In late 1997, solutions containing high concentrations of plutonium were drained into plastic bottles from four tanks in Building 771. These bottles, along with similar bottles from Building 771 and Building 776, were transferred to Building 371 and stabilized using the Caustic Waste Treatment System. (Reviews by the Board's staff on the conduct of tapping and draining activities in Building 771 are summarized below in Section 4.5, Deactivation and Decommissioning.) Liquids from the last criticality line tank in Building 371 were drained in early 1998 and used to blend down higher-concentration solutions from Building 771 before processing. In June, tapping and draining of piping began in Building 371, and five areas were drained during the remainder of the year. New techniques were also used in 1998 to fix contamination in two highly contaminated rooms in order to simplify future draining operations.

4.1.2 Enriched Uranium

The Board's staff continued its oversight of stabilization and removal of uranium fluoride gases from the Molten Salt Reactor Experiment at ORNL in accordance with Recommendation 94-1. The successful completion of reactive gas removal (primarily fluorine and uranium fluoride) from the head spaces of drain tanks and from off-gas system piping reduced the total uranium remaining in the system from greater than 37 kg to less than 15 kg and decreased the pressure enough to allow preparations to remove uranium deposits from the Auxiliary Charcoal Bed (ACB) to commence. Chemical operations required to denature the reactive fluorinated charcoal in the ACB (the first phase of uranium deposit removal) were safely completed following a review of the proposed operations by the Board's staff. The Board's staff will observe the readiness review for uranium deposit removal and assess the results in early 1999. Subsequent risk reduction activities include removal of fuel and flush salt from the drain tanks and stabilization/conversion of uranium to oxides.

4.1.3 Uranium-233

Uranium-233 (U-233) is a man-made isotope of uranium whose decay products are highly radioactive. Most of it is stored at ORNL and INEEL, with a smaller quantity at LANL. The Board issued Recommendation 97-1 to urge DOE to stabilize its U-233 materials and to provide for their safe storage. The Board recommended that DOE characterize the U-233, develop a storage standard, assess the adequacy of current storage conditions, and preserve technical competency in U-233 expertise. Because most of the U-233 at these sites has not been inspected for many years, there is uncertainty as to the safety of its current storage condition. Moreover, because of the high radiation associated with U-233, material handling and examination are likely to be difficult, requiring protection from both alpha particles and gamma rays.

ORNL, LANL, and INEEL have begun to take actions to characterize their U-233 materials. ORNL is constructing two hot cells for performing inspection and stabilization activities, has designed a shielded enclosure that will protect workers from radiation during inspection, and is developing an inspection plan. The Board's staff reviewed ORNL's plans and concluded that continued technical oversight by engineering personnel at ORNL will be required if the inspection program is to be completed safely and successfully.

During the past two years, LANL has visually inspected the exterior of all containers of U-233 at the Critical Experiments Facility (TA-18). No visual evidence of degradation has been found. In the near term, LANL plans to transfer its U-233 to the CMR facility. Ultimately, LANL plans to ship all but a small amount of its U-233 to ORNL for long-term storage; the retained material will be used for research purposes. Most of the U-233 at INEEL is contained in unirradiated fuel assemblies and buried waste. INEEL plans to continue its current visual inspection program for the exterior of fuel assembly containers. The majority of the remaining U-233 material is buried in retrievable waste mounds and cannot be readily inspected. A sampling of some unburied waste drums opened to check the condition of the packaging showed minor

degradation of the drums. Additional inspections are planned to evaluate the condition of some of the stored materials.

DOE has completed a technical competency study that identified more than 50 U-233 experts within DOE and its contractors. Much of this expertise is centered at ORNL, where a number of retirees are actively involved in the U-233 Safe Storage Project by mentoring younger engineers. DOE also formed a 97-1 Technical Team comprising experts from the DOE complex. The DOE 97-1 Technical Team completed several implementation plan deliverables. These included criteria for determining which U-233 is designated as waste, a study to identify long-term disposition options for U-233, a report on sites with small amounts of U-233 that can be shipped to ORNL for storage, and an ORNL Building 3019 Alternatives Trade Study.

On October 2, 1998, DOE issued a proposed U-233 safe storage standard. DOE also produced a System Requirements Document (SRD) for the U-233 Safe Storage Program in 1998. After reviewing the standard, the Board issued formal comments to DOE in a letter of December 14, 1998, stating that DOE needed to strengthen its technical basis; ensure that containers do not contain significant quantities of plastics and volatile materials; and ensure that the required attributes of materials, packages, and facilities credited as barriers are adequately specified. Furthermore, because of the large number of policy, programmatic, and technical uncertainties identified in the SRD, the Board considers that document incomplete. In 1999, the Board and its staff will continue to monitor risk reduction through on-site reviews, review of the U-233 inspections, and review of efforts to complete the U-233 standard.

4.1.4 Special Isotopes

Americium/Curium Solution at SRS

In Recommendation 94-1, the Board recommended expediting the stabilization of americium/curium solutions stored in F-Canyon. In October 1997, design and construction activities were suspended as a result of numerous unforseen complications with the proposed bushing melter vitrification system. In January 1998, after evaluating alternative stabilization methods, Westinghouse Savannah River Company concluded that vitrification remained the preferred stabilization method and proposed restarting design activities after sufficient system research had been conducted.

A staff review of the project identified several areas needing improvement to ensure safe and timely stabilization of the americium/curium solutions, including the need for a detailed research and development plan and schedule, improved project management, pursuit of backup stabilization alternatives, and mitigatation of ongoing solution storage risks. On July 10, 1998, the Board issued a letter communicating these observations to DOE, with a 45-day reporting requirement. In response to the Board's letter, WSRC made several changes in the americium/curium project. A more detailed research and development plan and schedule were issued in August 1998; periodic updates are planned. A new project management structure was established to improve management focus on the project. Several backup alternatives for the vitrification process are being researched. Additional safety controls for the americium/curium

storage tank are being implemented. Design activities resumed in October 1998, and a substantial portion of the design is planned for completion by May 1999. The Board and its staff continue to monitor the progress of the americium/curium stabilization project.

Neptunium Solution at SRS

SRS has 6,000 liters of neptunium-237 nitrate solution in H-Canyon. A decision on the method to be used for processing this solution has been delayed until DOE's Office of Environmental Management and DOE's Office of Nuclear Energy develop a memorandum of agreement formalizing commitments for the stabilization of this solution and its transfer from the site. Pending resolution of the form and method of disposition, compensatory measures have been implemented to reduce the risk associated with the material; these measures include a sampling and monitoring program, cooling system modifications, and preparation of actions in case deficiencies occur in current storage conditions. The implementation plan for Recommendation 94-1 committed DOE to stabilizing and packaging the neptunium material by December 2002. This date was subsequently revised to September 2003 and accepted by the Board. However, the delays experienced in determining the disposition form and method for this material appear to have caused a further delay of at least 6 months past this revised date.

4.2 STABILIZATION OF SPENT NUCLEAR FUEL

DOE's National Spent Nuclear Fuel Program coordinates activities at the various DOE sites involved in placing spent nuclear fuel into safe interim storage. An additional goal of this program is to ensure that the canisters used for interim storage can be used for shipment to and burial at a national repository without repackaging. During 1998, the Board's staff worked with DOE's staff to emphasize coordination of spent fuel storage activities at the Hanford Site, SRS, and INEEL.

4.2.1 Hanford Site

Deteriorating spent nuclear fuel in the K-Basins at the Hanford Site has the potential to release radioactive contamination to the environment, posing a threat to the health and safety of workers and the public. In response to Recommendation 94-1, DOE made a commitment to remove the spent fuel from the basins, stabilize it, and place it in interim dry storage at the site. Initially, DOE planned to initiate spent fuel removal by December 1997 and to complete it by December 1999. However, in 1997, the Spent Nuclear Fuel Project experienced substantial delays because of equipment design changes and modifications to the spent fuel stabilization process. On November 17, 1997, the Board transmitted to DOE its report DNFSB/TECH-17, *Review of the Hanford Spent Nuclear Fuel Project*. This in-depth technical and project review identified deficiencies in the project's processes and practices for identifying and resolving technical and safety issues, and noted that these deficiencies could lead to additional delays.

In 1998, DOE outlined corrective actions needed to improve SNFP project management and ensure the timely and technically justifiable resolution of emerging issues. Additional major

delays were identified during 1998 as the SNFP developed a revised project schedule that proposed commitment dates for the start of fuel removal by the end of November 2000 and for the completion of fuel removal by the end of December 2003.

During 1998, the Board and its staff closely followed project progress in the design, safety analysis, and construction of the SNFP facilities. During numerous meetings and discussions with DOE and in a letter to DOE in March 1998, the Board and its staff questioned the design basis for the Multi-Canister Overpack, which is intended to provide primary containment of the spent fuel during stabilization and storage. As a result, the design was revised to use more conventional materials, to provide periodic monitoring during storage, and to require code stamping to demonstrate compliance with American Society of Mechanical Engineers Code for nuclear components.

Additionally, reports documenting reviews by the Board's staff of instrumentation and control systems and fire protection for the proposed process facilities were forwarded to DOE in February and December 1998. DOE's response to these reports resulted in a reduced hazard of a hydrogen explosion in the battery rooms and in improved calibration of the electrical protective devices at the K-Basins. DOE is evaluating additional actions in response to these letters to further improve safety. The Board and its staff intend to continue to review the SNFP to ensure urgent reduction of the risks associated with continued storage of the spent fuel in the K-Basins.

4.2.2 Savannah River Site

In a previous technical report issued by the Board (DNFSB/TECH-7, *Stabilization of Deteriorating Mark 16 and Mark 22 Aluminum-Alloy Spent Nuclear Fuel at the Savannah River Site*), the technical rationalization was established for using chemical separation to stabilize the deteriorating defense-related spent nuclear fuel stored in the basins at SRS. The Mark 31 target elements had been stabilized in the F-Canyon/FB-Line prior to 1998. During 1998, stabilization of Mark 16 and Mark 22 spent nuclear fuel elements continued in the H-Canyon. To date, about 147 of 154 metric tons of heavy metal fuel have been stabilized. In its implementation plan for Recommendation 94-1, DOE made a commitment to complete stabilization by November 1999; this date was later revised to December 2000. The date continues to slip, and stabilization is now expected to be completed in December 2001. The Board's staff considers these operations as necessary to verify the continued use of appropriate safety measures and to ensure the timely resolution of safety issues. The Board has placed specific emphasis on the need for DOE to demonstrate the most technically justified process for stabilization; this emphasis has contributed to the attainment of measurable progress in remediating the problem of deteriorating spent nuclear fuel.

A large inventory of non-defense-related, aluminum-alloy spent fuel is also in wet storage in defense nuclear facilities at SRS. This inventory will continue to increase as additional fuel is received from off-site research reactors and other DOE sites. This aluminum-based spent fuel cannot be left in wet storage indefinitely, and will likely require treatment before ultimate disposal. DOE is continuing to evaluate alternatives for removing this spent fuel from wet

storage. The Board reviewed these developments during 1998 and intends to continue to monitor DOE's progress, particularly as it affects defense nuclear facilities.

4.2.3 Idaho National Engineering and Environmental Laboratory

The implementation plan for Recommendation 94-1 committed DOE to remove fuel from the CPP-603 Basin, a spent fuel storage basin at INEEL, by December 2000 because of concerns with underwater spent fuel storage conditions. DOE has met all milestones to date. Most spent fuel that does not require overpacking has been removed from CPP-603. Approximately 225 fuel units were removed from the CPP-603 fuel basins during 1998, leaving only 229 units. The Board and its staff continue to review these activities to ensure that they are performed in a timely and safe manner.

4.3 STORAGE OF HAZARDOUS MATERIALS

Since ultimate disposition of most legacy materials is many years away, it is important to ensure that these materials are adequately and safely stored in the interim. During recent years, the Board has issued several recommendations intended to upgrade storage conditions for these materials, and the Board continues to review new storage areas and evaluate existing storage conditions.

4.3.1 Plutonium Storage Facilities at the Savannah River Site—Actinide Packaging and Storage Facility and K-Area Material Storage

The Board's Recommendation 94-1 addressed the need to stabilize surplus plutonium metal and oxide and provide safe interim storage of this material. After stabilization and packaging, DOE intends to ship surplus plutonium from the Hanford Site and RFETS to SRS and store it with SRS material in two facilities—APSF and the K-Area nuclear materials storage project. DOE's plans are described in the amended *Record of Decision on Storage and Disposition of Weapons-Usable Fissile Materials* (August 1998), and depend upon SRS being selected as the surplus plutonium immobilization site. Numerous reviews by the Board and its staff have focused on the planning, safety analyses, and design activities for these two facilities.

APSF is intended to stabilize and repackage SRS plutonium by May 2002, in accordance with the DOE implementation plan for Recommendation 94-1, and to provide safe, secure storage of special nuclear material for up to 50 years. This project has been subject to shifting project requirements and increasing scope, including expansion of its mission from storing only SRS material to storing all surplus material from the Hanford Site, as well as some material from RFETS. While much progress on design has been made in 1998, the current schedule for construction, start-up, and operation of APSF is optimistic.

Because numerous safety issues, as well as DOE's surplus plutonium disposition strategy, depend on timely APSF start-up, the Board has closely monitored progress on the design and construction of this facility. In February 1998, the staff reviewed an early version of the system

design packages and concluded that more details were needed to assist the constructor, particularly the identification of codes and standards being invoked and the systems and components that are important to safety. Also in early 1998, the Board and its staff made suggestions for improving the robustness of the structural design and confirming design assumptions. For example, it was known early in 1997 that a soil soft zone existed beneath the planned footprint of the facility, but by early 1998, this soft zone still had not been adequately characterized. In February 1998, DOE and WSRC agreed to perform a more comprehensive geotechnical investigation to ensure an appropriately safe structural design. Also during 1998, DOE and WSRC increased the design tornado loading and completed a thorough seismic verification study, following suggestions of the Board and its staff.

Furthermore, to improve confidence in the seismic design and evaluation of SRS facilities, the Board's staff and DOE initiated a generic review of ground motion assumptions at SRS. The questions explored included (1) the magnitude and distance assumptions used to bound the 1886 Charleston earthquake, (2) the historical record of nearby ground motion estimates from the Charleston earthquake, (3) modeling of the crustal structure for the attenuation of ground motion, (4) modeling of probabilistic ground motion parameters, and (5) comparison of detailed site-specific data on the seismic hazard with generic data on national seismic hazard maps prepared by the U.S. Geological Survey. Considerable progress was made in addressing these issues, and as a result, SRS has modified design practices for future designs to improve structural performance under extreme loads. Continuing efforts in this area should streamline the selection of appropriate seismic design criteria and ground motions, thus ensuring the safe design of future defense nuclear facilities at SRS.

By the end of 1998, staff reviews of APSF had concluded that there were still open safety-related items, particularly for electrical and fire protection systems. DOE and WSRC need to continue to apply high-level attention to managing the remaining issues. One difficult challenge will be the installation, start-up, and operation of the plutonium stabilization and repackaging system, in light of the difficulties experienced at RFETS during start-up of a similar system. The Board will continue to closely follow progress on these matters.

The K-Area nuclear material storage project started in early 1998 and is an outgrowth of the APSF project. In early 1998, DOE began to pursue early closure of RFETS, and developed a strategy dependent upon SRS receiving RFETS material starting in 2000, about 1 year before APSF is due to be completed. Since APSF would not be ready, DOE began planning to upgrade K-Area facilities and to store shipping containers of properly stabilized and packaged RFETS material in K-Area. This strategy takes advantage of extensive upgrades completed in the early 1990s to support K-Reactor start-up. Additional modifications are required for security, criticality monitoring, and structural repairs. Of particular interest from a safety standpoint is the planned longer-term use of certified shipping containers to maintain plutonium containment in a storage environment. The Board and its staff will continue to review the planned K-Area modifications and supporting safety analyses, as well as progress in APSF design and construction.

4.3.2 Building 371 at the Rocky Flats Environmental Technology Site

The Board issued Recommendation 94-3, *Rocky Flats Plutonium Storage*, to ensure that the large quantity of SNM at RFETS would be safely stored. The Board recommended that DOE take a systematic approach to evaluating the suitability of Building 371 for the proposed new mission of storing the site's entire SNM inventory, and prepare a program plan for building upgrades and improvements consistent with the building's mission. Based on its reviews, the Board had concluded that activities to prepare Building 371 for this role were neither logically structured nor sufficiently broad in scope to ensure that the material would be adequately stored. In response, DOE determined that upgrades to Building 371's structure, systems, and components, as well as its safety basis, were needed. The Board and its staff followed DOE's progress closely and were instrumental in DOE taking a systems engineering approach to evaluating and developing upgrades, as well as integrating this approach into project management. Without the Board's proactive interaction, these evaluations would not have been completed in a timely manner.

In mid-1998, the Board's staff had reviewed progress on upgrades, the design adequacy of several upgrades, and the implementation of a new safety basis for the building. As a result of the Board's Recommendation 94-3, the safety basis was upgraded to be adequate for the building's mission. However, the staff's review had also identified the fact that analysis of one upgrade was inconsistent with accepted industry practice, and analysis of another upgrade functional test contained errors. Based on this review, the Board suggested that DOE independently evaluate work packages to ensure that the functional requirements of the upgrades have been satisfactorily met. DOE completed an independent review, which revealed that in general, upgrades were satisfactory, but additional controls were needed, and several issues required further resolution.

4.3.3 Uranium Hexafluoride Storage

Approximately 50,000 cylinders containing more than 500,000 metric tons of depleted uranium hexafluoride from the production of enriched uranium for both defense and civilian purposes are stored outdoors in carbon steel cylinders at gaseous diffusion plants in Oak Ridge, Tennessee; Portsmouth, Ohio; and Paducah, Kentucky. In Recommendation 95-1, *Improved Safety of Cylinders Containing Depleted Uranium*, the Board recommended that DOE (1) begin an early program to improve the corrosion resistance of the cylinders, (2) evaluate additional measures that would protect the cylinders from corrosion, and (3) determine the proper form for long-term storage of the uranium hexafluoride.

In response, DOE has taken substantial actions to slow the degradation of cylinders from external corrosion. Handling, inspection, surveillance and maintenance procedures have been upgraded, and more than 20,000 visual inspections of cylinders have been performed. Hundreds of severely corroded cylinders have been measured ultrasonically for wall thickness, and cylinder recoating efforts are well under way for cylinders with the highest levels of corrosion. A pilot lot of approximately 2,200 cylinders has been recoated at Paducah, and production programs at Oak

Ridge and Paducah started up in June 1998 and have recoated about 1600 cylinders to date. More than 1,000 cylinders are projected to be completed annually.

In December 1997, in response to a June 1997 letter from the Board regarding inadequate coverage in the Final Safety Analysis Report of a cylinder handler fire that would cause a rupture of a cylinder, DOE committed to a new set of controls. During 1998, the needed safety controls were implemented, including installation of fire suppression equipment. Technical Safety Requirements were modified to limit the allowable cylinder handler fuel loading, and additional procedural and maintenance controls were developed and finalized.

4.3.4 Hazardous Chemical Storage

The Board's staff is reviewing the chemical safety programs at all major DOE sites, even though chemical safety is not specifically under the Board's cognizance. This is because unplanned chemical reactions could lead to the release of radioactive material at defense nuclear facilities, and such incidents are within the Board's purview. The Board has observed that DOE has not rigorously followed up on its Chemical Vulnerability Study of 1994 or the Secretary of Energy's safety initiatives following the explosion at the Plutonium Reclamation Facility in May 1997. Since the Board's staff began its chemical safety study, DOE Headquarters has established a combined DOE/Contractor Chemical Safety Interest Group under the auspices of the Energy Facilities Contractors Group to formulate chemical safety issues and propose possible resolutions to DOE for line management action. The Board has expressed concern about the initial lack of line management involvement in the chemical safety issue. Line management involvement is a fundamental part of integrated safety management necessary to establish appropriate chemical safety controls.

The Board has also initiated a dialogue with the Center for Chemical Process Safety and has encouraged DOE's ES&H secretarial officers to similarly engage. Operating under the auspices of the American Institute of Chemical Engineers, the Center has much to offer regarding good chemical safety practices.

The Board's staff has observed deficiencies in the characterization of legacy chemicals and the incorporation of chemical safety programs into ISM programs at the major sites. For example, SRS does not have a chemical management program that is integrated with its nuclear safety program. After meeting with the Board's staff in October 1998, DOE called for the establishment of such a program, and followed up on several identified deficiencies in the safety program. RFETS and the Hanford Site have made progress in incorporating chemical safety into their ISMSs. The Hanford Site now requires its contractors to use an automated hazards identification form that helps identify chemical hazards. However, Hanford has not characterized all of its legacy chemicals, especially those in miscellaneous inactive underground storage tanks, as required by the Secretary of Energy's more recent directives.

Two reviews conducted by the Board's staff at the Y-12 Plant have disclosed weakness in job hazard analysis procedures relevant to chemical safety. Several facilities contained abandoned and excess or improperly stored chemicals not addressed in the facility safety basis.

Acknowledging such deficiencies, the contractor has indicated it would make improvements in conjunction with the implementation of ISM at the Y-12 Plant. Recently, the Board's staff noted some improvement in the storage conditions at the facilities.

Chemical reactions have caused several problems in radioactive waste packaging operations at the Fernald Environmental Management Project during the past two years. Investigation by DOE found that procedures and management systems were not adequate to prevent the packaging of chemically incompatible wastes together in a single container. After these events occurred, the Board's staff held discussions with DOE and the contractor regarding the root cause of the events and proposed corrective actions. Questions and comments by the Board's staff led to improved quality and level of detail of the reviews, and to upgraded safety of waste management operations. The Board's staff will continue to follow not only safety management at Fernald in general, but also the nexus of chemical safety and nuclear safety.

4. 4 WASTE MANAGEMENT

In keeping with the Board's statutory mandate to ensure the establishment of appropriate safety standards for DOE's activities, the Board has emphasized the importance of issuing DOE Order 435.1, *Radioactive Waste Management*, to incorporate the safety-related measures of Recommendation 94-2 and as a replacement for the existing DOE Order 5820.2A. DOE Order 435.1 addresses three major waste types—high-level, transuranic, and low-level waste—and the safety requirements for design, construction, operation, and decommissioning of associated facilities. The following subsections address, for each of those waste types, those activities in defense nuclear facilities essential for the protection of the health and safety of the public.

4.4.1 High-Level Waste

Savannah River Site In-Tank Precipitation Facility

The In-Tank Precipitation (ITP) Facility was intended as a pretreatment facility for use in concentrating and removing radioactive fission products from high-level waste liquids at SRS. The separated fission products would have been processed at the Defense Waste Processing Facility. The decontaminated liquids would have been processed at the Saltstone Production Facility. With the ITP process, chemical and radiolytic decomposition of the tetraphenylborate precipitating agent occurs, generating substantial quantities of benzene, a flammable and carcinogenic gas. If the accumulated precipitates were to decompose rapidly, the resulting benzene release could be very large. Such an event would pose a major flammability hazard. The Board's Recommendation 96-1, *In-Tank Precipitation System at the Savannah River Site*, was issued in August 1996 to ensure that the hazards associated with the ITP process would be adequately understood and controlled before the ITP Facility commenced operations. Laboratory experiments carried out in response to Recommendation 96-1 confirmed the Board's concerns and led DOE to conclude early in 1998 that the ITP process could not be operated safely without significant upgrades to the ITP Facility. As a result, DOE has halted efforts to begin operations at the ITP Facility, and alternatives to the ITP process are under evaluation.

The Board has carefully reviewed the methodology DOE is using to evaluate alternative waste treatment technologies, as well as the results of these evaluations. DOE began with a wide variety of candidate technologies and systematically reduced the field to four finalists: small-scale tetraphenylborate precipitation, nonelutable ion exchange, caustic-side solvent extraction, and direct grouting of tank liquids without cesium removal. The Board agrees that each of these options could be carried out safely, but each also has its own strengths and drawbacks. Notable drawbacks include the need to deal with benzene in downstream facilities for the small-scale tetraphenylborate option, the large radiological source term of the loaded nonelutable exchange media, the immaturity of the caustic-side solvent extraction process, and the need for on-site disposal of large quantities of radioactive cesium for the direct grouting option. DOE has not yet decided how to proceed from this point, but the Board expects a decision to be made soon. Immobilization of high-level waste at SRS remains one of the Board's highest priorities, and the Board will continue to review DOE's efforts to select a safe and effective process to replace ITP.

While DOE considers alternatives to the ITP Facility, the remnants of process testing at the ITP Facility are continuing to pose hazards. Tank 49, which holds radiologically contaminated, tetraphenylborate-bearing wash water from ITP process testing, was recently discovered to generate benzene at rates greater than the authorization basis limits for flammability. This problem resulted from inadequate control of the tank chemistry, which allowed conditions known to be favorable for benzene generation to arise. As a corrective action, the vapor space in this tank has been inerted with nitrogen, and improved flammability controls are being established. Tank samples indicate that virtually all the tetraphenylborate in the tank has already decomposed, and the benzene hazard should end once the intermediate decomposition products themselves decompose. The Board has reviewed draft versions of the proposed controls and will endeavor to ensure that the final controls provide adequate protection for the short period of time during which the benzene releases are expected to persist. This problem is a clear illustration of the need to fully understand and control process chemistry in waste treatment facilities. It also provides further incentive to use caution in pursuing the application of tetraphenylborate precipitation for high-level waste processing.

SRS High-Level Waste Facilities

A major upcoming activity at SRS is the 1999 start-up of the Replacement High-Level Waste Evaporator. This large new facility, located within the tank farms, will be used to concentrate high-level waste in order to conserve tank space at SRS. The site contractor recommended to DOE that only a contractor Readiness Assessment be conducted to verify the readiness of the facility prior to start-up. The Board preferred that the applicable DOE Order, 425.1, *Startup and Restart of Nuclear Facilities*, be followed. This Order clearly requires a full Operational Readiness Review, which includes independent verification of readiness for new nuclear facilities such as the new evaporator. After numerous interactions between DOE and the site contractor, and the Board's staff, DOE decided in 1998 that a full Operational Readiness Review should be performed. The Board believes this more rigorous review will provide better assurance that the new evaporator can operate safely.

The Board also reviewed high-level waste operations at SRS. In general, those operations were found to be conducted in a formal, well controlled manner. However, an effort to add water to Tank 8 high-level waste in preparation for its retrieval was found to be fraught with problems not recognized by the site contractor or DOE. Tank 8 is a 1950s-vintage single-wall tank that sits in a 5-foot-tall steel pan to contain leaks. Preparations for responding to potential leaks from the tank during the water addition were inadequate. Equipment needed to remove waste from the tank in the event of a leak was inoperable, the installed transfer jet was located too high above the waste to be useful, the response procedure was still in draft form, and the amount of water to be added was sufficient to overflow the leak collection pan. These concerns were identified to DOE, leading SRS to apply a more rigorous ISM methodology to this activity, which resulted in significantly improved planning and controls. This incident emphasizes the importance of continued attention to detail for every nuclear operation, even at sites with strong site-wide safety management systems and generally good conduct of operations.

Tank Waste Remediation System at Hanford

One of the most difficult tasks facing DOE is remediation of the more than 50 million gallons of high-level radioactive waste currently stored in 177 underground storage tanks at the Hanford Site. The system for storing, retrieving, processing, and immobilizing this waste is TWRS. The Board considers adequate characterization of the wastes at the Hanford Site to be the necessary first step in ensuring their safe storage, processing, and disposal. The Board has issued three sets of recommendations on this subject. Largely at the Board's urging, DOE has made substantial progress in the sampling and characterization of the wastes. The Board held a public meeting at the Hanford Site in August 1998 to discuss this progress. Information provided at that meeting indicated that a total of 139 of the tanks have been sampled. DOE has completed the sampling, characterization, and theoretical analysis associated with potentially explosive organic complexant mixtures, and has since issued a report showing that an explosion or fire cannot occur. DOE also has implemented a high-volume sampler for obtaining waste samples needed for designing processing systems in a timely fashion.

The progress DOE has made in characterizing the Hanford wastes is commendable; however, continued sampling and characterization of the remaining tanks will certainly provide additional necessary information. In particular, refined sampling techniques for flammable gases in the waste will aid in closing the flammable gas safety issue. Continuing to sample for organic solvents may allow DOE to narrow the number of tanks potentially at risk of an organic solvent burn. Lastly, additional characterization may be prudent to identify tanks with extreme chemical characteristics that may make processing difficult. DOE has been advised by the Board that this information could be useful in designing optimal blending sequences for providing feed for TWRS.

In 1992, while reviewing the design of one TWRS project, the Multi-function Waste Tank Facility, the Board found that this project, and indeed the rest of the TWRS, suffered from the lack of a systematic design process. In Recommendation 92-4, *Multi-Function Waste Tank Facility at the Hanford Site,* the Board recommended that DOE establish a systems engineering

process to ensure that all system requirements, including those necessary for the protection of health and safety, are considered for all phases of the system's life cycle.

In 1998, DOE satisfactorily completed all the commitments in its implementation plan for Recommendation 92-4. As reported in the Board's 1997 Annual Report, primary among DOE's improvements in systems engineering was development and use of the TWRS Program Logic, which identifies the logical flow of the TWRS efforts, including primary prerequisites, chronology, and interfaces. The Board recognized this logic as integral to the successful management of the TWRS and requested that DOE provide periodic updates on its evolution. In these updates, DOE successfully showed that the logic had been further defined at lower levels and was having a beneficial impact on the overall progress of the system, including the start-up of the new cross-site transfer line and initiation of retrieval of high-heat waste from Tank C-106. The Board considers the development of systems engineering at TWRS to be a success and worthy of application to the site as a whole.

Removal of High-Level Waste from Tank C-106 at the Hanford Site

The process of removing about 200,000 gallons of high-level nuclear waste sludge from the 50-year-old single-shell Tank C-106 and transferring the waste to double-shell Tank AY-102 was begun in late 1998. Tank C-106, the highest heat-generating single-shell tank at the Hanford Site, required the addition of 6,000 gallons of water each month to cool the waste. The removal of waste from Tank C-106 reduces the potential for leakage to the environment and eliminates the monthly addition of water. The waste is removed using a high-pressure liquid jet and vertical lift pumps to mobilize and remove the waste. This is the first attempt to transfer radioactive waste sludge at Hanford since 1978. Once the waste has been transferred to Tank AY-102, it will serve as the high-activity feed for the initial phase of waste vitrification operations planned at the Hanford Site.

The Board and its staff have closely followed and reviewed contractor and DOE activities on the Tank C-106 project, including the Safety Analysis Report and Technical Safety Requirements. The Board's staff also evaluated the DOE Operational Readiness Review completed before waste transfer operations were allowed to begin. Waste transfer operations began on November 18, 1998, but were stopped after the release of volatile organic compounds (VOCs) from Tank C-106 exceeded the permit limit. Operations will not be resumed until process or equipment changes are made to reduce the VOC releases below the permit limit. The Board's staff intends to follow the resolution of this issue and the progress of activities toward removal of the Tank C-106 waste sludge in 1999.

High-Level Waste Tank Level Rise in Tank 101-SY

Prior to the installation and subsequent periodic use of a mixer pump in 1993, the waste level in Hanford Tank 101-SY had been observed to rise as a result of accumulation of flammable gas in the sludge beneath a liquid supernate layer in the tank. When the sludge had accumulated enough gas, it became buoyant and rapidly rolled over, resulting in a significant release of flammable gas to the vapor space in the tank. The mixer pump had been operated

periodically to stir the waste sufficiently to prevent the buildup and rapid release of flammable gas in the tank.

In late 1997, DOE discovered that the waste level in Tank 101-SY had risen 2 to 4 inches during the year. Since then, the waste level has continued to rise. Applying the information gained from its tank waste characterization program and using the systematic approach developed in response to Recommendation 92-4, DOE methodically investigated this phenomenon, developed a plausible explanation, and planned a course of action. DOE concluded that the rise in waste level is the result of accumulated gas and that there is no credible release mechanism that could cause the vapor space in the tank to reach flammable concentrations. However, the level rise cannot be permitted to continue unabated. DOE plans to perform additional characterization of the tank waste and to transfer a sufficient amount of waste to Tank 102-SY in order to mitigate the problem. The waste currently in Tank 102-SY must be transferred to the East Tank Farms, necessitating the first use of a new cross-site transfer line. These activities, in addition to the planned sluicing of Tank C-106, represent a significantly higher operational tempo at the tank farms than that executed in the recent past. During 1999, the Board and its staff will continue to follow this safety issue closely and evaluate DOE's progress toward its resolution.

4.4.2 Low-Level Waste

Recommendation 94-2 called for a complex-wide review of DOE's low-level radioactive waste program to establish the dimensions of the low-level waste problem and identify suitable corrective actions. Most of the actions proposed in the recommendation either have been completed or are currently being addressed appropriately. Remaining open actions include meeting the requirement for "development and issuance of additional requirements, standards or guidance on low-level waste management that address safety aspects of waste form and packaging, burial ground siting and performance assessment, facility design, construction, operation, closure, and environmental monitoring." This action has been subsumed under DOE's efforts to produce a new overall waste management Order (435.1) to replace existing DOE Order 5820.2A. Substantial progress has been made on this new Order; it is expected to be issued in early 1999. Two additional actions remain necessary for closure of Recommendation 94-2. The first is the completion, or evidence of satisfactory progress toward completion, of the remaining comprehensive performance assessment analyses for existing low-level waste burial grounds. The second is the implementation of an acceptable strategy for meeting outstanding low-level waste research and development needs. The Board intends to work with DOE toward closing this recommendation by the end of 1999.

4.4.3 Transuranic Waste

Waste Isolation Pilot Plant

WIPP, a geologic repository intended for the disposal of defense transuranic nuclear wastes, was excavated out of a rock salt formation, 2150 feet below the desert surface, 26 miles east of Carlsbad, New Mexico. The Board has been reviewing the operational safety of WIPP

since early 1990. After several years of reduced attention to WIPP, reflecting continued operational delays resulting from various administrative, procedural, and legal obstacles, the Board increased its efforts in late 1997 in response to DOE's planned mid-1998 start-up of WIPP disposal operations. The Board's staff reviewed WIPP authorization basis documentation, as well as the waste characterization and certification audit process used by the DOE Carlsbad Area Office for the storage/generator sites expected to make initial shipments to WIPP for disposal.

In 1998, the Board's staff evaluated DOE's Operational Readiness Review for WIPP. The Board's staff also reviewed an emergency preparedness exercise and the safety and reliability of the mine hoist intended for transport of waste below ground for disposal. Based on these efforts and on an assessment of past review efforts by the Board and its staff, the Board concluded that WIPP could be operated safely. The Board reported this conclusion to the Secretary of Energy in a letter dated June 23, 1998.

DOE expects that the issues causing continuing legal and administrative delays will finally be resolved in 1999. It is the Board's intention, therefore, to carefully track WIPP developments, and conduct reviews to ensure that the readiness to operate safely demonstrated in 1998 is carried over into 1999 and through start-up of waste disposal operations.

Advanced Mixed Waste Treatment Project at Idaho National Engineering and Environmental Laboratory

In December 1998, the Board forwarded to DOE the results of a staff review of the design for the Advanced Mixed Waste Treatment Project. This project is a privatization effort to retrieve, characterize, treat, and package a large inventory of low-level transuranic waste that originated from defense nuclear facilities elsewhere in the DOE complex. The design is in the early stages. Operations are scheduled to begin by 2003. Preliminary staff reviews indicate that much of the design to date appears sound, but that more effort is required on preliminary safety analyses and on identification of structures and systems relied upon to perform safety functions. This identification is a key step in the design process since it determines which codes and standards should be invoked for safety-related structures, systems, and components. A thorough identification of safety systems early in the design can avoid the significant delay and disruption that would be required later in the design to correct deficiencies. The Board intends to assist DOE through its attention to the safe design aspects of this project.

4.5 DEACTIVATION AND DECOMMISSIONING

The Atomic Energy Act requires that the Board review and evaluate the content and implementation of standards (including applicable DOE Orders, rules, and requirements) relating to the design, construction, operation, and decommissioning of each DOE defense nuclear facility. After DOE determines that facilities are no longer needed to support the weapons program, the facilities will be deactivated and eventually will be decommissioned for reuse or dismantlement.

The Board has placed emphasis on:

- The need to stabilize special nuclear materials that are unstable residues of the weapons production program so they can be safely stored until final disposition.

- The initial clean-out of relatively stable, yet hazardous, materials in process lines, tanks, ducts, and other process equipment to allow contaminated facilities to be deactivated to a safe standby state.

- The location and characterization of known radioactive residuals after initial deactivation, to facilitate the planning required by the Environmental Protection Agency and the states before final demolition and cleanup commences when the Resource Conservation Recovery Act applies. DOE and EPA have agreed by memorandum of understanding that decommissioning activities will be conducted as Comprehensive Environmental Response, Compensation and Liability Act non-time-critical removal actions.

An objective of the Board regarding the hazardous remnants of weapons production is to confirm that DOE is aggressively pursuing the safe deactivation of excess defense nuclear facilities that pose a high risk to workers or the public. This objective is achieved by assessing the adequacy of DOE's risk-based approach for deactivation of excess defense nuclear facilities through evaluation of work activities. Facilities are selected for review based on a determination of potential risks to workers and the public.

During 1998, the Board focused its attention on standards development and deactivation and decommissioning activities at RFETS, the Hanford Site, the Y-12 Plant, and the Miamisburg Environmental Management Project (MEMP).[6] The number of clean-up projects selected by the Board for priority attention, using the considerations set forth above, is small relative to DOE's total environmental restoration program.

4.5.1 Activities at the Rocky Flats Environmental Technology Site

In 1998, the Board's staff reviewed the hazard analysis and identified safety controls for several RFETS decommissioning work packages. In addition, the staff performed extensive oversight of decommissioning activities to evaluate conduct of operations and radiological practices. Based on these observations and a series of radiological incidents, the staff discussed with RFETS the controls required to mitigate the identified hazards. The staff had two general concerns in this area. First, RFETS tended to rely on personnel protective equipment rather than engineered controls to eliminate or mitigate the hazards. Second, some of the engineered controls in use (e.g., air movers) had not been analyzed to ensure that they produced the desired result. Partly in response to these concerns, a multidisciplinary team was chartered at RFETSto develop a new generation of size-reduction tents with more rigorous engineered controls and

[6] Formerly referred to as the Mound Plant.

analyzed performance. RFETS is also investigating the use of remote size reduction for contaminated equipment. The Board's staff intends to follow these initiatives in 1999.

Building 779

Decommissioning activities at Building 779 (the former Plutonium Process Development Building), a moderate-risk plutonium facility, were approached as a pilot project, with the objective of applying knowledge and experience gained during this closure to future decommissioning activities at high-risk facilities at RFETS. Decommissioning of Building 779 began in early 1998 upon approval of the Decommissioning Operations Plan and successful completion of a management review. During 1998, approximately 90 gloveboxes were disconnected, size-reduced, and removed from the building. In addition, ducting removal began in the fall. The Board's staff oversaw the three readiness reviews conducted for removal of gloveboxes, implementation of the new BIO, and removal of ducting. The Board's staff also reviewed the implementation of an ISMS. In addition to the issues discussed in the preceding section, the Board's staff identified potential improvements in pre-evolutionary briefs, air sampling of the workers' breathing zone, and qualifications of operations personnel. These items were addressed by RFETS during 1998. The Board's staff, in cooperation with EPA and state authorities, plans to continue its review of Building 779 decommissioning until the nuclear hazards have been substantially reduced through completion of the removal of gloveboxes and contaminated ducting next year.

Building 771

The Board has identified Building 771 (the former Plutonium Recovery Facility) at RFETS as one of the highest-priority defense nuclear facilities slated for decommissioning. Building 771 contains more than 50 kg of plutonium held up in gloveboxes, ducts, equipment, plenums, furnaces, tanks, piping, and contaminated rooms or areas. In 1998, as part of activities addressing Recommendation 94-1, RFETS began tapping and draining the actinide and reagent solutions held up in piping and tanks. The Board endorses RFETS's proposal to DOE to remove the process piping immediately after the system has been drained rather than waiting several years; this approach is expected to provide efficiency benefits. During 1998, the piping associated with two reagent systems and an actinide system was removed. Oversight of these activities by the Board's staff has consisted of reviews of the hazard analyses and work packages, observation of two readiness reviews, and observation of the pipe removal activities. These reviews identified improvements that could be made in the verification and validation of the procedures, the training of the operators, and line management's ability to decide when it was time to conduct the readiness reviews. These matters were addressed by DOE and its contractor as part of the resolution of readiness review findings.

The Board's staff also identified several situations in which inadequate radiological controls were to be used for removing contaminated process piping. As a result of a discussion of this issue between the staff and RFETS personnel, the radiological controls were strengthened by requiring the use of more contamination containment, ventilation, and personnel protective equipment to reduce the spread of contamination and protect the workers against surprise

hazards. The Board's staff, in cooperation with state authorities, plans to continue taking an active role in overseeing the preparations for and conduct of removal of process piping during 1999. In general, these interactions among DOE, State, the Board, and contractors are proceeding in a commendable spirit of cooperation and unity toward a common goal.

4.5.2 Activities at the Hanford Site

233-S Plutonium Concentration Facility

The 233-S Plutonium Concentration Facility (233-S Facility) was built in 1955 to expand plutonium production by further concentrating the plutonium nitrate solution produced by solvent extraction by the REDOX Plant. The 233-S Facility operated until July 1967, at which time it was added to the DOE Surplus Facility Management Program as a retired facility. An estimated 1.5 kg of plutonium-239 remains in the process portion of the facility. DOE's removal action program calls for dismantlement and disposal of highly contaminated process systems, decontamination and/or stabilization of the facility, and then its demolition and disposal.

In May 1998, the Board's staff observed the Operational Readiness Review related to decommissioning of a portion of the 233-S Facility. The review represented a unique approach to DOE's traditional readiness review process and was important for two reasons: (1) the DOE Richland Operations Office (DOE-RL) review team had been asked to approve readiness for activities at the 233-S Facility that had not yet been planned, and (2) the 233-S Facility decommissioning is a pilot project, and thus the readiness process being tested there would likely be the prototype for future decommissioning projects within DOE. The Board's review revealed a systematic problem in the way DOE-RL was implementing its start-up and restart readiness verification process. This problem was addressed to the Board's satisfaction in the review team's final report and will require that DOE-RL conduct appropriate readiness reviews of decommissioning activities at the 233-S Facility. The Board's staff will observe additional readiness activities as they are performed and will continue to monitor the conduct of the most hazardous of decommissioning operations.

B-Plant

B-Plant was built during World War II to process plutonium for nuclear weapons, and was later reconfigured to remove strontium and cesium from Hanford's high-level waste storage tanks. The deactivation of B-Plant was completed in September 1998. The deactivation activities included removal of contaminated organic solvents, decontamination of the canyon, clean-out of piping and process cells, and installation of a new ventilation system. The deactivation also involved the decoupling of auxiliary operations and support services provided by B-Plant to the adjacent Waste Encapsulation and Storage Facility. During the deactivation process, the Board's staff conducted several reviews of the health and safety aspects of the B-Plant deactivation project, including the continued use of an aged filter train in the exhaust ventilation system, as well as the design of the new exhaust ventilation system. In part because of the Board's oversight activities, the existing ventilation system was replaced with a new

exhaust ventilation system, which has significantly reduced the potential for a radiological release to the environment.

B-Plant still contains between 100,000 and 1 million curies of residual radioactive materials. However, these materials have been stabilized to the extent that the facility can be left safely in a surveillance and maintenance mode, i.e., a non-time critical remediation status, for the near term until their final disposition is decided.

4.5.3 Activities at the Y-12 Plant

Building 9206 at the Y-12 Plant contains substantial quantities of material at risk. The facility is in a stand-down operational status, with no plans to restart operations. The original mission of the building was the recovery of a wide range of highly enriched uranium (HEU), but its current use is limited to storage of excess fissile material awaiting disposition. This backlog consists of more than 2,600 batches of uranium-bearing material in several forms and various enrichments, with a total net weight of 20,000 kg, with approximately 3,200 kg of uranium-235. The material is packaged in cans, vessels, drums, plastic bags, and containers located throughout the facility in vaults, piping, hoods, and tanks. Many safety vulnerabilities in the facility have been identified by the Board's staff and in DOE's HEU Vulnerability Assessment.

The Board issued a letter to DOE in February 1998, noting the lack of attention that Building 9206 was receiving even as the hazards and risks continued to increase because of neglect. Some safety deficiencies raised to management are starting to receive attention, and it appears that progress toward stabilizing the facility is beginning to be made. In late 1998, the Board's staff reviewed the status of deactivation and transition activities at Building 9206. Accomplishments made since previous staff reviews include removal of some hazardous and radiological material from storage areas; repackaging of some suspect containers of HEU; decontamination to reduce radiological and contamination areas; performance of several Unreviewed Safety Question Determinations to address HEU vulnerabilities; addition of an on-site maintenance crew; and issuance of a draft Deactivation Management Plan. Funding continues to be an uncertainty in long-term planning; DOE needs to identify the source of the funds required to move this initiative forward. Of particular concern is the delay in issuance of the BIO and the Preliminary Hazard Analysis, which are many months behind schedule and affect work planning and the development of implementation procedures. The Board's staff plans to continue to review deactivation and decommissioning activities in Building 9206, and to assess the BIO and final Deactivation Management Plan when they become available in 1999.

4.5.4 Activities at the Miamisburg Environmental Management Project

The mission of MEMP in Miamisburg, Ohio, is clean-up, environmental restoration, and private economic development. MEMP was built in the 1940s to produce components for nuclear weapons using radioactive tritium. A significant milestone was reached in the MEMP clean-up process with the safe removal of the last quantity of bulk tritium from the site in September 1998. Although a small amount of tritium remains in facilities and process equipment, the removal of the bulk of the tritium has significantly reduced a potential

environmental risk. This cleanup of tritium was the culmination of a 32-month project during which the Board's staff conducted several on-site reviews of the tritium operations. During the course of these reviews, the staff identified several potential safety concerns, which DOE and the MEMP site contractors satisfactorily addressed.

4.5.5 Deactivation and Decommissioning Standards

The Board reviewed and provided substantial input to DOE's revision of DOE Order 430.1A, *Life Cycle Asset Management,* and the development of DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities.* These efforts concluded an 18-month period in which the Board and DOE worked closely to develop and issue a DOE technical standard that comprehensively addresses methodologies for safe deactivation and decommissioning of nuclear facilities while incorporating the Board's approach to integrated safety management. Additionally, the Board worked with DOE to develop the requirements needed to address safety and health issues associated with the transition from facility operations to a safe and stable facility configuration while awaiting deactivation and/or decommissioning. The Board's staff is continuing to work with DOE in developing the detailed guidance to be used in implementing the requirements for the Order. It is anticipated that these two documents will be issued during the first quarter of 1999.

5. ADMINISTRATIVE MATTERS

CONTENTS OF THIS SECTION

5.1 PERSONNEL RECRUITMENT

By law, the Board is authorized to hire up to 150 full-time employees. As of December 31, 1998, it had 5 full-time Board Members and 90 full-time staff. Two Site Representatives are located at the Pantex Plant, near Amarillo, Texas; two Site Representatives at the Hanford Site, in Richland, Washington; one Site Representative at the Rocky Flats Environmental Technology Site, near Denver, Colorado; one Site Representative at the Savannah River Site, near Aiken, South Carolina; and one Site Representative at the Oak Ridge Site, near Oak Ridge, Tennessee.

The technical mission of the Board requires staff with multidisciplinary backgrounds and specialized engineering and scientific knowledge, and with demonstrated competencies in all major aspects of nuclear safety. The Board's technical staff includes individuals with extensive experience in nuclear, mechanical, electrical, chemical, structural, and metallurgical engineering and in physics. As an indication of the Board's technical talent, 25 percent of the technical staff hold degrees at the Ph.D. level, and an additional 72 percent have masters degrees. Most of the others, all of whom are college graduates, are technical interns who plan to complete their masters-level engineering programs within the next year. Moreover, almost all technical staff members, except interns, possess practical nuclear experience gained from duty in the U.S. Navy's nuclear propulsion program, the nuclear weapons field, or the civilian reactor industry. Three members of the General Counsel's office have a technical/scientific degree in

addition to a law degree. Both the Board and its staff include individuals experienced in environmental impact assessments and regulatory processes.

Staff expertise is supplemented on occasion by outside experts with special technical knowledge and extensive experience in the areas of plutonium processing, weapons assembly and disassembly, and other nuclear operations. Since the limited staff size precludes the ability to cover all technical and scientific matters by means of in-house specialists, the Board contracts for specialized technical expertise as needed. Drawing on the work of the Board's technical staff and outside experts and utilizing their own considerable specialized knowledge and capabilities, the Board Members have been able to make technical judgments and to serve as authors of the Board's recommendations and related actions.

Through its technical intern program, the Board has continued to recruit and develop a select group of the nation's top engineering graduates. Currently, five interns are in various phases of a 3-year training program encompassing formal graduate school education and on-the-job training. The outstanding academic and on-the-job performance of the five staff members who have already completed the intern program are proof of the effectiveness of these recruitment and selection methods. Board staffing projections include the recruitment of at least two technical interns in 1999.

5.2 OFFICIAL SITE VISITS BY BOARD MEMBERS AND STAFF

From the establishment of the Board in October 1989 through the end of 1998, in addition to its full-time Site Representatives, the Board, its staff, and its contractor experts have collectively made 1398 site visits to DOE's defense nuclear facilities. In 1998 alone, 300 such site visits were made. These visits focused primarily on selected facilities that both the Board and DOE consider to pose the most pressing safety issues in light of DOE's mission. Where appropriate, reports on staff visits have been conveyed formally to DOE managers.

During its visits to DOE sites, the Board has reviewed health and safety issues firsthand, and has gathered information relevant to its recommendations to the Secretary of Energy and their implementation.

5.3 INQUIRIES INTO HEALTH AND SAFETY ISSUES

During 1998, combined teams of legal and technical members of the Board's staff closed 37 and opened 10 new inquiries into health and safety issues at several defense nuclear facilities pursuant to 42 U.S.C. § 2286a. Inquiries were conducted at the Rocky Flats Environmental Technology Site, Oak Ridge National Laboratory, the Hanford Site, the Savannah River Site, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Idaho National Engineering and Environmental Laboratory, the Pantex Plant, and the Fernald Site. Several of these inquiries led to significant improvement in practices or conditions that could have adversely impacted public health and safety and, in a few cases, affected national security

missions conducted at DOE's defense nuclear facilities. Most of the lessons learned and corrective actions resulting from these inquiries had application throughout the defense nuclear complex.

Through continuing review of DOE's infrastructure for protecting safety-related structures, systems, and components from nonconforming or suspect/counterfeit parts, the Board's staff discovered a failure in DOE's response to an interagency alert issued by the Department of Defense regarding suspect/counterfeit electronic components sold to several federal agencies, including DOE. Intervention by the Board's staff provided DOE with legal, technical, and administrative assistance that enabled DOE to protect potentially compromised missions and to cooperate fully with actions of DoD and the Department of Justice.

DOE subsequently took effective measures to evaluate and control the future introduction of suspect/counterfeit parts into applications with the potential to adversely affect worker and public safety and the safe maintenance of the nuclear weapons stockpile. Specifically, with regard to the suspect semiconductor devices, DOE identified and technically evaluated the adequacy of the devices in significant national security applications and provided assurance that the suspect devices will not compromise the safety or support of the stockpile.

In response to issues raised by a concerned individual regarding the control of radiological sources and the use of cargo containers for temporary storage at Rocky Flats, the Board's staff conducted an inquiry into practices aimed at controlling radiological sources and the use of cargo containers for temporary storage. The Board's staff found no safety hazards associated with the issues raised by this individual. As a result of inquiries made by the Board's staff, however, weaknesses in the control of radiological sources and cargo containers were identified. The DOE Rocky Flats Field Office and contractors now recognize the vulnerabilities involved, and have taken actions to institute effective controls on sources, and to both improve controls on the use of cargo containers for temporary storage and reduce the number of cargo containers at the site.

The Board's staff also expanded upon the issues raised by this concerned individual regarding the use of cargo containers by conducting a thorough review of practices and controls applied to materials removed from buildings being decommissioned at the Rocky Flats Environmental Technology Site. This review included the use of all temporary storage, controls on equipment destined for the sites, and controls on parts and tooling to be provided to other sites. As a result of this expanded review, the Board's staff found the outdoor storage of low-level radioactive wastes to be poorly managed. DOE subsequently directed the contractor to take actions to improve storage conditions for low-level wastes.

The Board's staff also found deficiencies in practices used at Rocky Flats for the control and shipping of parts and tooling that are removed from buildings and are to be provided to other sites. As a result of the staff's inquiries, DOE appointed an individual to be responsible for all aspects of off-site shipments. Additionally, sites that have experienced problems with shipments from Rocky Flats have now formally identified those problems to Rocky Flats personnel.

5.4 PUBLIC INTERACTION WITH THE BOARD

The Board is sensitive to the need for public involvement in, and awareness of, defense nuclear safety issues. In its public health and safety reviews, the Board's contacts with the public are primarily through open meetings and easy access to the Board's technical documents on the Internet and in its public reading room. Since 1990, the Board has held 66 public meetings at sites across the nation and in Washington, D.C. The Board has found these meetings to be a highly effective tool for encouraging responsiveness on the part of DOE representatives, and for exchanging information with state and local officials, labor leaders, DOE facility workers, public interest groups, and area residents. The Board's public reading room is open to the public every working day. The staff has received numerous complimentary letters from private citizens, public interest groups, corporations, and other government agencies on the availability of the Board's technical and administrative documents.

During 1998, the Board conducted five public meetings at its Washington, D.C., office, and two in Richland, Washington. In addition to these meetings, members of the Board's staff have provided informational briefings to local officials, citizens advisory boards, and other public interest groups in the vicinity of the Pantex Plant, the Savannah River Site, the Hanford Site, and Rocky Flats Environmental Technology Site.

At three of the Board's public meetings, the Board, its technical staff, and outside experts discussed the status of DOE's implementation plan for Recommendation 95-2, *Integrated Safety Management*. Two public meetings were held to examine DOE's progress on the implementation of Recommendation 94-1. The two meetings in Richland, Washington, were held to review the status of DOE's implementation of Recommendations 92-4 and 93-5.

Notices of the Board's public meetings are published in the *Federal Register* and are mailed to more than 400 organizations and individuals that have requested to be on the Board's mailing list. In addition, each notice is published in local newspapers serving the communities near the facility involved, as well as being placed on the Board's Internet Web site.

As an efficient and cost-effective vehicle for communicating information, the Board's Internet Web site has been expanded to include additional categories of information. The site, located at www.dnfsb.gov, provides among other items the entire text of all unclassified Board recommendations, biweekly updates of the log of correspondence/documents sent or received by the Board, trip reports and issue reports prepared by the Board's staff, weekly Site Representative reports, and other background information on the Board's health and safety review activities. The site has received two awards for its clarity, ease of use, and presentation of information.[7] As of the end of 1998, more than 60,000 visits to the Board's Web site had been logged.

[7] *NetGuide* and *Places to See* awards are given to Web sites based on content, presentation, and graphics. These two Web sites help guide users through the Internet and stay on top of the constantly changing Internet environment.

In accordance with Office of Management and Budget Bulletin No. 95-01, the Board has established and includes on its Web site its Government Information Locator Service, identifying and describing public information resources available and directing users on how they can obtain this information.

5.5 NATIONAL PARTNERSHIP FOR REINVENTING GOVERNMENT OBJECTIVES

The President has directed that all agencies of the executive branch review their individual legislative mandates and operations as part of a fundamental rethinking of what the Federal Government should do and how it should be done. This program, under the direction of the Vice President, is called the National Partnership for Reinventing Government.

The Board believes that as a relatively new agency (formed in November 1989), unencumbered by years of bureaucratic rules and practices, it has accomplished many of the streamlining objectives of the National Partnership for Reinventing Government. At its inception, the Board recognized the importance of carefully structuring an organization that would avoid layering, promote empowerment, and encourage timely action. The Board has built a strong organization based on the successful implementation of the following initiatives.

5.5.1 Reducing Regulatory Burden

The Board's policy on regulations is fully consistent with the President's memorandum on streamlining the bureaucracy. To date, the Board has promulgated only those internal regulations (rules) required by law and necessary to maintain orderly operations—related to the Freedom of Information Act, the Privacy Act, the Government in the Sunshine Act, and Organizational and Consultant Conflicts of Interest. Moreover, in promulgating these regulations, the Board has written the rules in ways that achieve the statutory purposes without burdening the Board or the public with inflexibility, or with overly prescriptive requirements that attempt to substitute excessive paperwork for sound judgment.

5.5.2 Excepted Service and Pay for Performance

The Board successfully argued for, and subsequently received through legislation and administrative delegations, the means to overcome many of the administrative roadblocks that have traditionally frustrated change in government organizations. Most prominent on this list of specific statutory authorities sought by the Board and ultimately granted by the Congress is the excepted service personnel authority.

The pay-banding and pay-for-performance concepts recommended in the National Performance Review have been operational at the Board for more than five years and have received favorable review by the General Accounting Office and the Office of Personnel Management. These concepts have proven to be highly effective in hiring technical talent,

holding employees accountable for their performance, and rewarding outstanding performance on the job.

5.5.3 "No Frills" Approach to Operations

From the first day of operation, the Board Members have set a standard for having a "no frills" approach to conducting business. For example, the Board does not employ chauffeurs and has no government automobiles for local travel of Board Members or staff. Internal directives have been written to give practical and easily understood guidance in the most simplified manner. The Board has converted to the Electronic Time and Attendance Management System for recording of time and leave. All employees receive their salary checks and travel reimbursements by electronic funds transfer. The issuance of travelers checks has been eliminated by using ATM access for travel advances and encouraging all travelers to obtain a government-issued credit card for travel expenses. Government credit cards are also used extensively by the Board for telephone calls and miscellaneous purchases. These initiatives have provided good customer service and reduced overhead costs.

5.5.4 Effective Organizational Structure

The Board maintains focus on its mission to ensure adequate protection of public and worker health and safety at DOE defense nuclear facilities. By using matrix management, the Board has gained management flexibility and avoided the creation of layers of middle management that could dilute limited staff resources and thereby impede the Board's ability to perform health and safety reviews.

Adopting the approach of economies of scale for obtaining needed administrative support services, the Board has negotiated interagency agreements with the U.S. Nuclear Regulatory Commission, the Public Health Service, and the General Services Administration to obtain support for accounting, personnel, and payroll services. Resources that would normally be diverted to these administrative functions remain dedicated to the Board's health and safety mission.

5.5.5 Management Continuity

Under the Board's enabling legislation, the five Board Members are appointed to staggered five-year terms on a full-time basis. Thus, the Board has enjoyed management continuity and has not been subjected to the disruption of frequent changes in leadership that has been experienced by many government agencies. This continuity has permitted the Board to provide precise and consistent direction in conducting its technical mission and addressing major policy issues, as well as a degree of constancy and stability for DOE's upgrading efforts in safety management.

5.5.6 Information Technology

To improve communications with DOE field sites and to reduce travel time and expenses, the Board has installed video teleconferencing equipment at its field locations. The Board has used this technology for the rapid exchange of information during briefing sessions with multiple DOE field sites on issues that impact the entire weapons complex. This technology enables the Board's Headquarters and field staff to receive briefings from DOE and its contractors with minimal burden to DOE's staff. In 1998, the Board extended video teleconferencing capabilities to the Site Representative location at Oak Ridge, Tennessee.

The Board maintains a high-speed connection to the Internet for all staff members, which allows technical and administrative staff to communicate via electronic mail with other federal and state agencies and members of the public. Staff members use their desktop computers to obtain the latest information on events at defense nuclear sites; to review draft DOE rules and Orders; to exchange information with professional societies; to perform research on technical and legal subjects; to access notices, legislation, and legal decisions; and to send draft reports to colleagues for review. In addition, technical staff on travel and site representatives have remote access to the Board's local area network through dial-in communications, and can retrieve and send files, review electronic mail, and communicate with colleagues at headquarters.

APPENDIX A. BOARD RECOMMENDATIONS 98-1 AND 98-2

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

[Recommendations 98–1]

Integrated Safety Management and the Department of Energy (DOE) Facilities

AGENCY: Defense Nuclear Facilities Safety Board.

ACTION: Notice recommendations.

SUMMARY: The Defense Nuclear Facilities Safety Board has made a recommendation to the Secretary of Energy pursuant to 42 U.S.C. 2286a concerning integrated safety management and the Department of Energy (DOE) facilities.

DATES: Comments, data, views, or arguments concerning this recommendation are due on or before November 5, 1998.

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) 208–6400.

Dated: October 1, 1998.
John T. Conway,
Chairman.
[Recommendation 98–1]

Integrated Safety Management and the Department of Energy (DOE) Facilities

Dated: September 28, 1998.

On October 11, 1995, the Defense Nuclear Facilities Safety Board (Board) issued to the Secretary of Energy its Recommendation 95–2, entitled Safety Management. The Recommendation proposed adoption by the Department of Energy (DOE) of a concept termed ''Integrated Safety Management'' (ISM) as a means of improving assurance of safety at DOE's defense nuclear facilities. The Secretary of Energy provided an implementation plan for the Recommendation on April 18, 1996, which the Board accepted in turn. In accordance with the implementation plan, DOE issued its Policy Statement 450.4 to be the basis for initiation and conduct of ISM at its facilities.

DOE and its contractors are making good progress in implementing the concept of ISM at defense nuclear facilities. One of the central functions of ISM called out both in the Recommendation and the implementation plan is ''feedback and improvement.'' That function is exercised both in planning work and establishing safety controls at the outset, and in subsequent assessment of the diligence in application and the success in achievement of safety.

DOE has established through its directives system its expectation of actions by both the federal work force and contractor management in assessing the effectiveness of its safety management programs as they are practiced. Such safety assessments include both observance of work and determination of long term trends. They are accomplished principally through two major kinds of assessments for feedback and improvement.

· Self-assessment by the contractor of site/facility/activity programs responsive to DOE Policy 450.5, and parallel oversight by DOE line managers and facility representatives responsible for the missions and contractor performance. This is assessment by line management.

· Corporate level assessments by DOE safety specialists (ES&H), independent of the line, responsible for capturing and sharing lessons learned, preparing trend analyses, performing special investigations and otherwise performing corporate-level reviews in support of the Secretarial Offices. This is independent assessment.

These assessments and the corrective actions taken in response to them are important elements of the internal safety management program of DOE.

In the course of its oversight of DOE's safety management program, the Board has noted considerable variability in implementation and effectiveness of the feedback and improvement function as performed by the numerous federal and contractor entities.

There appears to be much collection of data (about 30 DOE directives drive the process) but less evidence of follow-up.

To facilitate a closer examination of the matter, the Board in a March 20, 1998, letter stated its observations, and requested a report on how the function was being performed at defense nuclear facilities. DOE, by letter dated June 3, 1998, provided such report. The report and the matter in general were the subject of discussions with representatives of DOE and its contractors at a public meeting held by the Board in Washington, DC, on June 24, 1998.

The outcome of these exchanges to date has been a mutual understanding of a number of improvements that are merited. An action plan presented to the Board in DOE's letter of June 3, 1998, proposes to focus on four areas:

· Accelerating implementation of DOE Policy 450.5,

· Improving DOE's tracking and follow-on processes,

· Improving DOE's lessons Learned processes, and

· Improving implementation of the Functions, Responsibilities, Accountability Manual (FRAM) relative to feedback and improvement..

The Board commends DOE for these initiatives. As worthy as they are, however, they are not, in the Board's view, sufficient to cover all aspects of DOE's feedback and improvement of its safety management programs. The Board has noted that the initiatives for improvement, particularly DOE's actions on findings, are limited to results of oversight by line operations. They do not address deficiencies in feedback and improvement based on results of independent oversight by the Office of the Assistant Secretary for Environment, Health and Safety (EH)—more specifically that of the Deputy Assistant Secretary for Oversight (EH–2). The purpose of this recommendation is to address that matter.

For many years, it has been commonplace for DOE's Headquarters to conduct independent assessments of safety management by the field offices and their contractors, in relation to performance of DOE's hazardous work. This parallels a normal practice of headquarters of commercial hazardous industries which have multiple product lines and facilities and which therefore delegate primary responsibility for doing work safely to officials of a facility or a product line. But assessment of safety is not sufficient. To be effective, the constructive criticisms must be brought to the attention of corporate management. There they must be evaluated, and course corrections must be directed, if the benefits of assessment are to be achieved. This is especially true where resource issues are involved and allocation or re-allocation of funds is required.

Recognizing that at times there is a need for Secretarial involvement at levels above the program offices and the corporate role of the independent assessors, in September 1989 Secretary Watkins established the Office of Nuclear Safety (ONS), reporting directly to him as described in SEN–6E–92. That led to Secretarial review of all findings of ONS, and an opportunity for response at the Secretarial level if necessary. With the change in Administration in 1994, this Office was assigned to report to the Assistant Secretary for ES&H, and it was redesignated as EH–2 with direction by a Deputy Assistant Secretary. In that capacity, EH–2, according to the DOE Manual of Safety Management Functions, Responsibilities, and Authorities (DOE M411.1–1), performs corporate level assessments, independent of the safety management programs as implemented by DOE program offices and associated contractors.

Evaluations are provided to the Secretary of Energy, Congress, Cognizant Secretarial Offices, Field Managers and Contractors. However, under this organizational arrangement, most of the assessments and findings by EH–2 are treated largely as advisories. Such follow-up actions as are taken are no longer subjected to a deliberative process involving, when appropriate, the Office of the Secretary of Energy (Secretary, Deputy Secretary, Under Secretary). Rather, they become discretionary to lower levels of DOE line management (such as cognizant Secretarial Officers and Field Managers). An exception to this general discretionary pattern occurs when an accident results in death or serious injury of workers, or threatens the public. For example, Type A accident investigations require, among other things, corrective action plans (CAPs), approval of the CAPs by the cognizant secretarial officer, and completion of corrective actions subject to independent verification. These requirements, in DOE Order 225.1A, Accident Investigations, November 26, 1997, and supporting guidance effectively close the loop on accident investigations.

EH–2 does make a practice of requesting a CAP after submission of a report on other types of investigation, and usually receives one from the cognizant party. Proposed corrective actions in these CAPs are frequently incomplete and are sometimes only loosely related to findings in the oversight report. Some CAPs are no more than commitments to provide a CAP in the future. The Department of Energy has not identified criteria for adequate CAPs, nor has DOE authorized EH–2 to require adequate CAPs which are responsive to evaluation reports. As a result, problems identified as accident precursors are not handled with the same rigor as accidents themselves. The end effect is that corrective action under the current system is reactive rather than proactive.

Nothing prevents EH–2 from elevating safety issues via its management (Assistant Secretary for ES&H), but the process of evaluation is now ad hoc, not institutionalized and protocol driven. There is a natural tension between those charged with doing work safely and those tasked by management to monitor and evaluate how well the doers perform. There is also a natural resistance to having to reallocate resources when deficiencies are found. Such factors cause outcomes to depend highly on the forcefulness of the personalities involved. It is precisely at this interface between the Secretarial Program offices and the independent reviewers of safety performance (EH–2) that DOE's safety management program merits additional attention. The need for an institutionalized protocol for content and treatment of a CAP, and for addressing and resolving differences are the central points of issue.

The Board is of the opinion that the Department of Energy should take additional action with respect to its program for improvement of feedback and safety for defense nuclear facilities by establishing clearer lines of authority and responsibility for resolution of safety findings of its internal, independent safety organization. Towards such end, the Board recommends that the Department of Energy:

1. Establish by policy statement, directives, or other protocols, the manner in which the Secretary expects Cognizant Program Secretarial Officers (Assistant Secretaries) and Field managers to address and resolve findings of its independent internal corporate safety organization (Assistant Secretary for ES&H). In so doing, consideration should be given to direction and guidance for the following:

· Establishing authority and responsibility for conducting and responding to independent oversight, preparing and approving corrective action plans, reporting on progress toward timely and adequate closure of findings, and subsequent closure, including independent verification of closure.

· Elevating cases of inadequate or untimely response to findings to the Office of the Secretary for resolution.

· Describing the purpose and content of corrective action plans responsive to oversight findings (e.g., cause identification, actions, to correct immediate problem, lessons learned, actions to prevent recurrence).

Scheduling the time frames within which the evaluation and process activities must occur.

· Periodically reporting the status of corrective actions by the responsible entity.

· Tracking findings and corrective actions to closure with a system accessible to DOE line management and the independent oversight organization.

2. Make explicit the Secretarial Officer or designee assigned the resolution function.

John T. Conway,
Chairman.

September 28, 1998.

The Honorable Bill Richardson,
Secretary of Energy,
1000 Independence Avenue, SW,
Washington, DC 20585–1000

Dear Secretary Richardson: On September 28, 1998, the Defense Nuclear Facilities Safety Board (Board), in accordance with 42 U.S.C. § 2286a(a)(5), unanimously approved Recommendation 98–1, which is enclosed for your consideration. Recommendation 98–1 deals with Integrated Safety Management and the Department of Energy (DOE) facilities.

42 U.S.C. § 2286d(a) requires the Board, after receipt by you, to promptly make this recommendation available to the public in DOE's regional public reading rooms. The Board believes the recommendation contains no information which is classified or otherwise restricted. Atomic Energy Act of 1954, 42 U.S.C. §§ 2161–68, as amended, please arrange to have this recommendation promptly placed on file in your regional public reading rooms.

The Board will publish this recommendation in the Federal Register.

Sincerely,

John T. Conway,
Chairman.

c: Mr. Mark B. Whitaker, Jr.

[FR Doc. 98–26753 Filed 10–5–98; 8:45am]

BILLING CODE 3670–01

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

[Recommendation 98–2]

Safety Management at the Pantex Plant

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 safety management at the Pantex Plant. The Board believes that opportunities exist to strengthen and simplify the process by which DOE
designs and develops activities at the Pantex Plant and independently evaluates the safety of those operations. The Board believes that DOE should take action to improve these processes. However, the recommendation contains Information which is classified and otherwise restricted. Therefore, only the letter forwarding the recommendation (which is unclassified when separated from the attachment) is being published.

FOR FURTHER INFORMATION CONTACT:
Kenneth M. Pursateri or Andrew L. Thibadeau at the address above or telephone (202) 208–6400.

Dated: October 1, 1998.
John T. Conway,
Chairman.

Appendix—Transmittal Letter to the Secretary of Energy

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700,
Washington, D.C. 20004, (202) 208–6400
SECRET—RESTRICTED DATA

September 30, 1998
The Honorable Bill Richardson,
Secretary of Energy, 1000 Independence Avenue, SW, Washington, DC 20585–1000

Dear Secretary Richardson: On September 30, 1998, the Defense Nuclear Facilities Safety Board (Board), in accordance with 42 U.S.C. §2286a(a)(5), unanimously approved Recommendation 98–2, which is enclosed for your consideration. Recommendation 98–2, deals with Safety Management at the Pantex Plant.

42 U.S.C. § 2286d(a) requires the Board, after receipt by you, to promptly make this recommendation available to the public in the Department of Energy's (DOE) regional public reading rooms. However, the recommendation contains information which is classified or otherwise restricted. Please arrange to have this letter forwarding the recommendation (which is unclassified when separated from the attachment) promptly placed on file in your regional public reading rooms.

The following is an unclassified summary of the Board's recommendation: The Board believes that opportunities exist to strengthen and simplify the process by which DOE designs and develops activities at the Pantex Plant and independently evaluates the safety of those operations. The Board believes that DOE should take action to improve these processes.

Sincerely,
John T. Conway,
Chairman.
c: Mr. Mark B. Whitaker, Jr.

When separated from enclosures, this document is unclassified. Document transmitted herewith contains Secret/Restricted Data.

[FR Doc. 98–26867 Filed 10–6–98; 8:45 am]
BILLING CODE 3670–01–M

APPENDIX B. LIST OF ABBREVIATIONS AND ACRONYMS

AA . . . . . Authorization Agreement
ACB . . . . . Auxiliary Charcoal Bed
APSF . . . . . Actinide Packaging and Storage Facility
BIO . . . . . Basis for Interim Operation
Board . . . . . Defense Nuclear Facilities Safety Board
CMIP . . . . . Capabilities Maintenance and Improvement Project
CMR . . . . . Chemistry and Metallurgy Research
DAF . . . . . Device Assembly Facility
D&I . . . . . Disassembly and Inspection
DEAR . . . . . Department of Energy Acquisition Regulations
DoD . . . . . Department of Defense
DOE . . . . . Department of Energy
DOE-RL . . . . . Richland Office of the Department of Energy
DP . . . . . Department of Energy's Office of Defense Programs
DP-20 . . . . . Deputy Assistant Secretary of Energy for Military Applications and Stockpile Support
EH-2 . . . . . DOE's Office of Environment, Safety, and Health
EPA . . . . . Environmental Protection Agency
EUO . . . . . Enriched Uranium Operations
FEB . . . . . Facility Evaluation Board
FR . . . . . Department of Energy's Facility Representative
FRAM . . . . . Manual of Safety Functions, Responsibilities and Authorities
FY . . . . . Fiscal Year
GPRA . . . . . Government Performance and Results Act (of 1993)
HAR . . . . . Hazards Analysis Report
HF . . . . . Hydrogen Fluoride
HEU . . . . . Highly Enriched Uranium
HIVES . . . . . Highly Invulnerable Encased Safe
INEEL . . . . . Idaho National Engineering and Environmental Laboratory
IPSPP . . . . . Integrated Pit Storage Program Plan
ISM . . . . . Integrated Safety Management
ISMS . . . . . Integrated Safety Management System
ITP . . . . . In-Tank Precipitation (Facility)
LANL . . . . . Los Alamos National Laboratory
LEP . . . . . Life Extension Program
LLNL . . . . . Lawrence Livermore National Laboratory
LMES . . . . . Lockheed Martin Energy Systems
MEMP . . . . . Miamisburg Environmental Management Project
MHC . . . . . Mason and Hanger Corporation
NESS . . . . . Nuclear Explosive Safety Study
NESSG . . . . . Nuclear Explosive Safety Study Group
NFPA . . . . . National Fire Protection Association

LIST OF ABBREVIATIONS AND ACRONYMS (Concluded)

NRC . . . . . Nuclear Regulatory Commission
NTS . . . . . Nevada Test Site
OMB . . . . . Office of Management and Budget
ORNL . . . . . Oak Ridge National Laboratory
ORR . . . . . Operational Readiness Review
PFP . . . . . Plutonium Finishing Plant
RFETS . . . . . Rocky Flats Environmental Technology Site
SNFP . . . . . Spent Nuclear Fuel Project
SNL . . . . . Sandia National Laboratories
SNM . . . . . Special Nuclear Material
SPRF . . . . . Sandia Pulsed Reactor Facility
SRD . . . . . System Requirements Document
SRS . . . . . Savannah River Site
SS-21 . . . . . Seamless Safety for the 21st Century (process)
TA-55 . . . . . Technical Area 55
TWRS . . . . . Tank Waste Remediation System
U-233 . . . . . Uranium-233
VOC . . . . . Volatile Organic Compounds
WIPP . . . . . Waste Isolation Pilot Plant
WSRC . . . . . Westinghouse Savannah River Company
WSS . . . . . Work Smart Standards