
SIXTH ANNUAL REPORT
TO CONGRESS

DEFENSE NUCLEAR FACILITIES
SAFETY BOARD



MARCH 1996

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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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March 25, 1996

To the Congress of the United States:


The Defense Nuclear Facilities Safety Board (Board) is pleased to submit to the Congress its sixth annual report for calendar year 1995. The Board is an independent executive branch establishment responsible for providing advice and recommendations to the President and the Secretary of Energy regarding public health and safety issues at Department of Energy (DOE) defense nuclear facilities. The Board also reviews and evaluates the content and implementation of health and safety standards, as well as other requirements, relating to the design, construction, operation, and decommissioning of DOE defense nuclear facilities.

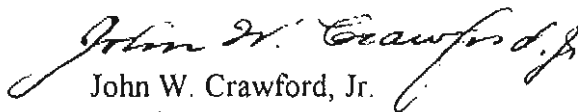
As required by statute, the Board's report summarizes activities during calendar year 1995, assesses improvements in the safety of DOE defense nuclear facilities, and identifies remaining safety problems.


Since our last report, the Secretary of Energy has received the report of a committee appointed by her to provide advice concerning the feasibility of external regulation of DOE's nuclear safety program. Inasmuch as the Board is identified in the committee's report as a possible base for external regulation of this portion of DOE's activities, the Board's report also responds to the committee's recommendations, in addition to the information required by the Board's enabling statute.


Respectfully submitted,


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**REPORT TO CONGRESS ON BOARD ACTIVITIES
RELATED TO HEALTH AND SAFETY DURING 1995**

TABLE OF CONTENTS

I.	INTRODUCTION	1
A.	BACKGROUND	1
B.	REPRESENTATIVE ACCOMPLISHMENTS IN 1995 ARISING FROM BOARD ACTIONS	4
II.	MAJOR TECHNICAL ACTIVITIES OF THE BOARD DURING 1995	6
A.	HEALTH AND SAFETY MANAGEMENT OF DEFENSE NUCLEAR FACILITIES - COMPLEX-WIDE ISSUES	6
	Review of DOE Proposed Safety Rules and Revised Orders and Standards ..	6
	Board Guidance Concerning Standards-Based Safety Management	11
	Continuing Efforts to Raise the Technical Competence and Expertise of DOE	15
	Efforts to Improve the Definition of Safety Responsibilities Among Headquarters and Field Organizations	18
	Safety Management of Laboratory Research and Development (R&D)	19
	Readiness of Facilities to Operate	20
	Department-wide Radiological Protection Program	22
B.	ASPECTS OF INTERNAL BOARD OPERATIONS	24
	Current Board Authority as a Means to Influence DOE Actions	24
	Formal Recommendations	24
	Reporting Requirements	27
	Public Hearings and Public Meetings	28
	Participation in the Work of the Advisory Committee on External Regulation of Department of Energy Nuclear Safety	29
	New/Rotated Site Representatives	30
C.	SAFETY ASPECTS OF DESIGN AND CONSTRUCTION OF DEFENSE NUCLEAR FACILITIES	30
	Defense Waste Processing Facility at the Savannah River Site	30
	In-Tank Precipitation Facility at the Savannah River Site	31

Structural Adequacy of Plutonium Storage Facility at the Rocky Flats Environmental Technology Site	32
Los Alamos National Laboratory (LANL) Design Process for the Chemistry and Metallurgy Research (CMR) Building	32
Preparations for Major Upgrades at LANL CMR Building	33
Guidance for Conducting Readiness Reviews at the Nevada Test Site (NTS)	33
Device Assembly Facility (DAF) at the Nevada Test Site (NTS)	33
Systems Engineering at the Hanford Site	34
D. SAFELY MANAGING SURPLUS NUCLEAR MATERIAL AND WASTE	34
Stabilization of Fissionable Residues at the Rocky Flats Environmental Technology Site	34
Nuclear Material Stabilization at the Savannah River Site	35
Spent Nuclear Fuel at the Savannah River Site	35
Spent Nuclear Fuel Stored in the K-Basins at the Hanford Site	36
Integrity of Cesium and Strontium Capsules at the Hanford Site	36
Adequacy of Nuclear Material Storage Conditions at the Oak Ridge Y-12 Plant	37
Cylinders Containing Depleted Uranium at the Gaseous Diffusion Plants ..	37
High-Level Waste Storage Tanks at the Hanford Site - Ferrocyanide Hazards	37
High-Level Waste Storage Tanks at the Hanford Site - Characterization of Tank Contents	38
Neutralization of Residual Production Materials at the Fernald Environmental Management Project	38
Implementation of Recommendation 94-2 - Improving DOE's Low-Level Waste Program	39
E. SAFETY ASPECTS OF NUCLEAR WEAPONS STOCKPILE STEWARDSHIP AND MANAGEMENT	40
Oversight of Stockpile Stewardship and Management Activities at the Nevada Test Site	40
Disparity in Applicability of Orders	40
Implementation of Recommendation 93-1/NESS CAP	40
Implementation of Recommendation 93-6	41
Improvements at the Pantex Plant	43
Reduced Risk due to Aircraft Overflights	43
Improved Technical Staffing in the Amarillo Area Office	43
Readiness to Begin Weapons Assembly/Disassembly Operations ..	44
Improved Conduct of Operations and Use of Standards	44
New and Upgraded Safety Analyses	45

	Design and Safety Basis for the New Special Nuclear Material Staging Facility	45
	Conduct of Operations and Criticality Safety at the Y-12 Plant, Oak Ridge	45
	Project Sapphire - Receipt and Handling of Highly Enriched Uranium from the former Soviet Union	46
	Control of the Authorization Basis for a Nuclear Research and Development Facility	47
	Reservoir Unloading at the Mound Laboratory	47
F.	SAFETY ASPECTS OF DECOMMISSIONING DEFENSE NUCLEAR FACILITIES	47
	Decommissioning Memorandum of Agreement Concerning the Rocky Flats Environmental Technology Site	48
	Deactivating the UO ₃ Facility at the Hanford Site	48
	Deactivating the PUREX Facility at the Hanford Site	49
	Decommissioning of C-Reactor at the Hanford Site	49
	Deactivation and Decommissioning of the Rocky Flats Environmental Technology Site	50
III.	ADMINISTRATIVE MATTERS	51
A.	PERSONNEL RECRUITMENT	51
B.	OFFICIAL SITE VISITS BY BOARD MEMBERS AND BY STAFF	51
C.	PUBLIC INTERACTION WITH THE BOARD	52
D.	NATIONAL PERFORMANCE REVIEW (NPR) STREAMLINING OBJECTIVES	53
	Starting Without Encumbrances	53
	Reducing Regulatory Burden	53
	"Excepted Service" and Pay for Performance	53
	"No frills" Approach to Operations	54
	Effective Organization Structure	54
	Management Continuity	54
	Experienced Leadership	54
	Information Technology	55
	Accountability vs. Excessive Controls	55
	Customer Service	55
IV.	PLANNED FOCUS OF BOARD ACTIVITIES DURING 1996	57
	Operational Formality - A Complex-Wide Issue	57

APPENDICES	61
1995 Board Recommendations	61

REPORT TO CONGRESS ON BOARD ACTIVITIES RELATED TO HEALTH AND SAFETY DURING 1995

I. INTRODUCTION

A. BACKGROUND

Beginning in the early days of World War II and continuing to the present, the Department of Energy (DOE) and its predecessor agencies, the Atomic Energy Commission and the Energy Research and Development Administration, produced special nuclear materials and designed, manufactured, tested, and maintained the weapons in the nation's nuclear arsenal. During most of that period, the defense nuclear weapons complex operated without independent external oversight. In the late 1980's, however, increasing awareness of the accumulating public health and safety issues involving many of the aging defense nuclear facilities led Congress to pass a law in 1988 to create the Defense Nuclear Facilities Safety Board (Board). The Board, which came into existence in 1989, a year later, is an independent technical oversight organization within the Executive Branch, chartered to provide advice and recommendations to the Secretary of Energy to ensure adequate protection of public and worker health and safety at DOE's defense nuclear facilities.

The Board is responsible for independent oversight of all activities relating to nuclear safety within DOE's nuclear weapons complex. Many of these activities are now associated with cleanup of extensive radioactive contamination resulting from decades of production operation. DOE is actively engaged in the ongoing process of disassembling nuclear weapons, maintaining the remaining weapons in the stockpile in a safe and reliable condition, and conducting research focused on ensuring the continued stewardship of the stockpile. In addition, considerable attention is currently being devoted to safe storage of fissionable material removed from disassembled weapons and of material remaining in the system following the abrupt cessation of many production activities more than seven years ago.

By law, the Board is required 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. The Board must consider the technical and economic feasibility of implementing the recommended measures, and 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 an imminent or severe threat to public health or safety exists, the Board is required to transmit its recommendations to the President, as well as to the Secretaries of Energy and Defense.

The enabling statute, 42 U.S.C. § 2286 *et seq.*, requires the Board to review and evaluate the content and implementation of health and safety standards, including DOE's orders, rules, and other safety requirements pertaining to the design, construction, operation, and decommissioning of DOE's defense nuclear facilities. The Board must then recommend to the Secretary of Energy any specific measures, such as changes in the content and implementation of those standards that the Board believes should be adopted to ensure that the public health and safety are adequately protected. The Board also is required to review the design of new defense nuclear facilities before their construction begins, as well as modifications to older facilities, and to recommend necessary changes. Review and advisory responsibilities of the Board continue throughout the full life cycle of facilities, including shutdown and decommissioning phases.

The Board may conduct investigations, issue subpoenas, hold public hearings, gather information, conduct studies, establish reporting requirements for DOE, and take other actions in furtherance of its review. These ancillary functions of the Board relate to the accomplishment of the Board's primary function, which is to assist DOE in identifying and correcting health and safety problems at defense nuclear facilities. The Department of Energy and its contractors at defense nuclear facilities are required to cooperate fully with the Board.

The terms of the statute setting up the Board gave clear guidance of what Congress had in mind for the Board to do, and the way it was to operate. Oversight with action-forcing powers was chosen instead of making the Board a regulator. Congress expected the Board's oversight to have many of the same positive results as regulation; that is, assure that DOE was implementing a program for the safe management of the production and use of defense nuclear materials, a program that provides reasonable assurance of no undue risk to the workers and the public, and protects the environment. Congress was well aware that DOE had issued safety policies and standards of good practices. However, Congress was also aware that they needed upgrading and that DOE and contractor operations in the past had left a residual of much contamination in buildings and the surrounding environment. DOE's problem appeared to be more one of failure by DOE to establish clear expectations of its contractors and to build safety compliance into the fabric of work planning and execution.

The Board's efforts in the past six years have been focused upon the examination of the standards identified by DOE as codes of good practices, the manner in which DOE defines for its contractors what is expected of them in the performance of DOE's mission, and how such expectations once established as requirements are enforced. These elements are basic to any safety management program whether internally or externally driven. The most significant deficiencies noted by the Board in these basic elements have been communicated to DOE via the recommendation process set forth in our authorizing legislation. These recommendations not only describe the perceived deficiency, but also provide guidance as to what the Board believes is advisable for a solution. Details of plans for addressing the issues identified through the recommendation process are then submitted by the Secretary for Board approval. The Board follows the progress of the required action program until the planned action has been completed.

To date the Board has issued 33 sets of recommendations containing 147 specific recommendations. These will be discussed in more detail later.

Not all Board action-forcing activities lead to formal recommendations. The Board's assigned functions also include the review of design, construction, operation, and decommissioning of defense nuclear facilities. For such activities the Board's charter allows it to satisfy a real need for DOE to get on with its work with a minimum of delay due to external oversight. The Board, through assignment of its staff to monitor and review work, whether it is design, construction or readiness preparations for operations, has been able to keep its reviews synchronized with DOE activities. Technical concerns that arise are frequently resolved by the technical staffs of DOE, the Board, and contractors without the need for action-forcing measures by the Board. If the Board determines there are unresolved safety issues that require resolution before proceeding, the Board can define the issue for the Secretary and recommend resolution before proceeding. In the case of operations at the Rocky Flats Environmental Technology Site, Congress specifically required the Board to certify safety of readiness before resumption of operations could begin.

In addition to its reviews of the basic elements and structure of DOE's safety management program, the Board has given priority attention to facilities and activities believed to represent the greatest safety risks -- mainly those that now comprise the residual of the nuclear weapons complex devoted to stewardship, maintenance and surveillance of nuclear weapons, the storage of strategic and highly radioactive materials and the stabilization of hazardous residuals of weapons production. For those facilities and operations representing significant hazards (e.g., those classified as hazard classes 1 and 2), the Board is pressing DOE to develop safety management programs that result in clearly defined systems and components important to safety, the technical specifications that define limiting conditions for operation, and the infrastructure needed to support maintenance and safety in operation. This has already been done in a number of cases. The extension of this effort to all high-risk facilities is the thrust of the Board's Recommendation 95-2. The end goal is to have safety management programs that are well defined but tailored to the diverse operations that make up the DOE complex, the hazards-specific nature of the activities involved and the aged nature of the facilities in which such operations must be conducted.

With respect to decommissioning of defense nuclear facilities, the Board has tended to focus its activities on those facilities in transition to cleanup or environmental restoration under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). A substantial number of such facilities require considerable effort to remove radioactive materials, or otherwise deactivate them, before they can be considered safe for non-time critical¹ remedial action. CERCLA and RCRA statutes

¹ Non-time critical remedial action is action which can be deferred temporarily, but which should be completed at the first reasonable opportunity.

are administered by the Environmental Protection Agency (EPA) and the States. The Board is working cooperatively with EPA and the States to by DOE effect this transition smoothly. The Board has recently signed a cooperative agreement with the State of Colorado, EPA, and DOE with respect to activities at the Rocky Flats Environmental Technology Site (RFETS).

The Board is required by statute to report to Congress each year concerning its oversight activities, its recommendations to the Secretary of Energy, and improvements in safety achieved at defense nuclear facilities as a result of its activities. This report addresses that requirement.

B. REPRESENTATIVE ACCOMPLISHMENTS IN 1995 ARISING FROM BOARD ACTIONS

During 1995, a number of Board initiatives, some undertaken in previous years, were completed or advanced significantly. A representative sample of these accomplishments is summarized below. These, as well as others, are discussed further in later sections of this report.

- The Board issued a landmark recommendation urging DOE to improve the process used in development, review, and approval of documentation for methods to be used in ensuring safety (Authorization Bases) for facility operation or conduct of potentially hazardous activities, based on two technical reports prepared by the Board (Recommendation 95-2).
- Based on the guidance contained in the technical reports² supporting Recommendation 95-2, the Board had its staff complete assessments of authorization bases for a representative sample of high priority defense nuclear facilities and activities, demonstrating the soundness and adaptability of the concepts included in the reports and setting the groundwork for future reviews of authorization bases prepared by DOE and its contractors.
- In response to Recommendation 94-1, plutonium residues remaining from metal casting at the RFETS were successfully stabilized during the summer of 1995, and by mid-November 1995, all plutonium in contact with plastic had been repackaged.
- Also in response to Recommendation 94-1 and a Board technical report, DOE changed its previous plans for dry storage of deteriorating reactor fuel in storage basins at the Savannah River Site and is now planning to stabilize the fuel by processing it in F-Canyon.

² *Fundamentals for Understanding Standards-Based Safety Management of Department of Energy Defense Nuclear Facilities, DNFSB/TECH-5; and Safety Management and Conduct of Operations at the Department of Energy's Defense Nuclear Facilities, DNFSB/TECH-6.*

- Largely as a result of the Board's attention to the problems associated with deteriorating fuel at the Hanford Site, the K Basins now have in place most of the elements of an adequate authorization basis³, including an updated Safety Analysis Report, revised Operational Safety Requirements, a corresponding Safety Evaluation Report prepared by DOE, a Standards/Requirements Identification Document (S/RID), and revised facility procedures.
- As a result of Board emphasis on the need for comprehensive readiness reviews, substantial improvements were made in systems and practices at the F-Canyon and FB-Line at the Savannah River Site, leading to the timely availability of these facilities for stabilization of plutonium solutions.
- In early 1995, the Board issued Recommendation 95-1 after its staff found that many cylinders containing depleted uranium hexafluoride in outdoor storage at the three gaseous diffusion plants were handled and stored under conditions that could lead to high deterioration rates. As a result, DOE initiated a program for repairing the affected cylinders and for improving storage conditions.
- Spurred by Recommendation 90-7, DOE produced credible evidence during 1995 that the previously suspected accumulation of potentially explosive concentrations of ferrocyanide compounds in waste tanks at the Hanford Site had been mitigated by degradation of any such compounds to the point that they are now present in relatively harmless concentrations.
- Due in large part to the Board's intensive review, agreements between DOE and the Federal Aviation Administration (FAA) have been reached that will eventually eliminate most aircraft flights over the Pantex Plant, where nuclear weapons are dismantled, thereby significantly reducing the risk of an airplane crash into the Plant.
- Board attention to technical staffing of DOE's Amarillo Area Office and the Y-12 Site Office at Oak Ridge led to the hiring of technically competent engineering professionals in Amarillo and new technical staff members in the Y-12 Site Office, yielding substantial improvements in operations at both locations.
- In response to Recommendation 94-4, DOE took immediate steps to correct safety deficiencies at the Y-12 Plant at Oak Ridge and then validated the corrections through a formal restart process.

³ DOE Order 5480.21 defines "authorization basis" as: "Those aspects of facility design basis and operational requirements relied upon by DOE to authorize operation."

- The Board's staff played a substantial role in helping prepare a needed standard for storing highly enriched uranium at the Y-12 Plant at Oak Ridge. None had existed prior to the summer of 1995.
- In response to an earlier Recommendation (92-6), which called for improved guidance for timing, staffing and content of operational readiness reviews, DOE had developed a new order and a new DOE standard. Both were revised in 1995 to respond to a number of Board comments suggesting improvements in both documents.

II. MAJOR TECHNICAL ACTIVITIES OF THE BOARD DURING 1995

A. HEALTH AND SAFETY MANAGEMENT OF DEFENSE NUCLEAR FACILITIES - COMPLEX-WIDE ISSUES

Review of DOE Proposed Safety Rules and Revised Orders and Standards

In its enabling statute, 42 U.S.C. § 2286 *et seq.*, the Board is assigned responsibility for review and evaluation of “. . . the content and implementation of the standards relating to the design, construction, operation, and decommissioning of defense nuclear facilities of the Department of Energy (including all applicable Department of Energy orders, regulations, and requirements) at each Department of Energy defense nuclear facility.” In addition to those imposed by statute, DOE sets requirements for its employees and contractors through one or more of the following vehicles:

- Rules incorporated in the Code of Federal Regulations;
- DOE Safety orders or S/RID's⁴ for specific subject areas, incorporating specific requirements, such as standards; or
- Standards established by the American National Standards Institute (ANSI), by other recognized standards-writing bodies (such as technical or professional societies or associations), or by DOE, when incorporated into contracts or into the Code of Federal Regulations.

DOE's rules, orders, and regulations can be supplemented by “guidance documents” that present acceptable methods for meeting requirements established in one of the above forms.

⁴ DOE safety orders or S/RIDs, in themselves, do not impose enforceable requirements on DOE contractors, but become enforceable when they are invoked by specific contract provisions, which are legally binding (See *Fundamentals for Understanding Standards-Based Safety Management of Department of Energy Defense Nuclear Facilities*, DNFSB/TECH-5).

This guidance may include a recognized industry standard, an accepted industry practice, or an internal DOE standard.

This compendium can be viewed as depicting a hierarchy of established good practices that exist in three tiers. The first tier contains the statutes, rules and other regulations that can be viewed as non-discretionary. The second tier contains DOE safety orders and standards that can be seen as discretionary until their applicability is established by contract. The third tier of the hierarchy contains the DOE “how-to” safety and implementation guides.

Whereas selected practices contained within the first two tiers become requirements by law or contract, the guidance contained within the third tier is viewed by DOE to be “optional” and is briefly described below.

The DOE safety and implementation guides describe acceptable methods that the contractor may implement in order to meet specific requirements. DOE has stated that the contractor is not required to use these methods and may propose alternative implementation methods for DOE’s approval, as long as there is technical justification that an adequate level of safety, commensurate with the hazard, is achieved. In this context, the methods described in the DOE safety and implementation guides are termed “optional.”

It is from this fabric of recognized good practices that safety management programs are tailored to fit the specifics of the work to be done.

During the past several years, DOE has revised, improved, and upgraded some requirements in response to many factors, including not only Board Recommendations, but also DOE and contractor initiatives and a general recognition of the importance of safety standards and requirements in establishing an effective safety management program.

During 1995, DOE initiated a major “Order/Requirement Reduction and Streamlining” effort to overhaul the requirements it had developed and used for years, motivated by a number of influences, both internal and external. The scope of this effort includes substantial revisions of requirements covering administrative, procurement and technical aspects of how the Department does its business. These are set forth in a small number of rules and in hundreds of DOE orders pertaining to the broad spectrum of DOE’s responsibilities. This DOE undertaking involved large commitments of the Department’s technical, administrative, and legal staff resources. Of the many hundreds of orders, fifty-one (51) are related to nuclear safety matters for which the Board has oversight responsibilities.

From its inception, DOE’s Order/Requirement revision effort has been closely monitored by the Board, as that effort applied to the 51 orders of interest to the Board. After reviewing initial drafts of order changes and proposed rules under this effort, the Board observed that extensive deletions of many good practices now captured as safety requirements were being considered by DOE. That possibility led the Board to have its staff and its outside experts

review in detail the 51 safety-related orders and DOE's implementation of those orders in the field. Based on that review effort, the Board determined that much of the requirements and guidance in most of the 51 safety-related orders should be retained. The Board also found that substantial improvement was needed in some of the existing orders⁵. On the other hand, it appeared that DOE 5480.18B, *Nuclear Facility Training Accreditation Program*, might be unnecessary for low hazard facilities, provided DOE 5480.20A, *Personnel Selection, Training and Qualification Requirements for DOE Nuclear Facilities*, was rigorously implemented.

By year's end, the Board and its staff were extensively engaged in reviewing DOE's Order/Requirement Reduction Effort, providing detailed technical comments and requesting DOE to provide justification for changes to nuclear safety requirements being contemplated in the "new" series of orders and proposed rules. The Board and its staff called to DOE's attention inadequacies in the new orders/rules and in the technical justifications developed to support these requirement changes. The Board observed that in carrying out this effort, DOE has set aside or is making discretionary or optional many well-established safety practices, thus rendering the affected orders deficient.

Numerous technical meetings with DOE's staff have been held during the past year to review and discuss the technical merits of the proposed changes. In July 1995, after a four-month review period, the Board held a public meeting on DOE's "new" order/rule process, and in September, a second public meeting on the subject was held to examine some of the issues remaining at that time. During these meetings, the Board's staff testified that the requirements in some of the proposed rules or draft orders, when analyzed together with their associated guidance, do not represent, in total, an adequate set of requirements and guidance for establishing the Department's safety management program for protection of the health and safety of workers, the public, and the environment. Based in part on that testimony, the Board concluded that DOE needed to examine more closely the total set of requirements and guidance encompassing nuclear safety instead of embarking on piecemeal changes. As part of this proposed examination, the Board requested that DOE prepare a "mapping" or "cross-walk" showing the tracking of requirements from the existing set of 51 safety-related orders to the "new" orders and rules. DOE officials have stated that the cross-walk would be completed prior to the issuance of new orders and incorporation into contracts. Despite these assurances, DOE has not completed its own analysis to assure that important safety requirements have not been lost or inadvertently dropped.

⁵ These included DOE 4700.1, *Project Management*; DOE 6430.1A, *General Design Criteria*; and DOE 5820.2A, *Radioactive Waste Management*.

The Board has informed DOE that only six⁶ of twelve⁷ new or amended safety orders that DOE had issued by the end of 1995 provided safety management frameworks with safety levels comparable to those incorporated in their predecessors.

During 1995, DOE also embarked on a parallel process of replacing portions of the existing set of DOE safety orders with rules to be incorporated in Title 10 of the Code of Federal Regulations. Reviews by the Board and its staff in this arena raised issues identical to those encountered in the Order/Requirement Reduction Effort. Major deficiencies in several of DOE's proposed rules have been pointed out to DOE. The Board also has taken issue with DOE for failing to establish a single organization within DOE with technically competent individuals as the focal point responsible for the rule and order development effort. At present, there is no single organization within DOE responsible for carrying out this key assignment.

The Board recognized in 1994 that DOE's program to revamp its requirements system of rules, orders, standards, and guides was not being done as an integrated effort nor being directed at a common goal. Accordingly, the Board issued Recommendation 94-5 that stressed the need for the Department to establish clearly for its contractors and staff the relationship and expected manner of implementation of both the non-discretionary and discretionary components of its good practices governing defense nuclear facilities. The Secretary of Energy accepted this recommendation and submitted a plan for its implementation. Some progress has been made, but the issue has not yet been brought to closure. In part, this is because of the close connection of the 94-5 issues and those subsequently raised in the Board's Recommendation 95-2, dealing with standards-based safety management.

Notwithstanding the Department's good intentions, the results to date, in the Board's view, leave much to be desired. Of particular concern is the move toward generalization and minimization of discretionary guidance and non-discretionary requirements. In effect, this will give greater leeway to contractors to interpret how the requirements are to be met. In this regard, DOE is preparing many safety and implementation guides which identify acceptable methods for meeting specific requirements. Alternative methods for meeting the requirements may be proposed by the contractor. However, it is the Board's position that any implementation method selected must be justified to ensure that an acceptable level of safety, commensurate with the identified hazard, is achieved.

⁶ These six new orders covered *Emergency Management* (151.1), *Safety and Health Reporting Requirements* (231.1), *Startup and Restart of Nuclear Facilities* (425.1), *Life Cycle Asset Management* (430.1), *Departmental Materials Transportation and Packaging Management* (460.2), and *Accident Investigations* (225.1).

⁷ Six other new orders had been provided to the Board as of the end of the year: *Performance Indicators and Analysis of Operational Information* (210.1); *Occurrence Reporting* (232.1); *Facility Safety* (420.1); *Worker Safety and Health Program* (440.1); *Packaging and Transportation Safety* (460.1); and *Directives System* (251.1).

Of particular concern to the Board about this restructuring is the effect it may have on the development of standards-based safety management programs. When safety requirements are more general and less specific, enormous demands are placed on the technical expertise of those charged with evaluating safety management programs based on these types of requirements. The Board has repeatedly urged the Department to increase the number of highly qualified staff assigned safety management functions (see Recommendation 93-3). It may be necessary for the Department to form special task teams using non-government employees with requisite expertise, such as has been done for Operational Readiness Reviews, to evaluate and approve safety management programs proposed by contractors for highly hazardous facilities and activities (see more detailed discussion of this issue in later sections of this report).

In attempting to resolve these problems, the Board issued Recommendation 94-5 which proposed that DOE take a systems engineering approach to establishing safety management programs and tailoring standards for such programs to the hazards of individual facilities and operations being conducted. Although the Secretary of Energy accepted Recommendation 94-5 on February 21, 1995, the implementation plan subsequently submitted to the Board was deficient in many respects, and the Board so informed the Secretary on September 15, 1995. Many of the key points in the recommendation that should have led to features in the plan were not included. An acceptable plan has not yet been issued. In the meantime, the Board has directed its staff to continue to work in parallel with DOE in overseeing the revision of individual safety orders, rules, and standards, and the Board has strengthened its call for integrated safety management programs by issuing Recommendation 95-2. The Board noted in its letter of November 2, 1995, that cooperation and progress had stalled on staff efforts to revise individual orders, rules, and guidance due to DOE's premature issuance of inadequate revised safety orders, policy statements, and guidance, and the Department's failure to provide the promised "cross-walk" which was to map the fate of all safety requirements contained in previous orders.

The Board has repeatedly urged DOE to review the adequacy of its safety requirements to create a solid base for the Department's safety management program. While strongly supportive of such efforts, the Board is, however, concerned that DOE, in its zeal to reduce and simplify requirements, has set aside or made optional well-established safety practices. The Board intends to continue its critical and constructive oversight of the "new" orders and proposed rules to ensure that the underpinning of safety management is not compromised.

DOE's Orders/Requirements Reduction Effort is continuing, as is the Board's continuing oversight of it. The dialogue between the Board and senior DOE officials remains candid and open regarding deficiencies identified by the Board and its staff, but a clear path forward to their resolution has yet to be developed.

In its Fifth Annual Report, dated February 1995, the Board considered the desirability of requesting legislative authority for the Board to establish safety standards to be used by DOE or alternatively to request legislative authority to approve standards developed by DOE. At that

time, the Board concluded that such enhanced authority was unwarranted. The Board's experience in the past year is causing it to reassess that position (See later discussion on external regulation, beginning on page 29).

Board Guidance Concerning Standards-Based Safety Management

In keeping with Congressional intent as embodied in the Board's enabling statute, the Board has committed a considerable amount of its resources to oversight of how standards are used by DOE and its contractors in establishing and performing safety management of DOE's diverse defense nuclear activities. The focus of the Board's attention has been on the safety bases upon which DOE authorizes contractor performance of its more hazardous operations and the conditions it imposes on such operations in the interest of protecting public and worker safety and the environment. In this regard, the Board has observed considerable variability across sites and among facilities. Both the Board and the Department have been active in attempts to address this matter generically, as well as for specific facilities.

As one of its earliest formal interactions with DOE, the Board urged the Department, in Recommendation 90-2, to identify, assess the adequacy of, and determine compliance with the applicable safety standards at each of its defense nuclear facilities. The Board's continued attention to this matter is reflected in four additional formal Board Recommendations (91-1, 92-3, 93-1, and 94-5) that directly or indirectly involve applicable DOE safety standards. These recommendations and associated actions have been discussed extensively in previous annual reports. Neither the Board's efforts nor DOE's responses to date have brought standards-based safety management programs of the Department to the desired end state.

In a further effort to assist DOE to understand and apply safety standards, the Board issued a seminal technical report, *Fundamentals for Understanding Standards-Based Safety Management of Department of Energy Defense Nuclear Facilities* (DNFSB/TECH-5). The report describes a generic process that begins with hazards analysis and leads to definition of ways to: (1) prevent radiological exposure; (2) preserve and properly use safety features; (3) prepare for emergencies and mitigate effects of unanticipated events; and (4) manage the authorized activities safely. Such a process, when completed thoroughly and comprehensively, can result in the definition of an adequate safety management plan (tailored to the specifics of the facilities or activities) that the Board deems an essential part of the overall management plan for the contractor's conduct of specified work.

To further clarify and reemphasize the importance of establishing a standards-based set of safety requirements for operation of defense nuclear facilities, the Board also held a public meeting in late May, 1995 on Standards-Based Safety Management. During that meeting, the DNFSB/TECH-5 report was reviewed in detail to give DOE and the public an opportunity to fully understand the essential ingredients of safety management.

Concurrently with its development of a formal recommendation on this subject, the Board prepared a second report, *Safety Management and Conduct of Operations at the Department of Energy's Defense Nuclear Facilities* (DNFSB/TECH-6). This report elaborates on the concepts of safety management and conduct of operations as outlined in DNFSB/TECH-5 and addresses appropriate bases for authorizing operation of facilities or conduct of specific activities. Such a program delineates all those attitudes, processes, and precautions taken in the interest of safety, comparable in content and parallel to an Operating License issued by the Nuclear Regulatory Commission.

One of the initiatives undertaken by DOE in connection with its program for revising and promulgating standards has been an attempt to define a process for tailoring its generally applicable requirements to those needed for its diverse facilities and activities. The DOE objective is to impose upon any one operation or activity only those requirements that are "necessary and sufficient" to provide reasonable assurance of the safety of workers and the public, and the protection of the environment. In comparing this initiative with what the Board is advancing for defining adequate safety management programs, the Board observes some differences, but also much that is common.

In the interest of bringing the Board and DOE initiatives into synchronization, the Board issued⁸ Recommendation 95-2 on October 11, 1995, recommending that DOE improve the focus of its entire standards effort and urging that the Department follow the guidance in DNFSB/TECH-5 and 6. On January 17, 1996, the Secretary accepted parts of the Board's recommendation and expressed the Department's willingness to continue the dialogue on sub-parts of the recommendation that DOE was not yet ready to accept.

In a pilot program initiated late in the year, the Board's staff used the guidance in DNFSB/TECH-5 and -6 for preliminary trial reviews of authorization bases for a representative sample⁹ of 33 DOE facilities and activities identified as having the highest priority for Board attention¹⁰. The selection of facilities to be reviewed considered such factors as the severity of hazards, operational intensity, and expected lifetime of the operation involved. The sample included processing facilities, laboratory research and development facilities, and deactivation and decommissioning. Findings disclosed in the pilot program have been briefed to the Board, and will be provided to DOE as part of the Board's ongoing attention to this matter.

⁸ Copies of formal Board recommendations issued during 1995 appear in Appendix B.

⁹ Facilities in the sample included Buildings 371 and 771 at the Rocky Flats Environmental Technology Site; TA-55 and CMR at LANL; the K-East Basin and the Tank Farms at the Hanford Site; and the DWPF and both canyons at the Savannah River Site. Specific activities included implementation of Recommendation 94-1 at the Rocky Flats Environmental Technology Site; assembly and disassembly operations at the Pantex Plant; and decommissioning work at the Hanford Site.

¹⁰ The priority facilities and activities are presented in tabular form in Appendix A.

The scoping effort has been beneficial for two reasons. It demonstrates the soundness and adaptability of the TECH-5 and TECH-6 concepts for use in both identifying and evaluating the required elements of acceptable authorization bases, and demonstrates that the concepts in TECH-5 and -6 have general applicability, regardless of differences among processing facilities, weapons facilities, national laboratories, or activities. The review also identified significant deficiencies in the performance of hazards analysis and identification of preventive and mitigative systems, and in the establishment of approved authorization bases for operation of facilities or conduct of specific activities. In addition, the exercise provided a number of broad insights regarding the condition of existing facility authorization bases. In general:

- Gaps exist in the set of safety elements required for establishing authorization bases for several facilities. Exceptions were found in areas where the Board had previously called specific deficiencies to DOE's attention and where DOE had subsequently taken corrective action.
- In many cases, DOE's development of safety management plans does not address the entire spectrum of hazards that should be considered, analyzed, and mitigated. It appears likely that this occurs in many cases because existing DOE directives do not require in-depth analyses of scenarios involving accidents that are less severe than the design basis, or bounding accident.
- Authorization bases are consistently deficient in addressing worker safety. The Board emphasized this issue as a condition of readiness for long-term operation of any facility.

In contrast to these general inadequacies in authorization bases, there are several examples of successful efforts by DOE and its contractors, brought about in large measure by the Board's intervention and scrutiny of safety issues at the Savannah River and Hanford Sites. Application of the process described in DNF/SB/TECH-5 and -6 to facilities at these sites has resulted in major improvements to safety management programs. Many identified vulnerabilities were subsequently eliminated, thereby providing reasonable assurance that the safety of the public, the workers, and the environment is adequately addressed, as demonstrated in the following examples:

The original hazard/accident analyses for the Defense Waste Processing Facility at the Savannah River Site did not adequately assure confinement of potential hazards. As a result of the Board's attention, a more extensive, deterministic design basis analysis was conducted to evaluate potential effects on the public from postulated accident scenarios. An additional study was performed to evaluate the protection of co-located workers and workers assigned to the facility. These studies resulted in the establishment of additional systems to provide redundancy, the upgrading of certain systems to "safety-

related" status¹¹ to provide greater assurance of operation during and after an accident, and the establishment of additional administrative controls.

In early 1994, DOE planned to address the problems associated with deteriorating fuel in the K-Basins at the Hanford Site by encapsulating the fuel and sludge for continued underwater storage. Extensive Board attention has been applied to these basins, through Recommendation 94-1, staff assessments of facility operations, and, more recently, staff review of the authorization basis for the K-Basins. This involvement has helped focus attention on a more plausible path forward as well as a better defined authorization basis. Currently, the K-Basins staff has put in place most of the elements needed for an adequate authorization basis. An updated Safety Analysis Report and revised Operational Safety Requirements have recently been approved. A corresponding Safety Evaluation report has been prepared by DOE. In addition, a Standards/Requirements Identification Document has been approved by DOE and implemented into facility procedures. These activities provide not only a basis for authorization to operate the basins, but also a sound basis for review of new activities associated with removing the fuel from the basins.

The guidance in DNFSB/TECH-5 and -6 provides a descriptive, rather than prescriptive, methodology for an adequate certification-type process for either operation of a new defense nuclear facility or initiation of a significant new activity. In this regard, the process described in Recommendation 95-2 compares favorably with that currently being followed by the Nuclear Regulatory Commission in its consideration of safety of the gaseous diffusion plants.

The issuance of DNFSB/TECH -5 and -6 and the associated Recommendation 95-2 represents a proactive role in the Board's ongoing efforts to assist DOE in the development and implementation of adequate nuclear safety requirements and guidance. By setting forth its views on the essential elements of an adequate standards-based safety management plan that is fully compatible with industry practices throughout the domestic and international nuclear community, the Board has laid out a constructive path forward for DOE to revamp and modernize its safety management program.

Notwithstanding the Secretary of Energy's reserved acceptance of Recommendation 95-2, the Board is encouraged by growing evidence that some DOE Operations Offices and operating contractors have accepted, and are moving forward with, the development of safety management programs consistent with concepts advocated in the recommendation. Notable examples are the Savannah River Site, for the DWPF and the F-Canyon; the Hanford Site, for the K-East Basin Project; the Lawrence Livermore National Laboratory, for Building 332; the

¹¹ Safety-related systems are subject to more stringent requirements regarding quality assurance, surveillance, and redundancy in order to improve reliability of the system function.

Los Alamos National Laboratory, for Building TA-55; and the Rocky Flats Environmental Technology Site, for Buildings 371, 707, and 771.

Continuing Efforts to Raise the Technical Competence and Expertise of DOE

The report of the Senate Armed Services Committee on S. 1085, that accompanied legislation establishing the Board includes the mandate: "The Board is expected to raise the technical expertise of the Department substantially . . ." The technical qualifications of DOE personnel who are assigned safety-related responsibilities have become increasingly important since the Board's establishment, not only because of the diminution of the extensive background and experience formerly residing in contractor organizations, but also because the less-prescriptive approach to safety management advocated by DOE will require greater reliance on judgments of highly experienced staffs. Examples of this increasing importance include:

- The Secretary of Energy's response to formal Board inquiries concerning the assignment of safety responsibilities [in DOE's *Manual of Functions, Assignments, and Responsibilities for Nuclear Safety* (FAR Manual); see next section] states that "competence commensurate with responsibilities" will be one of the five principles constituting the basis of DOE's Safety Management Program.
- In revising DOE rules and orders, representatives of the Office of Environment, Safety and Health (EH) have indicated that reviews of contractors' plans for implementing revised rules and orders will be feasible only if both Headquarters and Field Office employees' technical qualifications are improved.
- Under either the Safety/Requirements Identification Document (S/RID) closure process recommended by the Board in Recommendation 95-2, or the "necessary and sufficient" closure process advocated by DOE, the important safety determination of adequacy of facility authorization bases will hinge on review and approval by highly qualified DOE technical personnel.

In each of its previous annual reports, the Board has addressed DOE technical expertise, emphasizing repeatedly that the most important and far-reaching problem affecting the safety of DOE defense nuclear facilities is the lack of adequate numbers of qualified technical personnel in organizations responsible for safety at defense nuclear facilities. It remains the most critical problem today, despite significant efforts on the part of the Board.

From its inception, the Board has continually engaged DOE senior management in discussions addressing the importance that DOE must attach to obtaining and retaining technically qualified DOE personnel, both at headquarters and in the field. Numerous letters, as well as reports generated by the Board's technical staff, have been specifically directed to this subject; in the last three years alone, more than two dozen letters contained explicit observations

of negative impacts on nuclear safety due in part to the limited technical competence of DOE personnel. Twelve of the 33 sets of formal recommendations the Board has made to DOE include specific comments on the need to strengthen the technical capabilities of DOE personnel.

In particular, in Recommendation 93-3, *Improving DOE Technical Capability in Defense Nuclear Facilities Programs*, the Board urged DOE to make a direct assault on this problem. The Board pointed out that, at that time, DOE had 200 excepted service positions authorized under the Department of Energy Act [42 U.S.C. § 7231(d)] which were not being used. As noted by the Board, excepted service personnel authority provides a proven means by which Federal agencies can attract highly qualified scientific and technical talent. Furthermore, the Board's testimony before Congress was instrumental in helping DOE obtain, in November 1994, excepted service personnel authority for 200 *additional positions*. In mid-1994, and throughout 1995, DOE was in the midst of filling approximately 1200 general schedule positions within the defense nuclear complex, providing a unique opportunity to dramatically raise the technical expertise in the Department.

Despite DOE's recruiting efforts during the 1994-95 period, the number of highly qualified technical personnel added to the Department remains minimal. The Board initiated a public airing of this issue at a public hearing held in Washington, D.C. on January 30, 1996, at which members of the Board's staff who studied this matter reported the following observations.

- Although DOE has added a significant number of new hires to its technical staff¹², most of these were not the senior, highly experienced individuals required for technical leadership roles. In fact, DOE hired no excepted service personnel in 1994; by the end of 1995, only 33 of the 400 (that is, less than ten percent) available excepted service positions had been filled.
- DOE elected to base its hiring efforts almost exclusively under the more constrained rules of the civil service system, rather than enrich the talent pool through outside recruitment under the excepted service provisions authorized by Congress. Analysis by the Board's staff of the collective technical capabilities of the 1994 and 1995 technical hires revealed that DOE general schedule hiring practices did not result in hiring a significant number of highly qualified technical personnel. Further, the technical applicant hiring process used by DOE tended toward selection of marginally qualified candidates. Selection of highly qualified candidates occurred with no greater frequency than that expected through a random process.

¹² Personnel records show that DOE filled more than 900 technical billets in the defense nuclear complex during the 1994-95 period.

The Board notes that nearly half of the positions advertised by DOE were filled by individuals drawn from the existing DOE technical pool, a population considered by several prominent review groups (e.g. the National Research Council, the Advisory Committee on Nuclear Facility Safety, the Office of Technology Assessment, and the Galvin and Poston Task Forces) as lacking in scientific and technical excellence. At least half of these internal “hires” involved promotions. At the more senior levels (e.g., GS-14 and above), internal selection accounted for more than 80 percent of the positions filled.

Judging by these results, both the failure to use excepted service personnel authority and the marginal quality of the general schedule hirings, the Board concludes that DOE has not targeted recruitment of the exceptionally talented as Congress and the Board had advocated. As described in two cases below, if DOE desires to improve the technical capabilities of a particular unit, it can be done.

At the DOE Amarillo Area Office at the Pantex Plant and the DOE Y-12 Site Office at Oak Ridge, DOE managers have responded to Board prompting by augmenting their staffs, hiring 20 new, technically qualified personnel. The Y-12 Site Office, in particular, conducted a nationwide search for highly competent candidates. The effects of these newly hired individuals have been noted by the Board in such subject areas as improvements in the analysis, documentation, and control of the safety envelope; improved personnel training and qualification; and more formal control of nuclear weapons dismantlement processes. Each of these improvements can be directly attributed to the increases in the technical ability of the staffs. The Y-12 Plant and Pantex Plant experience shows the very positive results that can occur with DOE management’s determination to make such improvements and willingness to use all of the tools at their disposal. The key to this effort was the Secretary of Energy’s commitment to conduct a nationwide search for qualified candidates to fill the vacant safety related technical positions.

In contrast to efforts to bring new technical talent into the DOE system, a major portion of DOE’s effort to “raise the technical expertise of the Department” has centered on the training and qualification of incumbent personnel under a program developed as an outgrowth of DOE’s implementation plan for Recommendation 93-3. This program was to have been implemented by December 31, 1995. With respect to this Technical Qualification Program, the Board has observed that:

- reviews of assignments of personnel to functional areas at various Operations Offices and Headquarters reveal a lack of sufficient senior level management planning of the assignment process;
- although Department-wide standards for technical qualification in specific functional areas have been developed, reviews by the Board have identified

several as inadequate, others as marginal, and most as requiring specific improvements;

- approved training activities and acceptable equivalencies to meet competencies identified in technical qualification standards have not yet been identified, developed, or promulgated; and
- differences between the qualifications required for specific DOE technical positions and the competencies possessed by incumbents will be determined by the individual employees' supervisors; yet the technical expertise of many of the supervisors themselves is less than adequate.

The Board is aware of the difficult task it has asked DOE to accomplish in the face of substantial mandated reductions in total manning levels. As a result of such downsizing activities, however, the need to improve the Department's pool of unique technical expertise becomes all the more imperative. With the dictum of "Do more with less" in force, and with its heavy responsibilities for public health and safety, DOE must respond by obtaining and retaining the best technical talent.

However, the clear message from DOE's poor record in this area is that senior DOE officials have not placed enough emphasis on the solution to this problem. One important element in finding a solution to this vexing problem is for DOE to reinvigorate its middle to senior level managers with a greater sense of purpose and for DOE to pursue more aggressively methods for reassigning or removing poor performers. Given the importance of highly qualified DOE technical leadership to achieving safety objectives, the Board intends to continue its pressure on DOE to upgrade its technical capabilities.

The Board intends to resume its public airing of this issue by requesting DOE officials to explain the Department's 1994-95 recruitment efforts and its plans for accomplishing the upgrades committed in the implementation plan for Recommendation 93-3. The Board may also consider the advisability of seeking authority to establish or approve technical qualifications for selected safety positions within DOE.

Efforts to Improve the Definition of Safety Responsibilities Among Headquarters and Field Organizations

The Department continues to experience change in programs and organization. Throughout the past year, the Board has placed substantial emphasis on the need for the Department to establish a clear definition of roles and responsibilities for nuclear safety within the Department. This emphasis is an extension of a Board request in 1994 for the Department to define more clearly the nuclear safety responsibilities and organizational arrangements for all organizations with cognizance over defense nuclear facilities.

An important element of ongoing changes within DOE is the delegation of broad operational responsibilities to field organizations. This emphasis, along with proposed elimination from DOE orders of the assignment of responsibilities to Federal employees, places increased importance on the content of DOE's *Manual of Functions, Assignments, and Responsibilities for Nuclear Safety* (FAR Manual).

In response to the Board's 1994 request, the Secretary issued Revision 1 to the FAR Manual. The manual, already in its second revision, consisted entirely of extracts of DOE order requirements assigned to Federal employees, most notably Cognizant Secretarial Officers and Heads of Field Elements. Although the FAR Manual was a step in the right direction, its emphasis on assignment of responsibilities at only the highest levels did not support achievable and prompt implementation and thus it quickly became out-of-date.

The Board has continued to: (1) emphasize the importance it attaches to keeping the FAR Manual updated, and (2) ensure that DOE line management clearly understands its responsibilities. DOE does not appear to share the same sense of importance.

DOE has committed to updating the FAR Manual early in 1996, but, in the Board's view, without sufficient capable effort and active direction by top management, that schedule appears to be overly optimistic. Representatives of the Department have also stated their intent to reflect, in revisions of the FAR Manual, the results of the response and implementation plan for Recommendation 95-2, regarding Safety Management Programs for DOE defense nuclear facilities. While the Board agrees that the FAR Manual will eventually need to reflect the results of 95-2 implementation, an update of the FAR Manual should not be delayed awaiting the completion of the 95-2 Implementation Plan.

Safety Management of Laboratory Research and Development (R&D)

In late 1994, and throughout 1995, the Board held a series of discussions with DOE and representatives of the three nuclear weapons laboratories, focused on the integrated management of safety at DOE's weapons research and development facilities. Associated activities included: eight trips by the Board and its staff to the national laboratory sites; issuance of a formal reporting requirement to DOE; a meeting in Albuquerque with senior DOE and laboratory representatives; two public meetings; two status meetings in the Board's Washington offices; and other activities by the Board and its staff.

Nuclear R&D requires an environment that encourages creativity and fosters a management approach that is flexible enough to permit the safe execution and control of a wide variety of activities. The weapons laboratories had expressed concern that DOE's current safety management approach did not permit the required flexibility and was not improving R&D operational safety. During 1995, the Board engaged DOE and the laboratories in frank discussions on the perceived problems and potential solutions.

In late April, pursuant to its authority under 42 U.S.C. § 2286b(d), the Board requested that DOE provide a report that addressed:

- whether there is adequate DOE guidance on the subject of integrated safety management of R&D activities;
- how DOE plans to ensure the availability of adequate technical talent, mechanisms, acceptance criteria, and an exception approval process to address laboratory-proposed integrated safety management systems; and
- what DOE needs to do to coordinate line management and independent oversight safety audits at the weapons laboratories.

On May 25, the Board met with senior DOE management and the heads of the three weapons laboratories to discuss the basis for the Board's reporting requirement. During that meeting, the manager of the Albuquerque Operations Office assumed the responsibility for coordinating DOE's response. DOE representatives at this meeting stated that the Board's reporting requirement provided an opportunity that is broader than the obligation to address the specific issues that the letter contained. Later correspondence between the Albuquerque Operations Office Manager and DOE Headquarters reemphasize this, by stating:

"The development of this report is extremely important to continuing the missions of the laboratories while efficiently ensuring the safety of the workers, public and the environment. I believe this report provides DOE and the laboratories with the unique opportunity to create model Management Systems that integrate Environment, Safety, and Health (ES&H) at each laboratory. These laboratory management models will meet laboratory management requirements while meeting DOE responsibilities and DNFSB expectations."

An interim response to the Board's reporting requirement was formally submitted on September 15, including DOE's commitment to work cooperatively with the laboratories, and with the Board, to develop and implement integrated safety management systems at the weapons laboratories. DOE and the weapons laboratories have stated their commitment to additional effort in 1996, and potentially into 1997, on the development of the principles, implementation strategies, and actual implementation of integrated safety management of R&D activities. The Board will continue to exercise oversight of this important effort.

Readiness of Facilities to Operate

Since the Board's inception, the Board and its staff have closely scrutinized the preparations for starting or restarting activities at defense nuclear facilities and the conduct of associated readiness reviews. Confirmation of readiness to proceed is a major element of an acceptable safety management program as outlined in Recommendation 95-2. The Board made

a number of recommendations that addressed standards for performance of operational readiness reviews, including Recommendations 90-4, 91-3, 91-4, 92-3, 92-5, and 92-6.

In Recommendation 92-6, the Board urged DOE to develop uniform orders and guidance to govern the readiness review process for startup or restart of activities. In response, DOE developed a new order, DOE 5480.31, *Startup and Restart of Nuclear Facilities* and a new DOE standard, DOE-STD-3006-93, *Planning and Conduct of Operational Readiness Reviews*, both of which apply to all operations at defense nuclear facilities except nuclear explosive operations. In 1995, the DOE Nevada and Albuquerque Operations Offices completed development of separate interim guidance to govern readiness reviews for nuclear testing and weapons assembly and disassembly operations. This interim guidance is intended for use until implementation of Recommendation 93-1 is completed.

Both the order (now designated as DOE 425.1) and the standard were revised in 1995, to respond to Board comments and to provide clarification in some areas, based on readiness review experience across the complex. With these developmental efforts completed, DOE's commitments under Recommendation 92-6 were met and the recommendation was closed by the Board in October 1995.

The Board and its staff continue to monitor readiness preparations for startup/restart and conduct of readiness reviews throughout the complex. In general, the Board has observed continued improvement in line management preparations for startup or restart of operations and the conduct of readiness reviews. In the past year, the Board closely followed the readiness preparations and conduct of readiness reviews involving:

- the Defense Waste Processing Facility and the In-Tank Precipitation Facility at the Savannah River Site;
- the F-Canyon and FB-Line facilities at the Savannah River Site;
- weapons disassembly activities at the Pantex Plant;
- stabilization of plutonium solutions in Building 771 at the Rocky Flats Environmental Technology Site;
- plutonium operations in Building 332 at Lawrence Livermore National Laboratory;
- receipt, shipment and storage of highly enriched uranium at the Oak Ridge Y-12 Plant, including reviews leading up to Project Sapphire;
- the special unload project for tritium reservoirs at Mound Laboratory; and

- the uranyl nitrate hexahydrate stabilization project at the Fernald Environmental Management Project.

These activities are discussed in more detail in other sections of this report. The Board will continue to monitor line management preparations for the startup or restart of an activity and the conduct of readiness reviews in accordance with the requirements of DOE Order 425.1.

Department-wide Radiological Protection Program

Early in its history, the Board conducted extensive reviews and assessments of radiological protection programs at a number of facilities. This review effort disclosed a number of significant weaknesses in the Department's radiological protection program. As a result of the identified weaknesses, the Board issued Recommendation 91-6 in December 1991, emphasizing a need for increased DOE attention in five major areas: (1) DOE management and leadership in radiological protection programs; (2) radiological protection standards and practices at defense nuclear facilities; (3) training and competence of health physics technicians and supervisors; (4) analysis of reported occurrences and correction of radiological protection program deficiencies; and (5) understanding and attention to radiological protection issues by individuals and contractor organizations.

During the ensuing five years, a major Board effort has been devoted to tracking and evaluating DOE's implementation of Recommendation 91-6. In response to Recommendation 91-6, DOE has moved to strengthen various aspects of their radiological protection programs, including:

- issuance of 10CFR835, Occupational Radiation Protection;
- upgrading of occupational radiation training and certification of workers;
- development and promulgation of a Radiological Control Manual, a guide to good radiation practices; and
- authorizing the Department's M&O contractors to add additional staff to their radiological protection programs.

Although DOE has made progress in addressing some of the improvements needed, many commitments have been unnecessarily delayed. As a result, in late July 1995, the Board wrote to DOE criticizing the delays and observing that they were traceable to DOE's failure to designate specific DOE personnel responsible for commitments made in the 91-6 DOE Implementation Plan. Since then, DOE has initiated efforts to update the implementation of Recommendation 91-6 to reflect current realities, changed DOE approaches, and continuing Board interest.

During 1995, the Board conducted assessments of radiological protection programs at the Savannah River Site, the Hanford Site, the Rocky Flats Environmental Technology Site, the Mound Laboratory, and the Oak Ridge Y-12 Plant. Those assessments disclosed that worker exposures generally have been kept within established bounds. However, judged in terms of the need for radiological engineering and work planning to keep routine exposures low and the chance of accidental exposures small, implementation of good practices requires some improvement, especially at the Hanford Site. In particular, the need at Hanford to acquire sufficient numbers of competent personnel with the requisite technical expertise has been identified as essential to establishing and maintaining a radiation protection program in which radiation exposures are as low as reasonably achievable. The Board has concluded that this will be especially important as deactivating and decommissioning facilities require greater fractions of the total work effort and the associated hazards of moving, handling, and processing radioactive material increase.

In general, the radiological control program throughout the DOE complex has been improving. However, the quality of the program is inconsistent from site-to-site and from facility-to-facility on a site. In 1992, DOE issued its Radiological Control Manual and guidance documents to provide the framework of a radiological protection program that contractors could use in achieving radiation protection objectives. During 1995, the Board and its staff were deeply involved in reviewing the new DOE approach to standards in the radiological protection areas, including the newly published 10 CFR 835, *Occupational Radiation*.

B. ASPECTS OF INTERNAL BOARD OPERATIONS

Current Board Authority as a Means to Influence DOE Actions

Formal Recommendations

The Board's enabling statute is, in the words of the D.C. Circuit Court of Appeals, "action forcing." For example, the power in the Board's authority to issue recommendations is substantial. It rests on two foundations. The first is the Board's ability to articulate technically sound and persuasive support for actions it advocates, in a way that convinces the Department of the merits of those recommended actions. Secondly, the requirement for the Secretary to justify rejection of a recommendation in formal reports to cognizant Congressional Committees has been acknowledged by DOE to be a very powerful forcing action.

In Part 2 of its Fifth Annual Report, the Board provided a comprehensive analysis of the recommendation process. Since that analysis was completed, the Board has issued two additional sets of recommendations, including eight individual specific recommendations. Thus, in total, 33 formal Board recommendations, consisting of 147 individual recommendations, have been made to the Secretary of Energy concerning actions necessary to protect public health and safety. The first 32 recommendations have been accepted by the Secretary.

The Board's most recent Recommendation, 95-2, "*Safety Management*," was submitted to DOE on October 11, 1995. On January 17, 1996, the Secretary accepted parts of the Board's recommendation and expressed the Department's willingness to continue the dialogue on sub-parts of the recommendation that DOE was not yet ready to accept. The Board is currently exploring with DOE those provisions of this recommendation that the Secretary did not fully accept, for further resolution.

Also during the ensuing period, an additional six sets of recommendations have been fully closed or subsumed by later recommendations. The remaining 17 are in various stages of implementation. Updated versions of the tabular data concerning elapsed times presented in the Fifth Annual Report appear here as Tables 1 and 2.

The Board has reexamined its last year's analysis and found it to be confirmed by its experience in the past year. When a Board recommendation is precise in its language, with clearly stated, achievable deliverables and associated milestones for their completion and is compatible with DOE's missions and schedules, DOE is more likely to understand and respond favorably. When the problem addressed by a Board recommendation is generic, involving the entire defense nuclear complex or a combination of facilities and sites, or when the subject appears to be at odds with DOE's current priorities and schedules, the reaction is more likely to be resistant and to lead to considerable delay in its implementation..

3/25/96

Elapsed Times to Key Events Associated with Board Recommendations

Rec No	Subject	Issue Date	SOE Accept Date	IP Rev 0 Date	Bd Accept IP Date	Closure Date	SOE Increm to Accept	Increm to Dev Plan	Increm to Revise	Increm to Close	Elapsed Time to Closure	Total Elapsed Time to Date
90-1	Reactor Operator Training/Qualifications.	2/22/90	4/10/90	7/13/90	2/7/91	10/27/92	47	94	209	628	978	
90-2	Identify stds; assess adequacy; determine implementation.	3/8/90	6/12/90	9/17/90	11/1/95	11/1/95	96	97	1871	0	2064	
90-3	Monitoring and Corrective Actions for selected tanks.	3/27/90	5/16/90	8/13/90	10/12/90	5/1/92	50	89	60	567	766	
90-4	Conduct and content of ORR's for Rocky Flats buildings.	5/4/90	6/20/90	11/30/90	2/15/91	2/16/95	47	163	77	1462	1749	
90-5	Systematic Evaluation Program for Rocky Flats activities.	5/18/90	6/13/90	10/19/90	5/4/94	11/1/95	26	128	1293	546	1993	
90-6	Develop program for removal of Plutonium in ducts.	6/5/90	7/24/90	11/30/90	8/17/92	11/1/95	49	129	626	1171	1975	
90-7	Expansion of Recommendation 90-3 to cover ferrocyanide tanks.	10/12/90	12/3/90	3/7/91	5/6/94		52	94	1156			1991
91-1	Improvement needed in DOE standards development program.	3/7/91	5/13/91	8/16/91	10/27/92	10/27/92	67	95	438	0	600	
91-2	ROMP closure packages and practices.	3/27/91	5/14/91	8/7/91	10/27/92	10/27/92	48	85	447	0	580	
91-3	WIPP Readiness Review.	4/25/91	6/5/91	8/7/91	10/27/92	10/27/92	41	63	447	0	551	
91-4	Expansion/clarification of R 90-4 on Bldg 559 ORR.	9/30/91	11/6/91	11/8/91	2/3/92	5/1/92	37	2	87	88	214	
91-5	Savannah River K Reactor Power Limits.	12/19/91	2/7/92	2/7/92	8/27/92	4/7/93	50	0	202	223	475	
91-6	Need for improved department-wide guidance on rad protection.	12/19/91	1/31/92	6/17/92	7/2/93		43	138	380			1558
92-1	Need for ORR on HB Line.	5/22/92	10/20/92	10/20/92	10/27/92	10/27/92	151	0	7	0	158	
92-2	Need for improvement in DOE Facility Representative Program.	5/28/92	7/20/92	11/5/92			53	108				1397
92-3	Expansion on R 92-1; inadequacy of previous ORR's on HB Line.	5/29/92	9/15/92	9/21/92	10/16/92	2/3/93	109	6	25	110	250	
92-4	Improve Project Management and Design Control at Hanford MWTF.	7/6/92	8/28/92	2/5/93			53	161				1358
92-5	Discipline of Operation during period of changes in mission.	8/17/92	12/16/92	12/21/92	1/8/93	1/8/93	121	5	18	0	144	1316
92-6	Need for DOE guidance on content, timing and staffing for ORR's.	8/26/92	10/19/92	1/19/93	4/29/94	11/1/95	54	92	465	551	1162	1307
92-7	Need for broad improvement in DOE Training/Qualification Programs	9/22/92	1/19/93	11/4/93	11/4/93	11/4/93	119	289	0	0	408	
93-1	Need for consistency between Orders for weapons/production facili	1/21/93	4/27/93	7/19/93	7/30/93		96	83	11			1159
93-2	Need for continued general purpose Department criticality program	3/23/93	5/12/93	8/10/93	9/30/93		50	90	51			1098
93-3	Implement step change in DOE technical staff qualifications	6/1/93	6/23/93	11/4/93	11/5/93		22	134	1			1028
93-4	Need for improved tech mgt and oversight of ERMC's.	6/16/93	8/6/93	11/8/93	11/18/93		51	94	10			1013
93-5	Accelerate waste characterization program.	7/19/93	8/31/93	1/25/94	3/25/94		43	147	59			980
93-6	Need to retain access to capability/knowledge of weapons experts	12/10/93	2/2/94	7/5/94	8/2/94		54	153	28			836
94-1	Expedite remediation of SNM storage/stabilization/disposition	5/26/94	8/31/94	12/5/94	5/5/95		97	96	151			669
94-2	Comprehensive review of low-level waste program	9/14/94	10/28/94	4/10/95	6/15/95		44	164	66			558
94-3	Apply Sys Eng to dev prog for protection against nat.phenomena	9/26/94	11/18/94	6/30/95	10/3/95		53	224	95			546
94-4	Raise Conduct of Ops to acceptable level	9/27/94	11/18/94	2/24/95	3/28/95		52	98	32			545
94-5	Integrate DOE Safety Orders, Rules and other Requirements	12/29/94	2/21/95	7/19/95			54	148				452
95-1	Need to improve safety of depleted UF6 cylinders	5/5/95	6/29/95	10/16/95	11/1/95		55	109	16			325
95-2	Need to improve focus of standards effort	10/11/95										166

Table 1

03/25/96

Elapsed Time to Key Events for Complex-Wide Board Recommendations

Rec No	Subject	Issue Date	SOE Accept Date	IP Rev 0 Date	Date BD Accepts IP	Closure Date	SOE Increm to Accept	Increm to Dev Plan	Increm to Revis e	Increm to Close	Elapsed Time to Closure	Elapsed Time to Date
90-2	Identify stds; assess adequacy; determine implementation.	3/8/90	6/12/90	9/17/90	11/1/95	11/1/95	96	97	1871	0	2064	
91-1	Improvement needed in DOE standards development program.	3/7/91	5/13/91	8/16/91	10/27/92	10/27/92	67	95	438	0	600	
91-6	Need for improved department-wide guidance on rad protection.	12/19/91	1/31/92	6/17/92	7/2/93		43	138	380			1558
92-2	Need for improvement in DOE Facility Representative Program.	5/28/92	7/20/92	11/5/92			53	108				1397
92-5	Discipline of Operation during period of changes in mission.	8/17/92	12/16/92	12/21/92	1/8/93	1/8/93	121	5	18	0	144	
92-6	Need for DOE guidance on content, timing and staffing for ORR's.	8/26/92	10/19/92	1/19/93	4/29/94	11/1/95	54	92	465	551	1162	
92-7	Need for broad improvement in DOE Training/Qualification Programs	9/22/92	1/19/93	11/4/93	11/4/93	11/4/93	119	289	0	0	408	
93-1	Need for consistency between Orders for weapons/production facits	1/21/93	4/27/93	7/19/93	7/30/93		96	83	11			1159
93-2	Need for continued general purpose Department criticality program	3/23/93	5/12/93	8/10/93	9/30/93		50	90	51			1098
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93-4	Need for improved tech mgt and oversight of ERMC's.	6/16/93	8/6/93	11/8/93	11/18/93		51	94	10			1013
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94-5	Integrate DOE Safety Orders, Rules and other Requirements	12/29/94	2/21/95	7/19/95			54	148				452
95-2	Need to improve focus of standards effort	10/11/95										166

Table 2

After DOE acceptance and implementation of Board recommendations, safety improvements have been made in such fundamental areas as operational readiness reviews; compliance with safety standards, orders and requirements at certain facilities; technical training at DOE sites; discipline of operations; the safe handling of nuclear materials; and radiation protection. However, the pace of progress has been slow, especially in increasing the number of qualified technical DOE personnel and in development of a sound, standards-based, complex-wide safety management program.

The Secretary of Energy has testified that the Board's actions, primarily in its formal recommendations, had assisted the Department in identifying and correcting public health and safety deficiencies at defense nuclear facilities. Key areas for which the Secretary was most appreciative of the Board's oversight included compliance with DOE safety requirements including orders; hiring, retention, education, and training of DOE's technically-qualified personnel; readying facilities to operate safely, and conduct of operations.

Both the Board and DOE have learned much about smoothing the recommendation process during the past six years. Establishment of joint working groups early in the process contributes to satisfactory resolution of disagreements, and DOE's designation of a responsible senior manager to lead its development and completion of an acceptable implementation plan has greatly improved the earlier record. Not all the previous disagreements have been resolved, but some progress has been made, and the Board is confident that it can be sustained. The cooperation evident in the development of meaningful implementation plans for the most recent Board recommendations is a good omen, and with each such achievement, the climate improves further. Though some problems in actually completing implementation plans remain, these are, for the most part, amenable to correction by sustained attention of senior managers in both organizations. The Board reiterates its earlier conclusions regarding the effectiveness of the recommendation process, and refers the reader to Part 2 of its Fifth Annual Report for a thorough review of the subject.

Reporting Requirements

The Board's authority to establish binding reporting requirements, 42 U.S.C. § 2286b(d), is likewise a strong forcing function which has been effective in causing DOE to take actions to generate the information the Board seeks. This is particularly effective when the Board determines it to be likely that activities needed to generate a mandated report will provide irrefutable evidence of a problem, and will likely do so in a manner that points the way to DOE's resolution of the issue of interest to the Board. Several examples of the Board's exercise of this authority are presented in other sections of this report, as well as in earlier annual reports.

Public Hearings and Public Meetings

Finally, the statute also authorizes the Board to hold hearings on safety matters of concern, under 42 U.S.C. § 2286b(a). The Board has learned that conducting public hearings, or less formal public meetings in which the public may observe the Board as it reviews particular subjects with its own staff or with DOE representatives, is a particularly useful tool for helping to determine the causes for DOE delays in implementing Board recommendations aimed at achieving safety improvements. During the past year, the Board has used these tools more frequently, and has found them valuable, not only to improve public access to the Board's activities but also to obtain meaningful commitments from DOE officials.

In this connection, the Board has found that questioning key DOE and contractor witnesses in a public forum focuses the witnesses on the need for obtaining technically supportable and reliable answers. The Board's authority to obtain information in a hearing and under oath, if necessary, is quite compelling. For example, it is possible that holding such hearings could have pinned down more effectively and expeditiously the nature of technical and administrative problems, identified areas of disagreement between the Board and DOE and contractor personnel, and ultimately prompted DOE to complete some safety improvements more quickly in implementing such fundamental Board recommendations as 90-2 (development and implementation of safety requirements), 91-6 (radiation protection), 93-3 (improving DOE technical competence), and 93-5 (waste characterization).

Questioning in public forums creates an atmosphere of accountability--an atmosphere that conveys the Board's intent to use every available vehicle to achieve safety progress. It also provides leverage through public and peer pressure to meet commitments contained in implementation plans for Board recommendations accepted by DOE, and serves notice that unjustifiable delays will not be tolerated by the Board. The Board has used such hearings to good effect regarding, for example, the need to take prompt and vigorous steps to stabilize fissionable material in process lines and vessels, spent nuclear fuel, and waste materials; characterization of waste stored in the Hanford Tank Farms; and needed improvements in DOE's program for development, promulgation, and implementation of safety standards.

Response to public meetings and hearings such as these has been very positive. For example, representatives of labor organizations, the Texas State Senate, the City of Amarillo, local businesses, citizens' groups, and many individuals from the vicinity of the Pantex Plant responded to a public hearing by writing letters to the Board to applaud its openness, to express their views that the Board and its staff have performed admirably, and to endorse the Board's continuing oversight role. Similar responses have been received from neighbors of the Rocky Flats Environmental Technology Site and the Savannah River Site.

Participation in the Work of the Advisory Committee on External Regulation of Department of Energy Nuclear Safety

On January 25, 1995, with the support of the White House Council on Environmental Quality (CEQ), the Secretary of Energy created an Advisory Committee on External Regulation of the Department of Energy's nuclear activities. Some, but not all of these activities are regulated under provisions of laws pertaining to environmental protection. In 1988, Congress provided for oversight of the nuclear safety aspects of DOE's defense nuclear facilities by establishing the Board.

The Secretary's action in setting up the Advisory Committee was stimulated in part by a Congressional Subcommittee's interest in the idea of external regulation rather than oversight and a Department perception that the public acceptability and credibility of the Department's future activities could be enhanced through external regulation of nuclear activities. The Board was requested by CEQ and the Secretary of Energy to participate in the Advisory Committee's study. In the spirit of cooperation, the Board contributed to this matter through the active participation of Board Member Joseph J. DiNunno. This proved to be no small chore on his part.

The Committee's report, "*Improving Regulation of Safety at DOE Nuclear Facilities,*" dated December 1995, which advocates external regulation, was released to the public on January 19, 1996. Both the Board and the Nuclear Regulatory Commission were identified as candidate agencies around which such a regulatory program might be structured. Although the report purports to represent views of the Committee as a whole, there was in reality strong consensus on only a few of the conclusions and considerable diversity of views on others. Mr. DiNunno issued a statement of separate views which is appended to the Committee's final report. In his statement, Mr. DiNunno supported a number of the concepts and ideas in the Committee's report and explained in brief his objections to a number of specific recommendations.

The Board's initial reaction is that any regulatory model that embodies all the concepts recommended in the Committee's report will exacerbate the Department's problems, not solve them. Modest expansion of the Board's statutory authority would go a long way toward achieving many of the perceived benefits of external regulation, and at much lower cost. Such an expanded role for the Board might include, for example, greater powers involving: (1) standards setting; (2) approval by the Board of authorization bases for operating high hazard facilities; and (3) approval of qualification requirements for selected safety positions. This concept of an incremental increase in the Board's functions was presented to the Committee during its deliberations. It was never considered seriously.

The matter of external regulation of defense nuclear facilities is particularly sensitive since national security issues are involved. The Board is sensitive to not only this aspect of increased regulatory oversight of DOE defense nuclear activities, but also the cost implications

of legalistic, formal regulatory procedures. NRC estimated an additional cost of \$100 to \$300 million per year and an additional 1100 to 2000 full-time employees if it were to assume regulatory responsibility similar to the certification process used for the gaseous diffusion plants; licensing of new DOE facilities was not included in NRC's estimate. In addition, if the Committee's recommendation were to be implemented in full, it would provide greater opportunity for citizen lawsuits in defense nuclear activities than currently exists in the commercial nuclear regulatory arena.

New/Rotated Site Representatives

During 1995, the Board continued to increase its on-site oversight of defense nuclear facilities by assigning two experienced staff members to full-time duty at the Rocky Flats Environmental Technology Site (RFETS). Technical staff members already had been stationed at two other DOE sites; two individuals who are assigned to the Pantex Plant, and one who is assigned to the Hanford Site. During the past year, the Board also completed the first rotation of staff members assigned as site representatives at the Pantex Plant, thus highlighting an additional potential career path for the Board's technical staff. A second site representative was assigned to the Hanford Site in March 1996 and the Board expects to have a full-time staff member at the Savannah River Site by mid-year.

The Site Representatives Program has greatly expanded the Board's ability to closely monitor DOE activities. Site representatives have facilitated prompt identification of health and safety concerns and in conducting daily assessments of nuclear safety management at the priority sites to which they have been assigned. Site representatives regularly interact with the public, union members, Congressional staff members, and public officials from federal, state, and local agencies. The Board has received numerous unsolicited comments from members of these groups reflecting favorably on the performance of the assigned site representatives.

C. SAFETY ASPECTS OF DESIGN AND CONSTRUCTION OF DEFENSE NUCLEAR FACILITIES

Defense Waste Processing Facility at the Savannah River Site

The Defense Waste Processing Facility (DWPF) is a large, new vitrification plant designed to convert highly radioactive waste into a stable borosilicate glass form. Construction began in 1983, before the facility was completely designed. Detailed design proceeded concurrently with construction through the late 1980's. Since then, additional facility design improvements determined to be either desirable or necessary have been identified and implemented. The chemical processes involved are extremely complex. They are significantly complicated by the presence of high-level waste (HLW) and the resulting need for remote handling of the material.

During the past several years, the Board and its staff have emphasized to DOE the importance of providing defense-in-depth in both the design and the operation of the plant. This emphasis has led to improvements in designs and operational modes, including: upgrading of selected critical plant systems to safety class; installing backup nitrogen inerting systems on process vessels; improving training and qualification programs; and reducing the potential number of simultaneous safety-critical alarms in the control room.

At year-end, DWPF preoperational testing was nearing completion, and DOE had scheduled a comprehensive Operational Readiness Review (ORR) in anticipation of an early 1996 startup. The Board's staff will observe the readiness review and assess the results.

In-Tank Precipitation Facility at the Savannah River Site

At the In-Tank Precipitation (ITP) facility, sodium tetrphenylborate (TPB) is used to concentrate and remove radioactive cesium from the waste stream in preparation for processing at the Defense Waste Processing Facility. During the process, chemical and radiolytic decomposition of the TPB occurs, liberating substantial quantities of highly flammable benzene. This situation creates the potential for a tank deflagration accident that could release large amounts of radioactive material. Safeguarding against this potential situation has been a major focal point of Board scrutiny.

Another focus of the Board's attention at this facility was an assumption in the ITP safety analysis that benzene vapor in the tank head space would be well mixed. Benzene vapor is significantly denser than air or nitrogen and thus there is a distinct possibility that flammable pockets of benzene vapor could develop near the liquid surface of the waste. Based on an analytical study of this issue by its staff, the Board has prodded DOE to perform a detailed fluid dynamics analysis to determine whether this assumption of a well-mixed vapor in the tank head space is indeed valid. The Board also established the need for an on-line sampling system to measure temperature and vapor concentrations throughout the tank. This system has proven valuable in helping to analyze recent unexpected conditions.

Although several tests and experiments have been performed during the last 13 years, the exact processes which result in the production and liberation of benzene are not well understood. Unexpectedly, the release of benzene is significantly increased by forced mixing resulting from operation of the slurry pumps. The resultant concentration of benzene in the vapor space would likely exceed Operational Safety Requirement (OSR) limits during multiple slurry pump operation. This anomalous behavior is being examined assiduously by both the Board and DOE as part of pre-operational preparations.

An Operational Readiness Review performed by the Westinghouse Savannah River Company (WSRC) in October 1994 determined that training and qualification of operating and support personnel were still at a very early stage. Furthermore, high quality procedures needed by operators were not sufficiently in place. The Board insisted that the ORR be redone when

ITP was better prepared to start up and operate. A supplemental ORR, performed by WSRC in the April-May 1995 period, was much more effective at confirming facility readiness. The subsequent ORR performed by DOE supported this by identifying only a limited number of additional deficiencies requiring correction.

The Board will continue to review upcoming ITP activities, including Unreviewed Safety Question Determinations associated with postulated benzene production and release mechanisms, testing evolutions, plant modifications, and research.

Structural Adequacy of Plutonium Storage Facility at the Rocky Flats Environmental Technology Site

In 1993, DOE formulated plans to consolidate storage of large amounts of plutonium in Building 371 at the Rocky Flats Environmental Technology Site (RFETS). The building was not originally designed for this mission. The Board reviewed the design of the building, including the building's capacity to withstand external forces from natural phenomena (e.g., earthquakes). Based on its review, the Board concluded that activities to prepare Building 371 for an extended storage role were neither logically structured nor sufficiently broad in scope to establish structural adequacy under loadings from unusual natural phenomena.

In September 1994, the Board issued Recommendation 94-3, *Seismic and Safety Systems*, addressing this matter. During DOE's preparation of an implementation plan, the Board spurred DOE to take a systems engineering approach in the development of an integrated plan that addresses the civil-structural-seismic and systems safety issues and evaluations involved. In October 1995, DOE completed an analysis which determined that the building could be made structurally adequate provided several structural upgrades were accomplished. DOE is currently planning to make these upgrades. Based on further efforts to systematically assess the plans for Building 371, DOE is now evaluating whether there are better options for storing special nuclear material at the Rocky Flats Environmental Technology Site.

Los Alamos National Laboratory (LANL) Design Process for the Chemistry and Metallurgy Research (CMR) Building

In late 1994, the Board, its staff, and its outside experts reviewed preparations for a testing program designed to study reactions of molten plutonium with other materials within full-sized components from dismantled nuclear weapons. For this program, LANL had already begun upgrading the structural capability of a portion of its Chemistry and Metallurgy Research Building and had been constructing an experimental apparatus.

The Board's reviews disclosed that even though the contract for the building upgrade had been placed and an experimental apparatus was being fabricated, potential hazards did not appear to have been fully identified, and no clear analytical process for identifying them was apparent.

Based on these disclosures, the Board requested that DOE provide a report identifying the formal processes LANL follows in design, construction and preparation for operation of new and upgraded facilities. As a result, LANL has begun to clarify and implement an improved system for technical management of such projects.

Preparations for Major Upgrades at LANL CMR Building

LANL is planning upgrades of the CMR Building totaling more than \$100 million, including major changes in the electrical systems. Based on a review by the Board's staff, it appears that a proper identification of hazards for the probable mission of CMR would lead to the necessity of providing emergency/standby power. LANL stated that while emergency/standby power will be considered for the upgrades, it is possible that neither emergency nor standby power would be implemented. This matter was brought to the attention of DOE line management.

Configuration Management was also reviewed at CMR. The fundamental objective of configuration management is to establish and maintain consistency among the facility design basis, physical configuration, and facility documentation for safety-related structures, systems and components. It appears that configuration management activities need to be considerably strengthened prior to significant additional work on the CMR upgrades.

Guidance for Conducting Readiness Reviews at the Nevada Test Site (NTS)

In June 1995, the Board received revised interim DOE guidance for the conduct of readiness reviews for testing of nuclear devices, termed "Testing Readiness Assessments." This guidance was originally developed in response to Recommendation 92-6, *Operational Readiness Reviews*, and was subsequently revised to address Board comments regarding when such assessments are required. The Board accepted the Testing Readiness Assessment guidance as meeting the intent of Recommendation 92-6 for the conduct of readiness reviews of tests of nuclear devices at the Nevada Test Site (NTS), should such operations be resumed in the future. DOE has committed to use the process until additional guidance, to be developed as part of Recommendation 93-1 implementation, becomes available.

Device Assembly Facility (DAF) at the Nevada Test Site (NTS)

The Device Assembly Facility (DAF) at NTS is a new, moderate hazard facility for nuclear explosive operations, that was originally intended for assembling one-of-a-kind nuclear test devices. However, a broader range of operations, such as disassembly, modification, staging, maintenance, repair, retrofit, and surveillance of nuclear weapons, could be accommodated within the DAF mission with only modest changes. The Board and its staff reviewed the DAF safety basis and the design of selected systems, in anticipation of its upcoming ORR. Specific deficiencies in the electrical distribution and fire protection systems identified by the reviews were provided to DOE; these were addressed by coordination studies

applicable to protective devices, anticipated electrical system upgrades, and a consolidated fire hazards analysis.

Systems Engineering at the Hanford Site

In Recommendation 92-4, the Board pressed DOE to commit to systematic management of the Hanford Multi-function Waste Tank Facility (MWTF) project because of indications that the Department was proceeding with the project without adequately addressing all health and safety design criteria for the full life cycle of the facility. In response, DOE committed to take a systems engineering approach to the design of the MWTF, and to perform independent design reviews, starting with an overall System Requirements Review (SRR) for the Tank Waste Remediation System (TWRS).

This SRR, performed by an independent group and led by representatives from DOE Headquarters, identified significant risks and uncertainties associated with the project. As the Board had independently determined, the SRR team found that health and safety requirements including those related to end state criteria and final waste form had not been adequately defined even though a project baseline had been assumed. Selections of alternatives had been made without adequate justification from performance and safety perspectives. As a result of the SRR, DOE-RL and its contractors are working toward more systematically identifying the systems functions and requirements, including those requirements related to health and safety.

D. SAFELY MANAGING SURPLUS NUCLEAR MATERIAL AND WASTE

Stabilization of Fissionable Residues at the Rocky Flats Environmental Technology Site

In Recommendation 94-1, the Board recommended that DOE expedite its efforts to characterize and stabilize a wide variety of production residues remaining in process lines and storage containers which were continuing to degrade, creating an increasing hazard. Although the problem exists at several facilities in the defense nuclear complex, it is especially acute at the Rocky Flats Environmental Technology Site (RFETS).

During the summer of 1995, impure material remaining from metal casting, which constituted one of the highest risk sources of plutonium-bearing residues at RFETS, was successfully stabilized. In addition, by mid-November 1995, plutonium metal in contact with plastic at RFETS had been repackaged in accordance with DOE's implementation plan. Moreover, processing and safe interim storage of other plutonium residues and oxides are proceeding, albeit not on the schedule set forth in DOE's implementation plan.

Nuclear Material Stabilization at the Savannah River Site

At the Savannah River Site, Recommendation 94-1 applies to stabilization of solutions containing plutonium and trans-plutonium elements in F-Canyon, plutonium metal in storage, and irradiated fuel and target assemblies in basins. In accordance with its implementation plan, DOE has expedited processing of plutonium solutions in F-Canyon and FB-Line, in addition to reassessing its earlier plans for deteriorating fuel and target material.

As part of the material stabilization effort, the Board has insisted that each facility to be used for stabilization undergo a thorough Operational Readiness Review, including reviews of operator training and procedures, verification of equipment operability, and definition and control of the facility's authorization basis. This process has resulted in: (1) augmented steps to protect against radioactive material release, including the isolation of an F-Canyon tank that contains highly radioactive americium and curium; (2) modifications to the FB-Line ventilation system to provide exhaust filtration through a sand filter; (3) additional controls in F-Canyon and H-Canyon to prevent an explosion similar to the accident at the Tomsk facility in the former USSR; and (4) reductions in the size and number of contaminated areas in both F-Canyon and the FB-line.

Spent Nuclear Fuel at the Savannah River Site

In Recommendation 94-1, the Board urged DOE to expedite processing of deteriorating reactor fuel stored in basins at the Savannah River Site. In its implementation plan, DOE committed to begin stabilizing this aluminum-clad highly-enriched fuel by November 1996. Subsequently, DOE announced plans to continue to store the material in water basins and to conduct additional studies of the feasibility of dry storage.

The Board and its staff identified problems with pursuing dry storage plans for aluminum-clad highly-enriched uranium fuel, and pointed out certain rapidly corroding nondefense fuel that had been previously predicted by DOE to remain stable for another ten years. In a subsequent technical report, DNFSB/TECII-7, *Stabilization of Deteriorating Mark 16 and Mark 22 Aluminum-Alloy Spent Nuclear Fuel at the Savannah River Site*, the Board established the technical basis for concluding that stabilization of this fuel by chemical separation is the better alternative.

The Board's attention to this matter caused DOE to refocus its previous dry storage plans, and, as a consequence, DOE now is examining means to expedite conversion of the fuel into more manageable components (i.e., feed for the Defense Waste Processing Facility and low-enriched uranium).

In addition, had the Board not alerted DOE to the rapidly corroding but incorrectly categorized fuel, it is likely that DOE would have continued wet storage, based on its assumption of stability for at least the next decade. In response to the Board's findings, DOE rapidly made

plans to remove this fuel from wet storage and to stabilize it by chemical processing. Only weeks after these revised plans were initiated, this fuel demonstrated its lack of stability under the prevailing conditions of accelerated chemical attack and corrosion in wet storage by having one of its storage containers rupture.

Spent Nuclear Fuel Stored in the K-Basins at the Hanford Site

At the beginning of 1994, DOE pursued a vaguely defined course of action to resolve recognized safety issues with severely deteriorated spent fuel stored in leaking basins located next to the Columbia River. A Tri-Party Agreement involving DOE, the Environmental Protection Agency, and the State of Washington had been reached to remove the fuel from the basins by the end of the year 2002. DOE-HQ expressed reservations about the feasibility of meeting the agreed-upon completion date. Meanwhile, the contractor expended considerable resources, but made little progress, on an interim effort to encapsulate (in the basin water) all of the fuel in the K-East Basin.

In early 1994, the Board pointed out the lack of a technical basis for DOE's planned course of action and urged DOE to identify engineering alternatives, the criteria for selecting an alternative, and the anticipated radiological consequences of proposed actions. In May 1994, the Board issued Recommendation 94-1, specifically recommending that the program be accelerated to place the deteriorating reactor fuel in a stable configuration for interim storage until an option for ultimate disposition is chosen.

As a result of intense interactions between DOE and the Board and its technical staff, DOE's implementation plan committed to begin fuel removal by the end of 1997, and to complete fuel removal by December 1999. In addition, this implementation plan reflected results of recently performed engineering studies identifying stabilized dry storage as the best interim storage for the type of fuel stored in the K-Basin.

The Board's involvement with these issues resulted in a technically sound path forward and an expedited schedule for resolving the safety and environmental vulnerabilities associated with the leaking fuel. The Board was instrumental in steering both the contractor and DOE toward a system where all activities associated with the stabilization of the fuel in the K-Basins were conducted on a separate project basis. The Board has since continued to apply pressure to ensure timely implementation of this path forward.

Integrity of Cesium and Strontium Capsules at the Hanford Site

The B-Plant/Waste Encapsulation and Storage Facility (WESF) at the Hanford Site contains about 1900 metal capsules containing radioactive cesium and strontium which are stored underwater. The material, which was extracted from high level waste and sealed in the double-encapsulated metal containers between 1974 and 1985, contains about 73 million curies - about one-third of the total inventory of radioactive material at the Hanford Site.

The capsules are currently intact, but confinement must be maintained until the capsules are removed from the facility, and final disposition may not occur for another twenty years. During the coming year, the Board and its staff will continue to review the long-term integrity of the capsules, the integrity of the storage pools, and the capability to detect and handle a leaking container. Through its staff, the Board is also reviewing the authorization basis of the facility. These reviews are expected to continue into FY 1997, and beyond.

Adequacy of Nuclear Material Storage Conditions at the Oak Ridge Y-12 Plant

At the Y-12 Plant, the nation's repository for Highly Enriched Uranium (HEU), DOE plans to consolidate much of the HEU from other sites in the complex. This will involve receipt, processing, and storage of uranium in many different forms. Historically, no standard existed for uranium storage. This past summer, DOE approved a standard for storing HEU at the Y-12 Plant. The Board and its technical staff played a key role in the creation of this standard through on-site reviews and detailed technical comments on the initial drafts.

Cylinders Containing Depleted Uranium at the Gaseous Diffusion Plants

Approximately 50,000 cylinders containing more than 500,000 metric tons of depleted uranium hexafluoride (UF_6) remaining from the production of enriched uranium for both defense and civilian purposes are in outdoor storage at the three gaseous diffusion plants in Oak Ridge, Tennessee; Portsmouth, Ohio; and Paducah, Kentucky. In early 1995, the Board and its staff reviewed the safety of these cylinders, following up on information indicating that poor maintenance and storage conditions had led to severe corrosion and breaching of several cylinders. The Board found that the corrosion-resistant coatings of the cylinders had not been maintained and that many cylinders were handled and stored under conditions that could lead to high deterioration rates.

To protect against further cylinder breaches and the resulting potential for dispersion to the environment of large amounts of UF_6 , the Board issued Recommendation 95-1 in May 1995, urging DOE to address the problem promptly. The Secretary of Energy accepted the Board's Recommendation and submitted an acceptable implementation plan in October 1995. DOE committed to: (1) address severely degraded cylinders expeditiously; (2) start a program to renew protective coatings on cylinders; (3) investigate other measures to protect cylinders; and (4) complete a full evaluation of cylinder storage hazards. The Board will continue to closely monitor these efforts during 1996.

High-Level Waste Storage Tanks at the Hanford Site - Ferrocyanide Hazards

During the first year of its existence, the Board identified the storage tanks for high level radioactive waste at the Hanford site as one of the most serious hazards in the defense nuclear complex, and gave the tank farms its immediate close attention. One of the hazards of particular

concern was the suspected accumulation of potentially explosive concentrations of ferrocyanide compounds in the tanks.

Late in 1990, the Board issued Recommendation 90-7, urging DOE to improve significantly the monitoring, modeling, characterization, and emergency preparedness for those high-level waste tanks believed to contain ferrocyanide compounds. In its implementation plan, DOE committed to upgrade instrumentation in the tanks, greatly accelerate efforts to characterize the tank wastes and vapors, and conduct a focused investigation into the properties of simulated wastes.

Spurred by the Board's recommendation, DOE and its contractors at Hanford researched and investigated this issue and produced substantial evidence that during the decades of high-level waste storage, the ferrocyanides have degraded to the point that they are now present in relatively harmless concentrations, thus relieving a major safety issue. DOE is expected to complete the work needed to close this issue permanently in the coming year.

High-Level Waste Storage Tanks at the Hanford Site - Characterization of Tank Contents

In Recommendation 93-5, the Board exhorted DOE to substantially improve and accelerate characterization of high-level waste in tanks at the Hanford Site. In response, DOE committed to improve its management and conduct of the characterization program, to greatly accelerate the sampling rate, and to ensure the timely completion of sampling and associated analyses needed by the tank safety and waste disposal programs.

DOE and its contractors have struggled with the tank sampling and characterization program. The result is that the characterization effort has not progressed at the planned rate. However, a number of significant improvements have resulted from DOE's efforts to implement the Board's recommendation. The needs of the safety program have been identified, and laboratory analyses critical to safety are evaluated and reported more rapidly than they had been before the Board emphasized the seriousness of the issues. In addition, efforts to define information needs have led to an improved understanding of the tank safety issues. In addition, these efforts have led to a recognition that substantial uncertainties remain about waste tank safety. DOE has responded by expanding safety-related controls on tank farm operations, a precaution intended to reduce the likelihood of a tank accident.

Neutralization of Residual Production Materials at the Fernald Environmental Management Project

In Recommendation 93-4, the Board recommended that DOE develop and implement a plan for technical management of the contractor for the Fernald Environmental Management Project, and to develop a clear plan and authorization basis for the neutralization of 200,000 gallons of uranyl nitrate hexahydrate (UNH). In accordance with its implementation plan, DOE

developed a technical management plan identifying the responsibilities of DOE personnel involved in management of the contractor. As a result, the UNH program was substantially improved. Modifications to the process were made, disciplined conduct of operations principles were implemented, and detailed formalized procedures were developed. With these improvements, the entire UNH inventory and a smaller amount of thorium nitrate solution were safely neutralized.

Implementation of Recommendation 94-2 - Improving DOE's Low-Level Waste Program

Recommendation 94-2, issued in September 1994, called for a complex-wide review of DOE's low-level radioactive waste (LLW) program to establish the dimensions of the LLW problem and identify suitable corrective actions. DOE's implementation plan organized efforts into six areas: (1) systems engineering, (2) a complex wide vulnerabilities assessment, (3) a study of DOE LLW regulatory structure and process, (4) LLW performance assessments, (5) LLW projections, and (6) research and development associated with LLW disposal.

Originally, the implementation plan called for work to be completed by August 1997, with most activities completed by late 1996. DOE has made little progress, however, toward achievement of this schedule. Instead, DOE has directed its efforts toward reassessing existing commitments and formulating a new strategy that is more consistent with available funds and technical resources.

Key technical issues remaining to be resolved include:

- bounding DOE's low-level waste program in a manner that is consistent with DOE's needs;
- development of a sound technical strategy for reflecting composite radionuclide source terms in LLW performance assessments;
- revision of DOE Order 5820.2A, *Radioactive Waste Management*, to include the commitments in DOE's implementation plan; and
- delays in formulating a LLW policy consistent with low-level waste projections and capacity in terms of both volume and radionuclide loading.

Overall, DOE misjudged the technical complexity of implementing this recommendation and is in the process of determining what resources and strategies are necessary to resolve fundamental issues. The Board is following these efforts with keen interest, to ensure that DOE's selection of alternatives is consistent with the Board's intent.

E. SAFETY ASPECTS OF NUCLEAR WEAPONS STOCKPILE STEWARDSHIP AND MANAGEMENT

Oversight of Stockpile Stewardship and Management Activities at the Nevada Test Site

During 1995, DOE conducted several test readiness exercises and activities at the Nevada Test Site (NTS). The Board oversaw the first high-explosive experiment conducted in a new underground facility and other experiments that exercised safety-critical skills needed for nuclear testing operations. In addition, the Board Members traveled to NTS in November 1995, where they obtained firsthand information on a variety of experimental activities being conducted in support of DOE's Stockpile Stewardship and Management Program; the status of the new Device Assembly Facility; and the archiving efforts related to Recommendation 93-6 being performed by the Nevada Operations Office/Joint Test Organization. The Board also examined the LYNER underground experimental facility.

Disparity in Applicability of Orders

The Board issued Recommendation 93-1, *Standards Utilization in Defense Nuclear Facilities*, in early 1993, recommending that DOE address the differences between the safety requirements applicable to nuclear explosives facilities and those applicable to other defense nuclear facilities. In 1994, DOE completed its analysis and developed a plan to improve the set of DOE orders applicable to nuclear explosives facilities, and to take corrective actions in sixteen functional areas. The Department planned to "adopt by reference" nine previously excluded DOE orders as the cornerstone of its corrective actions. Additionally, DOE had agreed to review standards currently applicable to nuclear explosives facilities and to develop additional standards, as needed.

The Board is encouraged by DOE's commitment to extend the applicability of nuclear safety orders and to increase the set of DOE safety standards applicable to nuclear explosive operations.

Implementation of Recommendation 93-1/NESS CAP

In its implementation plan for Recommendation 93-1, *Standards Utilization in Defense Nuclear Facilities*, and the associated Nuclear Explosive Safety Study Corrective Action Plan (NESS CAP), DOE made commitments to complete five major actions. Three of the five actions have been completed and subsequently accepted by the Board.

The Board currently is having its technical staff evaluate one of the remaining tasks concerning the revision of orders applicable to facilities involved in assembly, disassembly, and testing of nuclear explosives. The current drafts of the new orders represent quantum improvements over the existing orders; however, some significant issues remain. For example,

the revised orders do not include the previous requirement to conduct a quantitative risk assessment of plutonium dispersal during Nuclear Explosive Safety Studies. In addition, several of the previously-excluded nuclear safety orders DOE has committed to "adopt by reference" are only partially invoked in the revised orders. At the end of the year, the Board's staff was continuing to work with its DOE counterparts to address these issues.

DOE's Albuquerque Operations Office (DOE-AL) is reviewing all of its Supplemental Directives (AL-SDs), with the aim of eliminating as many as possible. These directives provide detailed guidance for safety of nuclear explosive activities conducted at the Pantex Plant. The Board intends to follow this activity closely to ensure that safety of nuclear explosive operations at the Pantex Plant is not compromised.

In response to Recommendation 93-1, DOE has been working to expedite and upgrade Order Compliance Self-Assessments (OCSA) at the following five sites: the Pantex Plant, the Los Alamos National Laboratory, the Lawrence Livermore National Laboratory, the Oak Ridge Y-12 Plant, and the Nevada Test Site. This effort has significantly enhanced the use of standards that affect nuclear explosive safety. During the thirty months since the Board accepted DOE's implementation plan for Recommendation 93-1, other initiatives to define, control, and implement safety requirements have also been underway. A summary of each site's work completed or planned is included below:

- The Pantex Plant is expected to complete a revised site-level OCSA in the first quarter of 1996. Development of an "Essential Standards Program" that will include SRIDs and compliance assessments has been initiated by the management and operating contractor.
- At Oak Ridge, revised OCSAs have been completed for site-level and Buildings 9212 and 9720-5 SRIDs at the Y-12 Plant.
- The three nuclear design laboratories are working together to develop integrated safety management programs for research and development activities.
- DOE committed to verify order compliance prior to conducting its operational readiness review (ORR) for the Device Assembly Facility at NTS.

Implementation of Recommendation 93-6

In its implementation plan for Recommendation 93-6, "*Maintaining Access to Nuclear Weapons Expertise in the Defense Nuclear Facilities Complex*," DOE committed to retain access to and capture the unique, and as yet undocumented knowledge of individuals who had been engaged for many years in the assembly, disassembly, and testing of nuclear weapons.

DOE's execution of the approved implementation plan was problematic from the start. Some efforts were made in certain areas, but little progress in completing several key commitments was evident by the spring of 1995. The commitment to establish an ongoing program to identify and capture skills and knowledge was several months overdue, due to the lack of integrated technical guidance and coordination. Efforts to remove administrative obstacles to gaining needed access to retirees for archiving purposes were stalled. The commitment to establish processes for development of safe dismantlement and modification procedures for the Pantex Plant, originally due in October 1994, had not been completed six months after that date. DOE's assertion that the existing stockpile surveillance program addressed the Board's concerns on hazards from the degradation of remaining weapons and the potential impact on weapon operations was not supported by the description of this program provided as a deliverable under the implementation plan.

On April 5, 1995, the Board wrote to the Secretary of Energy expressing these concerns about Recommendation 93-6 implementation. The letter stated the Board's position that:

“ . . . the delay in completing these and other important commitments has jeopardized the overall schedule and effectiveness of the DOE's implementation of Board Recommendation 93-6. These delays continue to indicate that the necessary level of management attention at DOE Headquarters, field offices, and contractors organizations is not being applied in meeting the commitments to the Board.”

The Board asked to be informed of additional actions DOE planned to take to address the identified implementation deficiencies and to minimize further adverse impact to the overall implementation of Recommendation 93-6.

The Board received the Department's response to the April 5 letter on July 7. This response committed to develop a revised Implementation Plan for Recommendation 93-6. However, this response, which came three months after the Board's letter, only committed to having the Defense Program organization draft an Implementation Plan revision by the time another month had passed. As of the end of 1995, DOE had failed to provide a revised Implementation Plan for Recommendation 93-6 for Board consideration and acceptance. The Department's performance in this important form of formal interaction with the Board has been poor. However, despite the problems discussed above, DOE field and contractor efforts to implement the intent of Board Recommendation 93-6 made significant progress in 1995.

While revision of the Implementation Plan was in progress, the Nevada Operations Office (NVOO) effectively completed all commitments under both the old Implementation Plan and the revised Plan under consideration. This included completion of Job Task Analyses (JTAs) for all key positions involved with the critical safety activities, functions, and operations for nuclear testing. An evaluation was completed on the reliance on traditional administrative controls for nuclear explosive safety in testing operations. A knowledge, skill, and experience

archiving program has been developed and is being actively implemented. NVOO has formally institutionalized an annual adequacy assessment of critical functional areas, key positions, JTAs, and personnel. NVOO personnel involved in Recommendation 93-6 implementation should be commended for their high degree of independent initiative.

A "Knowledge Preservation Program" involving both the Y-12 Plant and the DOE Oak Ridge Operations Office was developed and was being implemented at year-end, in anticipation of completion of the revised implementation plan.

Progress was less evident for those elements of the Recommendation involving operations at the Pantex Plant, which come under the cognizance of the Albuquerque Operations Office. A Board briefing on the status of the weapons laboratories' archiving programs in late May showed little evidence of progress in capturing the undocumented safety-related skills and knowledge of departing weapons program personnel. In response to the Board's expressed concerns, DOE issued additional explicit instructions to the laboratories; by year-end there was evidence of more activity, on both the DOE side and at the laboratories.

Improvements at the Pantex Plant

The Board's activities have initiated or provided significant contributions to a number of achievements at the Pantex Plant during the last year:

Reduced Risk due to Aircraft Overflights

Due in large part to the Board's intensive review of the aircraft crash analysis for the Pantex Plant, an Overflight Working Group, chaired by DOE and including representatives from the City of Amarillo, the Federal Aviation Administration (FAA), and the United States Air Force (USAF), was chartered to assess the feasibility of moving air traffic away from the plant. Based on the recommendations of this working group, DOE has funded the FAA to upgrade navigational aids at the Amarillo International Airport. The FAA has completed engineering design studies and expects to complete in late 1996 the construction of a precision approach to Runway 22. Eventually, most flights over the Pantex Plant will be eliminated, thereby reducing significantly the risk of an aircraft crash at the site. Additionally, DOE has discussed the safety implications of aircraft overflights of the Pantex Plant with representatives from neighboring USAF bases whose aircraft use the Amarillo runway for pilot training. The Air Force commanders have issued safety bulletins to their aircraft squadrons that will help reduce the number of overflights of the Pantex Plant.

Improved Technical Staffing in the Amarillo Area Office

On July 20, 1994, the Board wrote to DOE concerning the paucity of technically competent personnel on the DOE Amarillo Area Office (AAO) staff. This deficiency had resulted in delays in implementing nuclear safety requirements, as well as a general inability to

ensure the contractor's readiness to proceed with new nuclear weapons activities. The Board urged DOE to place the highest priority on upgrading the staffing of AAO with the correct mix and quantity of technically qualified personnel. Because of the Board's efforts, technically competent engineering professionals were hired, many with strong nuclear industry experience. This enhancement of technical competence of the AAO staff has yielded substantial improvements in operations at the Pantex Plant in the areas of analysis, documentation and control of the safety envelope; personnel training and qualification; and control of the nuclear weapon dismantlement process.

Readiness to Begin Weapons Assembly/Disassembly Operations

The Board and its staff have been reviewing implementation of the DOE process used to confirm readiness to conduct nuclear weapons assembly, disassembly, and surveillance operations at the Pantex Plant. This process was developed partially in response to Recommendation 92-6, *Operational Readiness Reviews*. The Board is encouraged by the increased involvement of personnel from the National Laboratories in the review of readiness to begin operations. However, the Board's review of DOE's efforts to start operations on a number of weapon systems revealed deficiencies with implementation of the process. For example, reviews were being utilized more as a technical assistance visit by the Laboratories, than as a final independent assessment of operational readiness. In January 1995, the Board asked DOE to address certain issues and identify actions to improve the readiness process and its implementation. In response to the reporting requirement, and at DOE's direction, the Pantex Plant has improved its line management ability to assure readiness and is incorporating improved guidance for the independent review processes.

Improved Conduct of Operations and Use of Standards

During the past year, in response to Board Recommendations on standards and reporting requirements concerning conduct of operations, DOE and the Pantex Plant management and operating contractor have improved the use of procedures, thereby greatly improving the formality of operations at the plant. AAO has developed a set of operating procedures to standardize area office functions. These procedures capture requirements from DOE orders and other guidance to ensure the AAO staff fulfills all its responsibilities. The contractor also has improved its use of standards during the last year to control operations more formally. Examples of these improvements include a standardized process for writing Nuclear Explosive Operating Procedures, standardized review criteria, methods for self-assessments, and improved maintenance surveillance procedures. DOE-AL directives require verbatim compliance with approved procedures; however, the Board continues to identify numerous cases in which procedures are not followed or cannot be followed as written. This matter will receive close attention from the Board's site representatives and other staff members during 1996.

New and Upgraded Safety Analyses

The Board has had a significant impact on the efforts to upgrade safety analyses at the Pantex Plant. Its reviews have ensured consistency between the safety analyses being performed for the site-wide Environmental Impact Statement (EIS) and the facility Safety Analysis Reports (SARs). The Board has also closely reviewed the technical adequacy of the Basis for Interim Operations and the rigor of the bounding accident analysis. This focused review by the Board has helped ensure that the safety analyses being developed are complete and technically sound. A draft site-wide EIS and SAR's for the Assembly/Disassembly Bay and Cell are expected to be completed in 1996. These efforts to upgrade safety analyses have led to the identification of several Unreviewed Safety Questions at the Pantex Plant. For example, additional analysis and controls were required to improve the safety of tritium storage and of cell operations so as to assure that an explosion would not cause radioactive material to be released from the building.

Design and Safety Basis for the New Special Nuclear Material Staging Facility

The Special Nuclear Material (SNM) Component Staging Facility at the Pantex Plant (Building 12-116) was designed in 1988; construction was completed in 1993. However, the facility has never been operated, primarily because of shifting mission requirements and the need to correct design and construction discrepancies. The facility, which is expected to have new equipment backfitted during the next two years and to become operational in 1998, will be used to consolidate staging, inspection, and packaging operations for strategic reserve components.

During the latter half of 1995, the Board initiated a systematic review of this facility, focusing particularly on design characteristics that establish the nuclear safety envelope. These characteristics are expected to form a significant part of the authorization basis for the facility. The ongoing review by the Board is to identify hazards and appropriate accident scenarios for the facility, and to determine whether safety-related Structures, Systems and Components (SSCs) provide the requisite defense-in-depth. In addition, the review will examine standards, tests, analyses, and independent design reviews used in the design of the SSCs. The review, which is scheduled for completion by mid-1996, is designed to provide early identification of potential facility safety problems and to allow DOE up to six months to resolve any problems prior to the anticipated start of backfit construction.

Conduct of Operations and Criticality Safety at the Y-12 Plant, Oak Ridge

In September 1994, in response to numerous violations of criticality safety and weaknesses in disciplined operations identified by its staff, the Board issued Recommendation 94-4, *Deficiencies in Criticality Safety at the Oak Ridge Y-12 Plant*. This recommendation discussed observed weaknesses in operator discipline and in criticality safety programs, as well as in the adequacy of DOE and contractor experience, training, and performance. Based on the Board's observations, DOE suspended operations at the Y-12 plant, pending development of an implementation plan. Both DOE and its contractor have since undertaken a number of initiatives

to prepare the Y-12 facilities for resumption of operations, in accordance with DOE's implementation plan.

DOE's course of action for resumption of operations was to take immediate steps to correct safety deficiencies and then validate them through a formal restart process in accordance with DOE 5480.31, *Startup and Restart of Nuclear Facilities*. Three mission areas have been restarted successfully. Disassembly and assembly operations are projected to be restarted in the spring of 1996 and enriched uranium operations are scheduled to resume in 1997. In addition, within months of the Board's issuance of Recommendation 94-4, the DOE Y-12 Site Office was able to add eight new, technically competent personnel. These individuals have technical degrees and extensive nuclear backgrounds.

Several other independent DOE functional area assessments (training, conduct of operations, and criticality safety) have been performed in accordance with commitments in DOE's 94-4 Implementation Plan. Each of these assessments found that, in general, significant progress had been made in the past year as a direct result of activities associated with Recommendation 94-4. The training area assessment made note of the technical competence of key DOE personnel at the Y-12 Plant, stating, "The base level of Federal personnel technical expertise and competency at the Y-12 Plant site has significantly increased since the September 1994 event." The evaluators also noted that continued progress is still required in those areas that have been restarted, and that significant work is needed in other areas where restart has not occurred.

Project Sapphire - Receipt and Handling of Highly Enriched Uranium from the former Soviet Union

During the period November 1994 through October 1995, the Board provided safety oversight of activities involving "Project Sapphire" materials at the Oak Ridge Y-12 Plant. In November 1994, Project Sapphire personnel transported approximately 600 kilograms of Highly Enriched Uranium (HEU) from a nuclear facility in the Former Soviet Union State of Kazakhstan to Dover Air Force Base, in Delaware. After arrival at Dover, the material was shipped to the Y-12 Plant, where it was received and placed into interim storage by the Y-12 personnel. DOE next began negotiating with private vendors for the sale of the material, for the purpose of eventual blending the material down for commercial reactor fuel. The final shipment of Project Sapphire material was made from the Y-12 Plant in October 1995.

The Project Sapphire material was received, stored, and reshipped from the Y-12 Plant in a safe manner. However, Board oversight did identify areas for improvement that should be considered for similar initiatives, should any become necessary. During Board staff reviews conducted prior to shipment to the Y-12 Plant, it appeared that the Project Sapphire material had not been sufficiently characterized to conclude that it complied with Y-12 standards for storage of HEU. In addition, adequate hazards analysis and unreviewed safety question screening were not accomplished prior to receipt of the material to determine if the special operation was

actually within the safety authorization basis for the facility. Although DOE eventually developed an adequate sampling plan, the necessary additional sampling and characterization were never accomplished. DOE decided to allow the characterization and subsequent processing to be accomplished after shipment to the vendor's facility.

Control of the Authorization Basis for a Nuclear Research and Development Facility

The primary mission of the Plutonium Facility at the Lawrence Livermore National Laboratory (LLNL) involves the conduct of plutonium research and development activities associated with the DOE Stockpile Stewardship and Management program. During a 1994 review of the facility, the Board's staff noted the absence of facility operating limits on which the newly approved final Safety Analysis Report (SAR) is to be based. LLNL had failed to meet surveillance requirements established by the SAR to ensure operability of safety systems, such as emergency power, fire protection, and ventilation. After the Board identified these deficiencies to both DOE and laboratory personnel, LLNL placed the facility in administrative standby and normal nuclear operations were curtailed.

Before resuming operations in late 1995, LLNL required approximately six months to rewrite many of the Technical Safety Requirements. After additional analysis, training, and procedure writing efforts, the newly implemented safety improvements were validated through a successful formal restart process in accordance with DOE Order 5480.31, *Startup and Restart of Nuclear Facilities*.

Reservoir Unloading at the Mound Laboratory

The Mound Laboratory is currently involved in the safe shutdown and decommissioning of facilities formerly used for the production, repackaging and offsite shipment of nuclear materials, and the cleanup of nuclear waste. The Board has followed closely DOE's project for unloading more than 500 special tritium reservoir units at the Mound Laboratory. Review of the project disclosed that DOE had not completed appropriate readiness reviews for the proposed operations. Subsequent readiness reviews by DOE and the contractor for Mound Laboratory contractor confirmed deficiencies in radiation protection, training, and surveillance requirements. Action plans were developed to correct these deficiencies, and the unloading of the reservoirs began in late 1995.

F. SAFETY ASPECTS OF DECOMMISSIONING DEFENSE NUCLEAR FACILITIES

At the present time, as required by its statutory charter, the Board is following deactivation and decommissioning activities at the Rocky Flats Environmental Technology Site (RFETS) and the Hanford Site -- two locations DOE has selected for priority attention. At RFETS, work is underway to develop new methods for deactivation and decommissioning of

facilities and to streamline processes that would permit the site to be decommissioned much more rapidly than the ten-year span that had previously been projected. At the Hanford Site, DOE has identified the UO₃ facility and the PUREX Deactivation Projects as models for the development of common deactivation practices. In addition, DOE has identified C-Reactor at the Hanford Site as the centerpiece of a large-scale demonstration project for development of new decommissioning technologies, including placement of the reactor in a cocoon¹³.

Decommissioning Memorandum of Agreement Concerning the Rocky Flats Environmental Technology Site

The Board's statutory assignment includes the responsibility to review the adequacy of DOE's safety standards and their implementation in the design, construction, operation and decommissioning of defense nuclear facilities. Decommissioning of such facilities commences in earnest when DOE determines they are no longer needed for support of the weapons program and they are scheduled for decontamination and eventual dismantlement.

On the basis of understandings with the Environmental Protection Agency (EPA) and associated State authorities, DOE is proceeding to decontaminate excess facilities to the extent required to maintain and monitor them safely until they can be dismantled, and environmental restoration can be accomplished under provisions of the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as may be appropriate. Provisions of those statutes bring such actions under the oversight of EPA and/or the affected states.

The Board has been working with DOE, EPA, and the State of Colorado to fashion an agreement on how best to bring their respective oversight and regulatory authorities to bear on cleanup of RFETS, to facilitate DOE's cleanup effort. This effort has been progressing well and the principals hope to have a cooperative agreement in place in early 1996. The Board plans similar dialogues with Federal and State authorities having jurisdiction over decommissioning activities at other DOE sites.

Deactivating the UO₃ Facility at the Hanford Site

The UO₃ facility was formerly used to convert uranyl nitrate hexahydrate (UNH) solution from the PUREX Plant into solid UO₃ powder. The facility's last operating campaign was completed in June 1993, after which deactivation began immediately.

¹³This involves extending all reactor shield walls to the same height, and adding a new concrete roof over the reactor; modifying the reactor building to seal all penetrations and most other building access points; removing all ancillary buildings and structures; and allowing only infrequent and limited access to the facility for periodic inspection.

The purpose of the UO₃ facility deactivation project was to establish a passively safe and environmentally secure configuration and to preserve that configuration for up to 10 years. DOE considers the project to be completed. Currently, the plant is unoccupied and devoid of portable equipment and furniture. In its stabilized condition, nearly all the radioactive or hazardous materials have been removed. Only minimal effort is required for Surveillance and Maintenance (S&M) activities. All process equipment, instrumentation, and systems for heating, ventilation and air conditioning are shut down. The building doors and gates in the perimeter fence are locked to limit access. The facility is entered only for quarterly surveillance visits or to correct deficiencies identified during previous surveillance entries.

Deactivating the PUREX Facility at the Hanford Site

The PUREX facility processed irradiated fuel from the Hanford production reactors for the recovery of plutonium and uranium between 1956 and 1972. It was restarted in 1983, and continued to operate until 1990. DOE intends that the PUREX facility follows a deactivation process similar to that used at the UO₃ plant.

The Board's primary focus at both the UO₃ and PUREX facilities will be to ensure that DOE's deactivation and decommissioning methods provide adequate protection of the health and safety of workers and the public, and the protection of the environment. Board attention is currently focused on DOE's planning for transition from deactivation to decommissioning to ensure that later stages also provide adequate protection.

Decommissioning of C-Reactor at the Hanford Site

The C-Reactor is a surplus production reactor that was originally scheduled to be the first of eight to be dismantled at the Hanford Site. In lieu of dismantling, DOE now intends to place the C-Reactor in a cocoon for an extended period of up to 75 years before dismantlement is completed. DOE expects that this approach will constitute a safe storage mode during this long waiting period and reduce risks and costs of prolonged maintenance. In addition, DOE believes that the use of a cocoon for the C-Reactor could provide technology improvements to reduce cost, improve safety, and lessen environmental liabilities within the DOE complex. Technologies developed at the C-Reactor could be transferred quickly to other Hanford facilities, where seven other similar reactors and dozens of other large facilities require action, as well as to facilities elsewhere in the defense complex.

The Board intends to continue to focus its attention on ensuring that the technologies developed for the long-term storage of the C-Reactor are adequate for maintaining the safety of the facility throughout the storage period.

Deactivation and Decommissioning of the Rocky Flats Environmental Technology Site

The Rocky Flats Environmental Technology Site , constructed in the early 1950s, had as its primary mission the production of nuclear weapon components. This mission included manufacture of specific weapon components and chemical recovery of plutonium from residues and scrap. In early 1993, DOE canceled all plans for production of nuclear weapon components at RFETS and changed the primary mission of RFETS to one involving area cleanup, elimination of residues that had accumulated, interim storage of materials until they can be shipped to their final location, and removal of excess facilities. In order to accomplish these activities, the integrating contractor at RFETS is exploring alternatives to the previously identified sequencing of plant decommissioning.

The Board is following closely the development of deactivation and decommissioning plans to ensure the safety of workers and the public, and the protection of the environment.

III. ADMINISTRATIVE MATTERS

A. PERSONNEL RECRUITMENT

As of December 31, 1995, the Board had a staff of 98 full-time employees, including two full-time Site Representatives at the Department of Energy's Pantex Plant, near Amarillo, Texas; one Site Representative at the Hanford Site, in Richland, Washington; and two site representatives at the Rocky Flats Environmental Technology Site, near Denver, Colorado.

The highly technical mission of the Board requires staff of the highest scientific and technical caliber with demonstrated competencies in all major phases of nuclear safety. The Board's technical staff includes individuals with extensive backgrounds in nuclear, mechanical, electrical, chemical, structural, and metallurgical engineering; and physics. As an indication of the Board's technical talent, 20 percent of the technical staff hold degrees at the Ph.D. level and an additional 64 percent have Masters degrees. 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 weapon field, or the civilian reactor industry. Five other senior members of the Board's staff have law degrees (JD), in addition to degrees in a technical specialty. Both the Board and its staff include persons experienced in environmental impact assessments and regulatory processes.

This staff expertise is supplemented on occasions when special technical expertise is needed by outside experts with extensive experience with plutonium processing and weapons assembly and disassembly, and other nuclear operations. Since the limited staff size precludes its ability to cover all scientific matters by means of in-house specialists, the Board contracts for specialized technical expertise as needed. Guiding the work of its technical staff and outside experts and utilizing their individual specialized knowledge and capabilities has enabled the Board to make its own technical judgements forming the basis of its 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, six interns are in various phases of a three-year training program encompassing formal graduate school education and on-the-job training. The recruitment and selection methods used have proven very effective, based on the outstanding academic and on-the-job performance of the five staff members that have already completed the intern program. Board staffing projections include the recruitment of five technical interns in 1996.

B. OFFICIAL SITE VISITS BY BOARD MEMBERS AND BY STAFF

From the establishment of the Board in October 1989, through December 31, 1995, Members of the Board, its staff, and its contractor experts had collectively made 870 site visits to DOE's defense nuclear facilities. In 1995 alone, 173 site visits were made to DOE's defense

nuclear facilities by Board Members, staff, and outside experts. These visits focused primarily on selected facilities that both the Board and DOE consider to be most pressing in light of DOE's mission. Where appropriate, the results of staff visits were conveyed formally to DOE managers as trip reports.

During its visits, the Board reviewed firsthand the health and safety issues at each of these sites. The Board also gathered information relevant to its recommendations to the Secretary of Energy and observed their implementation.

C. PUBLIC INTERACTION WITH THE BOARD

The Board continues to be sensitive to the need for public involvement and awareness of defense nuclear safety issues, and has found public meetings to be very effective tools in encouraging responsiveness on the part of Department representatives, and in exchanging information with state and local officials, labor leaders, DOE facility workers, public interest groups, and area residents. During 1995, the Board conducted five public meetings, hearings, and briefings at or near the following DOE defense nuclear sites:

- Savannah River Site
- Rocky Flats Environmental Technology Site
- Hanford Site -- two meetings
- Lawrence Livermore National Laboratory

During 1995, the Board also held five public meetings at its Washington, D.C. offices where, among other topics, the Board, its technical staff, and outside experts discussed the status of work in the standards area, as well as health and safety reviews at DOE defense nuclear facilities. In addition to these public meetings, members of the Board's staff have provided information briefings to local officials and public interest groups in the vicinity of the Pantex Plant, and the Savannah River, Hanford, and Rocky Flats Environmental Technology Sites, and the Fernald Environmental Management Project.

Notices of such public Board meetings are published in the Federal Register and are mailed to 386 organizations and individuals who have requested to be on the Board's mailing list. In addition, each notice is published three times in several local newspapers serving the communities near the DOE facility involved.

In July 1995, the Board expanded the information available to the public via its Home Page on the World Wide Web¹⁴. The Home Page includes links to, among other things, the entire text of all Board recommendations, the Board's most recent Annual Report, biweekly updates of the log of all correspondence/documents sent or received by the Board, and other

¹⁴ <http://www.dnfsb.gov>

background information on the Board's health and safety review activities. This service has been heavily utilized, with more than 22,000 inquiries registered during the month of December 1995 alone .

D. NATIONAL PERFORMANCE REVIEW (NPR) STREAMLINING OBJECTIVES

The Board believes that as a new agency, not encumbered by years of bureaucratic rules, regulations, and practices, has already accomplished many of the streamlining objectives of the NPR. At its inception, the Board's executive leadership recognized the importance of carefully structuring an organization to avoid layering, to promote empowerment, and encourage timely action. Using this philosophy, the Board focused its early attention to the following key organizational elements:

Starting Without Encumbrances

As a new agency, the Board did not inherit any staff, organizational structure, or internal regulations governing the conduct of business. Therefore, the Board was free to create a lean organization tailored to its specialized scientific and technical mission, without the encumbrances often associated with traditional government operations such as, vertical layering, excessive administrative support, and duplication of function. The simple structure of the technical staff enables the Board to use technical staff members in an optimum way to deal with each new topic the Board takes up.

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 regulations necessary to maintain orderly operations -- Freedom of Information Act, Privacy Act, Government in the Sunshine Act, and Organizational and Consultant Conflicts of Interests. Moreover, in promulgating these regulations, the Board has written the rules in ways that achieve the statutory purposes without burdening the Board with inflexibility, or overly-prescriptive requirements that attempt to substitute detailed paperwork for sound judgment.

"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 road blocks that have traditionally frustrated change in government organizations. Most prominent in 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 NPR have been operational at the Board for more than four years and have received favorable review by the

General Accounting Office and the Office of Personnel Management. These concepts have proven to be very effective in hiring technical talent, holding employees accountable for their performance, and rewarding outstanding performance on the job.

"No frills" Approach to Operations

From the first day of operation, the Board Members have set the standard for having a "no frills" approach to conducting Board business. Administrative expenses are carefully reviewed for absolute necessity before expenditures are allowed. For example, the Board does not employ chauffeurs and has no Government automobiles. It carefully enforces the Federal Travel Regulations. These internal policies have been in place since its inception with no adverse impact on operations. Internal directives were written to give practical guidance in the most simplified manner.

Effective Organization Structure

The Board maintains focus on its mission respecting the adequate protection of public and worker health and safety at DOE defense nuclear facilities. Using a matrix form of organization, the Board gained management flexibility and avoided the need to establish layers of middle management that divert limited staff resources from performing health and safety reviews.

Adopting the "economies of scale" philosophy for obtaining needed administrative support services, the Board negotiated Interagency Agreements with the U.S. Nuclear Regulatory Commission, the National Science Foundation, the Public Health Service and the General Services Administration to obtain immediate support for accounting, procurement, personnel, and payroll services. Resources that normally are diverted to these administrative functions remain dedicated to the health and safety mission.

Management Continuity

Under the Board's enabling legislation, the five 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 resulting from frequent changes in leadership experienced by many government agencies. From the first day of operation, the Board has had precise and consistent direction of the conduct of its technical mission and major policy issues.

Experienced Leadership

Building an organization from its statutory foundation offers a special management challenge requiring individuals with good planning skills, organization skills, and detailed knowledge of a wide range of Federal government policies and practices. The Board

successfully recruited a small senior management staff with demonstrated management experience and proven accomplishments.

Using their collective knowledge of government operations, the Board and its senior management staff planned and implemented an organizational structure that maximizes the effectiveness of the scientific and technical resources available and that avoids unnecessary layers of management.

Information Technology

The Board has encouraged the full use of today's advanced computer capabilities by investing in state-of-the-art hardware and software. Staff members use their desk top computers to obtain the latest information on events at defense nuclear sites; review a data base of more than 1.2 million pages of technical documents received by the Board on defense nuclear facilities; access Federal Register notices and legal decisions; and electronically send draft reports to colleagues for review. Expert consultants, engineers on travel, and site representatives send and receive electronic communications through remote access to the Board's local area network.

Accountability vs. Excessive Controls

Small organizations such as this Board cannot afford to waste scarce resources establishing layers of internal management. The Board believes that the foundation for a strong, effective program to prevent fraud, waste, and abuse of government property and funds begins with the line managers responsible for overall program administration.

An independent review of the organization structure and management of the Board conducted by the Institute of Public Administration recognized the significant progress and accomplishments made by the Board in establishing a streamlined structure with a minimal commitment of resources. Also, a recent independent audit of the Board's administrative operation conducted by Gardiner, Kamyra & Associates, a private accounting firm, in November 1995, confirmed that a reliable and workable system of management controls operates as an integral part of the Board's administrative systems.

Customer Service

In the Board's public health and safety reviews, contacts with the public are primarily through open hearings and access to the Board's public reading room. Since 1990, the Board has held 48 public hearings at sites across the nation and in Washington, D.C. The public reading room is open to the public every working day and the staff has received numerous complimentary letters from private citizens, public interest groups, corporations, and other government agencies.

To assist the public in requesting information, the Board published a Customer Service Standard in July 1995. This publication catalogs the various public information services offered by the Board. This document was mailed to all groups and individuals on the Board's mailing list and placed in a new customer service category in our World Wide Web Home Page.

IV. PLANNED FOCUS OF BOARD ACTIVITIES DURING 1996

Operational Formality - A Complex-Wide Issue

As described broadly in Recommendation 95-2 and in DNFSB/TECH-6, operational formality is a structured and systematic way of planning and performing work while ensuring that a sound authorization basis for the facility or activity is preserved. It encompasses the set of practices used to ensure safety in a facility, and in the operations conducted therein, extending to the systematic coverage implied by the term "safety culture."

Operational formality is not simply a group of unrelated functional areas, but an integrated approach to performing essential elements of operations such as: ensuring that facility activities, including any environmental discharges, are conducted within the authorization basis; formal communications during evolutions; independent safety reviews of significant procedure and plant changes; continuing review of operating experience and implementation of lessons learned; and preparing, reviewing, approving and using operating procedures. Though details may vary from facility to facility, the need for a structured approach, appropriately tailored, remains constant and will be a major focus of the Board in 1996.



During the coming months, extending through and beyond 1996, the Board anticipates that the ongoing transition of the mission of DOE's weapons complex will continue to evolve. At the same time the weapons stockpile programs demand continuing attention, the legacies of aging facilities, widespread contamination, and huge inventories of highly toxic and radioactive waste products and residues from half a century of nuclear weapons production must be dealt with. In the face of these challenges, and as DOE realigns itself to accommodate mandated downsizing, the role of competent, independent, external oversight will become even more demanding. Based on its experience during the past five years, the Board believes that its oversight function is an indispensable element of the overall national effort to cope with the myriad safety issues at defense nuclear facilities.

Within this broad context, the Board plans to continue much the same emphasis it established a year ago. The Board will continue to place a high priority focus on complex-wide safety issues, such as the need to:

- oversee the continuation of dismantlement and storage of weapons and weapons components - to help ensure protection of the health and safety of the public and the workers involved, and of the environment;

- evaluate proposed upgrades to facilities and processes vital to the stockpile stewardship and management programs - to ensure their design adequacy and their safe operation;
- closely monitor DOE's upgrading of its technical capabilities and expertise and those of its contractors - to verify the effectiveness of DOE's program for improving staff qualifications at the same time it seeks to meet demands placed on a dwindling staff;
- ensure that DOE expedites the processing, packaging and safe long-term storage of plutonium-bearing materials - to reduce the risk of unwarranted exposures to these hazards;
- review in detail authorization bases prepared by DOE for priority facilities and activities - to verify conformance with established principles, including recent guidance prepared by the Board and its staff;
- monitor the integration of safety management of both defense nuclear research and development activities and weapon assembly, disassembly, and testing operations - to ensure that both can be accomplished effectively and safely;
- continue its close attention to DOE's program for resolving safety issues associated with existing inventories of corroding spent fuel in storage pools at several facilities and with byproduct material from historical defense enrichment operations - to assist DOE gain control of these potential and actual sources of significant contamination and radiological exposure;
- encourage DOE to continue to improve its radiation protection program - to reduce the risk of unnecessary worker exposures, as well as to reduce potential public exposures;
- monitor closely DOE's planning for work in hazardous and radiological environments, criteria for release of materials after cleanup, and development and evaluation of radiological protection performance indicators applicable to unique cleanup situations - to ensure adherence to the principles of the "As Low As Reasonably Achievable" concept
- evaluate DOE's ongoing expedited revision of its program for development and promulgation of requirements, including orders, rules, standards, guides and contract provisions, as well as reviewing DOE's programs for verification of adherence to those requirements - to ensure that DOE appropriately integrates these processes; and

- insist that DOE adopt sound systems engineering practices in all its safety-related projects and programs - to foster DOE's overall management of its safety program.

Technical issues at DOE continue to evolve. The combination of well-recognized and longstanding threats to public health and safety, accompanied by potentially hazardous new activities, presents different and potentially serious challenges. These include, for example, the need to:

- operate facilities for short periods to remove and stabilize radioactive or hazardous materials held up in processing lines and vessels;
- establish improved storage conditions to minimize corrosion of spent nuclear fuel stored in basins that were not designed for long-term use;
- gain control of the existing inventories of chemical and radioactive wastes, which continue to grow and are bound to become even larger when decontamination and decommissioning get underway in earnest;
- surmount technical problems associated with existing high-level radioactive waste storage tanks;
- ensure the safe startup and operation of high-level radioactive waste processing facilities;
- ensure that dismantlement of more than 2,000 warheads each year is conducted safely;
- design, construct, and operate facilities to store nuclear materials from dismantled nuclear weapons;
- consolidate weapons stockpile stewardship and management functions at a reduced number of sites, including in upgraded facilities that were previously used predominantly for research and development.
- process and replenish tritium in nuclear weapons retained in service; and
- determine possible roles of existing research and development facilities for limited production missions, and institute the significant modifications to traditional laboratory operating practices that will be required to fulfill those roles.

The Board is concerned that these technical challenges, and others not yet identified, may be at least as large in number and just as severe as those encountered during production operations.

APPENDICES

A Table of Priority Facilities and Activities

B 1995 Board Recommendations

Appendix A

Appendix A

Priority Facilities and Activities

Facility	Status (Note 1)	Hazards (Note 2)	Key Regulatory/ Oversight Bodies
SAVANNAH RIVER SITE FACILITIES			
F-Canyon/FB-Line/FA-Line H-Canyon/HB-Line/HA-Line	Operational (EM)	HIGH Plutonium, Uranium, Transuranics, IILW	DNFSB
DWPF/ITP/ESP HLW Tanks	Operational (EM)	HIGH Fission Products	DNFSB
RBOF, L-Basin, K-Basin and P-Basin	Operational (EM)	MODERATE Plutonium, Uranium, Fission Products	DNFSB
Tritium Facilities	Operational (DP)	HIGH Tritium	DNFSB

HANFORD FACILITIES			
High Level Waste Tank Farms	Operational (EM)	HIGH Fission Products	DNFSB, State, EPA
K-Reactor Area Fuel Storage Basins	Operational (EM)	MODERATE Spent Nuclear, Fuel and Sludge	DNFSB, State, EPA
Plutonium Finishing Plant	Operational (EM)	MODERATE Plutonium	DNFSB, State, EPA
Waste Encapsulation and Storage Facility	Operational (EM)	MODERATE Cesium & Strontium	DNFSB, State, EPA

Priority Facilities and Activities (Continued)

Facility	Status (Note 1)	Hazards (Note 2)	Key Regulatory/ Oversight Bodies
ROCKY FLATS FACILITIES			
Solution processing and SNM Storage Building 771	Shutdown	MODERATE Plutonium solution, SNM, and waste	DNFSB, State and EPA
Solution processing and SNM consolidated storage Building 371	Shutdown	HIGH Plutonium solution, SNM, and waste	DNFSB, State and EPA
Residue Processing and SNM Storage Building 776, Building 779, Building 707	Shutdown	MODERATE Bldg 776 could be HIGH based on contamination. Plutonium residue SNM, and waste	DNFSB, State and EPA
Highly Enriched Uranyl Nitrate Processing Building 886	Shutdown	MODERATE Highly Enriched Uranium Solution SNM, and waste	DNFSB, State and EPA

INEL FACILITIES			
Advanced Test Reactor	Operational (NE)	HIGH Fission Products, Uranium-235	DNFSB
CPP-603 Underwater Fuel Storage	Operational (EM)	MODERATE Fission Products, Uranium, Plutonium	DNFSB

Priority Facilities and Activities (Continued)

Facility	Status (Note 1)	Hazards (Note 2)	Key Regulatory/ Oversight Bodies
REPRESENTATIVE PANTEX FACILITIES			
Nuclear Weapon Assembly/Disassembly cells	Operational (DP)	HIGH High Explosives, Plutonium, Uranium, Tritium	DNFSB
Nuclear Weapon Assembly/Disassembly Bays	Operational (DP)	HIGH High Explosives, Plutonium, Uranium, Tritium	DNFSB
Building 12-116, SNM Staging Facility (New nuclear facility)	New Facility - Startup in FY 97 (DP)	MODERATE (at present) Plutonium, Uranium, Tritium	DNFSB
Building 12-104A, Special Purpose Bays (New nuclear facility)	New Facility - Startup in FY95 (DP)	MODERATE Weapons hazards Radiation Generating Device (Linac)	DNFSB

REPRESENTATIVE LANL NUCLEAR FACILITIES			
TA-55, Plutonium Facility, LANL's main facility for R&D and processing of plutonium.	Operational. (DP)	HIGH. Plutonium. Chemical hazards. Nuclear criticality.	DNFSB (New Mexico Environmental Department (NMED))
TA-3, Chemistry and Metallurgy Research Building, an R&D	Operational. (DP)	HIGH. Plutonium, Uranium. Chemical hazards.	DNFSB (NMED)
TA-18, Los Alamos Critical Experiments Facility	Operational. (DP)	HIGH. Nuclear criticality.	DNFSB
TA-16, Weapons Engineering Tritium Facility	Operational. (DP)	MODERATE. Tritium	DNFSB
TA-15, Dual Axis Radiographic Hydrotest (DARHT) Facility	Partially constructed. (DP)	HIGH. Radiation generating device. Explosions. Depleted Uranium. Chemical Hazards.	DNFSB

Priority Facilities and Activities (Continued)

Facility	Status (Note 1)	Hazards (Note 2)	Key Regulatory/ Oversight Bodies
REPRESENTATIVE OAK RIDGE FACILITIES			
Y-12: Highly Enriched Uranium Processing.	Operational. (DP)	MODERATE. HEU Hazardous, toxic, and radioactive materials	DNFSB
Y-12: Component Assembly, Disassembly, and Evaluation	Operational. (DP)	MODERATE. HEU, Lithium Hazardous, toxic, and radioactive materials	DNFSB
Y-12 and ORNL: Material Storage	Operational. (DP)	MODERATE HEU, ²³³ U, Hazardous, toxic, and radioactive materials.	DNFSB
K-25 Highly Enriched Uranium Remediation and Depleted Uranium Tailings Storage	Transition (EM)	MODERATE. HEU, DU, HF	DNFSB
REPRESENTATIVE LIVERMORE FACILITY			
Building 332, Plutonium Facility	Operational (DP)	MODERATE Plutonium, Uranium	DNFSB
SANDIA NATIONAL LABORATORIES FACILITIES			
Technical Area V: - Annular Core Research Reactor (ACRR) - Sandia Pulse Reactor Facility	Operational (DP)	MODERATE Highly enriched uranium fueled reactors.	DNFSB
REPRESENTATIVE NTS FACILITIES			
Abel Site, Area 27 (to be replaced by the Device Assembly Facility, Area 6)	Operational (DP)	HIGH High Explosives Plutonium, Uranium, Tritium	DNFSB
Radioactive Waste Management sites in Area 5, Area 3 and the TRU Pad	Operational (DP)	MODERATE Plutonium, Uranium	DNFSB

NOTES:

1. DP = DOE Defense Programs; EM = Environmental Management.
2. These are not DOE rankings. Rankings are tentative, currently under Board review.

Appendix B

**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD****[Recommendation 95-1]****Improved Safety of Cylinders
Containing Depleted Uranium****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
concerning improved safety of cylinders
containing depleted uranium. The
Board requests public comments on this
recommendation.**DATES:** Comments, data, views, or
arguments concerning this
recommendation are due on or before
June 14, 1995.**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.**FOR FURTHER INFORMATION CONTACT:**
Kenneth M. Pusateri or Carol C. Morgan
at the address above or telephone (202)
208-6400.**John T. Conway,**
Chairman.

The three large gaseous diffusion plants that were operated by the Department of Energy (DOE) and its predecessors produced enriched uranium, some for defense use and some for incorporation into nuclear fuel for civilian reactors in the United States and other countries. In the course of isotope separation, most of the uranium ended up as the part depleted in U-235, designated as "tails" or "tailings". Enriched uranium at all desired assays was simultaneously extracted from the

plants, for all purposes, and so no amount of tails can be identified as related to enrichment solely for either defense or civilian purposes. Most of all uranium ever mined in the United States or imported into the United States remains in tails at the gaseous diffusion plants. These tails are stored onsite at the three plants in large steel containers, normally termed "cylinders", as the chemical compound UF₆.

Members of the staff of the Defense Nuclear Facilities Safety Board recently had an opportunity to visit the gaseous diffusion plants, to follow up on information that had been obtained on safety of storage of the tails. A short report documenting the results of their review is attached. It was found that DOE has approximately 50,000 cylinders in outdoor storage at the three diffusion plants, containing more than 500,000 metric tons of UF₆. Poor maintenance and storage conditions, combined with mechanical damage suffered during handling, have led to corrosion and subsequent breaching of several of these carbon steel cylinders.

Cylinders have surface coatings (paint) of varying quality and integrity, which in a large number of cases is severely degraded. Cylinders are kept outdoors, some stacked on pads and some directly on the ground. Some older cylinders have been in storage in excess of forty years. Although general external corrosion seems to increase with time, handling damage and localized corrosion attributable to electrolytic attack appear to be more important factors in deterioration.

The corrosion-resistant coatings have not been maintained, leaving the vast majority of cylinders vulnerable to localized corrosion. Visual inspections have shown abundant pitting and crevice corrosion of the cylinders, as well as galvanic attack near bronze valves and plugs. Since neither localized corrosion rates nor the extent of existing defects in the cylinders are well known or well understood, it is uncertain how many cylinders may be expected to fail in the near future. DOE and MMES (Martin-Marietta Energy Systems) are attempting to evaluate the extent of the erosion rates and their consequences; results are very preliminary, but they indicate that more than 1,000 cylinders have a potential to breach before the year 2020 if no remedial actions are taken, with the result that their components of more than 10,000 tons of uranium could become accessible to release to the environment.

In section 1016 of Public Law 102-486 (October 24, 1992), Congress directed the Department of Energy to

provide within one year a uranium inventory study that would include among other matters recommendations for the future use and disposition of inventories of all Government-owned uranium or uranium equivalents, including depleted tailings. The Department has not yet complied with this requirement, presumably at least in part because the matters addressed by Congressional action are very comprehensive and require extensive decisions on future courses of action.

It is clear to the Board that directions developed in response to section 1016 of Public Law 102-486 will affect the long-term future of the vast inventory of depleted uranium tails. However, the very size of that inventory means that no matter what actions may be taken, they will require a long time to consummate, with deterioration of the cylinders continuing all the while.

To protect against the dispersal of large amounts of uranium to soil and ground water in years to come, an early start to remedial action should be planned and then instituted. The alternative could be a massive problem with extraordinary financial costs.

Therefore, the Board recommends that:

1. An early program be started to renew the protective coating of cylinders containing the tails from the historic production of enriched uranium.
2. The possibility of additional measures be explored, to protect these cylinders from the damaging effects of exposure to the elements, as well as any additional handling that may be called for.
3. A study be instituted to determine whether a more suitable chemical form should be selected for long-term storage of the depleted uranium.

The Board designated Mr. Steven Krahn as its principal staff member for discussions with those in DOE whom you may designate to act on this recommendation and matters that may arise concerning it.

John T. Conway,
Chairman.

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BILLING CODE 3870-01-M

**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

[Recommendation 95-2]

Safety Management

AGENCY: Defense Nuclear Facilities
Safety Board.

ACTION: Notice; recommendation.

SUMMARY: The Defense Nuclear
Facilities Safety Board (Board) has made
a recommendation to the Secretary of
Energy pursuant to 42 U.S.C. 2286a(a)(5)
concerning Safety Management. The
Board requests public comments on this
recommendation.

DATES: Comments, data, views or
arguments concerning this
recommendation are due on or before
November 20, 1995.

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.

FOR FURTHER INFORMATION CONTACT:

Kenneth M. Pusateri or Carole J. Morgan, at the address above or telephone (202) 208-6400.

Dated: October 16, 1995.

John T. Conway,
Chairman.

[Recommendation 95-2]

Safety Management

Dated: October 11, 1995.

The Defense Nuclear Facilities Safety Board (Board) has issued and the Secretary of Energy has accepted three sets of recommendations (90-2, 92-5, and 94-5) concerning the use of standards by contractors at the Department of Energy's (DOE) defense nuclear facilities, and the level of conduct of operations to be maintained at these facilities. These recommendations intersect in many of their implications. The Board now wishes to combine and modify these recommendations into a form that (1) reflects what it has learned from DOE's response to the recommendations, (2) more sharply focuses continued activity on the objectives DOE and the Board seek to achieve, and (3) is more clearly consonant with the actions which DOE has under way to modify DOE's system of Orders.

On March 8, 1990, the Board forwarded to the Secretary of Energy Recommendation 90-2. Briefly paraphrased, it recommended that (1) DOE identify the particular standards that it considered should apply to certain designated defense nuclear facilities of DOE, (2) DOE provide its views of the adequacy of these standards, and (3) DOE establish the extent to which the standards were being applied to the facilities. The Secretary accepted this Recommendation on June 11, 1990, and provided the Board with an acceptable Implementation Plan on November 9, 1994.

The principal product of implementation was to be a set of facility-specific documents that set forth the applicable standards and requirements for a selected set of DOE's defense nuclear facilities. These were termed Standards/Requirements Implementation Documents (S/RIDs). The S/RID was to contain those requirements considered necessary and sufficient for ensuring safety in the particular application. These were to be principally extracted from DOE Orders, appropriate standards, NRC guides, and similar sources. The S/RID was envisioned as the basis upon which work controls would be developed and implemented.

This concept has been maturing in the course of its application to several DOE defense nuclear facilities. Subsequently, in connection with its internal plans to restructure its system of Orders, DOE has developed the concept of the "necessary and sufficient" set of requirements at a site or a facility or for an activity. As applied to safety requirements, we recognize the "necessary and sufficient" and S/RID concepts to be identical. In the following, the identity of the two will be implicitly understood, although we shall continue to use S/RID as the preferred term for the documented set of applicable standards and requirements in agreements between DOE and its defense contracts. This is the nomenclature found in implementation plans submitted by DOE to the Board. To avoid confusion, we suggest that DOE continue uniform use of the term S/RID in this connection.

DOE is to determine the extent to which standards are implemented through a process of Order Compliance Self-Assessment. This has generally been accomplished through review of detailed compliance with the DOE safety Orders of interest to the Board. The practice is to be followed until S/RIDs are in place, after which time, the issue becomes compliance with requirements in S/RIDs.

The Board has viewed the Order Compliance Self-Assessment Program of DOE as an initial activity in the formulation of the S/RIDs. As part of this compliance self-assessment, DOE required the contractors to justify in documented form the rationale for judging requirements to be non-applicable. This procedural requirement has been reported to have caused the expenditure of more effort than merited to achieve the end result the Board sought, which was the establishment of the particular subset of requirements upon which the safety management programs at a site would be structured. In the recommendations below, the Board seeks to streamline the process of arriving at an Authorization Basis and Authorization Agreements with respect to DOE's safety management of its sites, facilities, and activities. The review and acceptance by DOE of (1) the hazards assessment of the work contracted, (2) the standards/requirements identified as appropriate, and (3) safety management controls committed by the contractor for the work would in effect constitute, in the view of the Board, a DOE determination of adequacy relative to sufficiency of the requirements base.

In another action, on August 17, 1992, the Board forwarded its Recommendation 92-5, which called for

establishing certain safety policies at defense nuclear facilities faced with missions that were changing in response to the shifting world situation. The principal features of Recommendation 92-5 can be paraphrased as follows: (1) that facilities to be used in the longer term in nuclear defense missions or in cleanup from previous nuclear defense activities should be operated according to a superior level of conduct of operations, (2) that certain safety practices be followed at nuclear defense facilities being restarted after a long period of idleness, and (3) that defense nuclear facilities designated for various other kinds of use (such as standby) should be subject to a graded approach of safety criteria and requirements to be developed. The Board requested that it be informed on a timely basis of changes in the intended use of DOE's defense nuclear facilities.

Implicit in the Recommendation was a broader view of conduct of operations than adherence to written procedures and related activities directly in support of operations. It encompassed the entire set of practices used to ensure safety in a facility, and in the operations conducted therein, extending to coverage implied by the term "safety culture."

On December 16, 1992, the Secretary of Energy accepted Recommendation 92-5, and forwarded to the Board an Implementation Plan which the Board accepted on January 8, 1993.

Circumstances affecting DOE's defense programs have continued to evolve since then, and the view of the future of the defense nuclear establishment is now different from that in late 1992. Many facilities then scheduled for restart or standby are now slated for deactivation and decommissioning. Though the future form of the establishment continues to be uncertain, the Board believes that the extent of the changes and other intervening events makes it necessary to bring major features of its Recommendation 92-5 up to date and in line with the updating of Recommendation 90-2.

Another important development has been the elaboration of the S/RID concept into a system view of a standards-based safety management system.¹ This has shed further light on such important matters as permissible variability of safety management at facilities of different kinds and different levels of risk, and the formal means whereby an Authorization Agreement

¹ Fundamentals for Understanding Standards-Based Safety Management, Joseph J. DiNunno, DNFSD/TECH-5.

related to environment, safety and health objectives is incorporated into contractual terms.

Principles that should guide the structure and use of safety management, the framework for conduct of operations appropriate to different cases, the basis for grading of safety management and conduct of operations, and the application to the important defense nuclear laboratories of the Department of Energy, are outlined in another document in the DNFSB/TECH sequence.² The points laid out in DNFSB/TECH-6 are consistent with those in DNFSB/TECH-5. Although the concepts and processes discussed in these documents are couched in terms of radiological hazards, they are more general, and apply as well to hazards of other kinds. In addition, they offer an appropriate match to requirements established elsewhere for safety in decommissioning of facilities, and would serve as a bridge to such operations.

The Board agrees with the view adopted by DOE in certain pilot tests presently under way, that the contractor for a site, facility, or activity should originate the drafting of the Safety Management Plan and the S/RID with assistance and input as appropriate by DOE. DOE has the responsibility for determining that the proposed S/RID will ensure an adequate level of safety, and finally approving it when it is found to be satisfactory. In the Board's view, an S/RID should be the central component of the Authorization Agreement which should have contractual status as part of the agreement with the contractor relevant to performance of the work authorized for the site, facility, or activity.

In accordance with its statutory directive to review DOE's safety standards and their implementation, the Board plans to track selected S/RIDs and the associated Safety Management Programs as they are developed. The Board will formally review them after their completion and will provide its comments to DOE in letters to the Secretary or in the statutory form of recommendations. The Board would normally expect DOE to have performed its own review with documentation of the results before being formally provided with the Board's comments.

We recognize that the various DOE organizational units which may be delegated review and approval authority for S/RIDs and associated Safety Management Programs may not have

enough individuals with qualifications in the technical specialties required to carry out effectively the streamlined process being recommended. This means that technical assistance may need to be retained from elsewhere to compensate for such personnel deficiencies where they exist. It also means that DOE may need to augment its own technical expertise so as not to be obliged to continue indefinitely to rely on technical assistance from outside DOE.

The Board renews its request that it be informed on a timely basis of changes in planned use of defense nuclear facilities. In addition, the Board now wishes to replace Recommendations 90-2 and 92-5. The schedule agreed to by DOE and the Board for S/RID development and implementation pursuant to Recommendation 90-2 will be revised and carried forward as a part of Recommendation 94-5, which is not being otherwise modified at this time.

Therefore, the Board recommends, that DOE:

1. Institutionalize the process of incorporating into the planning and execution of every major defense nuclear activity involving hazardous materials those controls necessary to ensure that environment, safety and health objectives are achieved.
2. Require the conduct of all operations and activities within the defense nuclear complex or the former defense nuclear complex that involve radioactive and other substantially hazardous materials to be subject to Safety Management Plans that are graded according to the risk associated with the activity. The Safety Management Plans and the operations should be structured on the lines discussed in the referenced documents DNFSB/TECH-5 and DNFSB/TECH-6.
3. Establish a new list of facilities and activities prioritized on lines of hazard and importance to defense and cleanup programs, to focus the transition from implementation programs related to 90-2 and 92-5 to this revised development of S/RIDs and associated Safety Management Plans, following the process of Section I of DNFSB/TECH-6.
4. Promulgate requirements and associated instructions (Orders/standards) which provide direction and guidance for this process including responsibilities for carrying it out. The manner of establishing responsibilities and authorities as currently set forth in DOE Order 5480.31 (425.1) for Operational Readiness Reviews should serve as a model for preparing, reviewing, and approving the Safety Management Programs. The requirement

for conformance should be made a contract term.

5. Take such measures as are required to ensure that DOE itself has or acquires the technical expertise to effectively implement the streamlined process recommended.

John T. Conway,
Chairman.

October 11, 1995

The Honorable Hazel R. O'Leary,
Secretary of Energy, Washington, DC 20585

Dear Secretary O'Leary: On October 11, 1995, the Defense Nuclear Facilities Safety Board, in accordance with 42 U.S.C. § 2286a(a)(5), unanimously approved Recommendation 95-2 which is enclosed for your consideration. Recommendation 95-2 deals with Safety Management.

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 regional public reading rooms. The Board believes the recommendation contains no information which is classified or otherwise restricted. To the extent this recommendation does not include information restricted by DOE under the Atomic Energy Act of 1954, 42 U.S.C. §§ 2161-68, as amended, please 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.

Enclosure
c: Mark Whitaker, EH-9

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BILLING CODE 3870-01-M

² Safety Management and Conduct of Operations at the Department of Energy's Defense Nuclear Facilities, DNFSB/TECH-6.