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Bert Chapman

Abstract

Concern over the safety of the United States' defense nuclear reactors in the late 1980s led to congressional creation of an independent oversight board. The Defense Nuclear Facility Safeties Board (DNFSB) is responsible for overseeing safety issues at the U.S. Department of Energy's nuclear facilities and issuing recommendations on operations and safety at these facilities, which include South Carolina's Savannah River Site, Texas' Pantex facility, Colorado's Rocky Flats Depot, and others. This article provides an historical overview of the DNFSB's first decade and discusses its relationship and interaction with the Department of Energy and congressional oversight committees as well as the recommendations it has issued on nuclear safety. An assessment of DNFSB's future prospects concludes the article.

Keywords: U.S. Defense Nuclear Facilities Safety Board; Defense nuclear facilities; U.S. Department of Energy defense programs; Nuclear weapons storage; Environmental policy; Public administration

1. Introduction

Developing a viable nuclear weapons arsenal was an essential component in the U.S. military victory over Japan during World War II. Expanding and sustaining the credibility, quantity, and quality of this nuclear deterrent would also play a critical role in the United States' protracted, but ultimately triumphant, Cold War confrontation with the Soviet Union. Creating the technical and physical foundations of the infrastructure supporting this nuclear weapons development saw the creation of numerous facilities with diverse responsibilities at various locations nationwide. These facilities, under the guidance and generally secretive policies of agencies such as the Atomic Energy Commission (AEC) and the U.S. Department of Energy (DOE), succeeded in developing and maintaining an effectual American nuclear deterrent but at the price of significant environmental degradation¹.

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This environmental degradation occurred over the past 50 years as DOE and its predecessor agencies focused on nuclear weapons development, production, and testing at the expense of environmental safety. A 1994 U.S. government report provides a contextual assessment of some of the environmental costs of the nuclear weapons production:

The nuclear weapons complex consists of 15 major facilities and a dozen or so smaller facilities at which production, research, and testing have occurred over the past five decades. In addition, DOE is responsible for environmental cleanup at thousands of sites formerly used in the weapons program and sites where uranium was processed. Altogether DOE must contend with more than 100 million gallons of highly radioactive waste, 66 million gallons of waste contaminated with plutonium, and larger volumes of low-level radioactive waste. It also must deal with huge volumes of other toxic materials, including heavy metals, chemicals used as solvents, acids, and other materials that are difficult and costly to clean up¹.

The extent of DOE's nuclear weapons complex is staggering. Its facilities are dispersed over 13 states covering 3,350 square miles and employ more than 100,000 people. These individuals and facilities have been involved in responsibilities such as producing uranium materials, irradiating them in nuclear reactors, reprocessing those materials to separate weapons parts, manufacturing and finishing weapons components, weapons assembly and testing, researching and designing new weapons, and recycling parts of retired weapons².

Specific weapons-related work at these DOE facilities has generally been divided into four categories. Weapons research and development is performed at New Mexico's Los Alamos and Sandia National Laboratories and California's Lawrence Livermore National Laboratory. Production and processing of nuclear materials, such as plutonium and tritium, occur at the Hanford Plant in Washington and the Savannah River Site in South Carolina with supplemental uranium processing at Ohio's Feed Materials Production Center and the Idaho National Engineering Laboratory. Warhead component production occurs at Colorado's Rocky Flats Plant, Tennessee's Y-12 plant at Oak Ridge, Ohio's Mound Plant, Florida's Pinellas Plant, and Missouri's Kansas City Plant, culminating in final weapons assembly at Texas' Pantex Plant. Warhead testing at the Nevada Test Site rounds out the nuclear weapons production cycle³.

These weapons-producing complexes are in diverse natural and demographic settings. The possibility of environmental accidents at some of these sites, coupled with their proximity to significant population centers, illustrates the need for further understanding of public concern over operations at these facilities. The Rocky Flats plant is within 16 miles of downtown Denver, Boulder, and Golden, Colorado, with 80,000 people living within three miles of its facilities. Approximately 140,000 people live in close proximity to the Hanford facility which is also near the Columbia River and some 360,000 people live in Portland, Oregon, just 230 miles downstream from Hanford on the Columbia. The Savannah River Site and Tennessee's Oak Ridge Reservation are located near metropolitan areas such as Aiken, South Carolina, Augusta, Georgia, and Knoxville, Tennessee⁴.

A study of the environmental costs caused by weapons production at the Hanford Site reveals that public concerns over environmental contamination from nuclear weapons production sites has some justification. Findings from this study, garnered from the 1986 release of DOE documents, demonstrate that radioactive and chemical wastes in billions of gallons, and over one billion cubic meters of gases were emitted since Hanford's opening in late 1944⁶.

This report also maintained that other consequences of toxic releases from Hanford included the following characteristics:

In the hectic months of 1945 alone, 345,000 curies of radioiodine (I-131), generated by the chemical separation of plutonium from the irradiated fuel rods, was released into the atmosphere. This gas blew down the wind streams ("down-wind") of eastern Washington: to the east, northeast, and south-east. The radioiodine also deposited on vegetation throughout the region where it was available to cows and goats, which produced milk drunk by humans. . . .

By 1955, eight single-pass (open coolant) nuclear reactors operated continuously at Hanford, . . . These reactors discharged billions of gallons of cooling water, laden with fission and activation products, to the river and to the ground. Through the rich aquatic life in the Columbia, as well as through the insects and waterfowl that bred in and fed on it, these radioactive wastes entered the food chain. . . . By the late 1950's, underground tanks holding the most toxic, concentrated, and long-lived radionuclides at Hanford had begun to leak into the ground. Sometimes these releases have reached the water table⁷.

Nuclear waste emitted from these sites has also proven to be a public policy, scientific, and political problem. Nuclear weapons site clean-up costs are estimated at over \$100 billion⁸. Highly dangerous wastes temporarily stored near reactor sites must remain isolated from the biosphere for up to 10,000 years and beyond. Estimates of the total volume of high-level waste are for 41,000 metric tons by 2000 and nearly 87,000 metric tons by 2020. Public and political concern over this issue became more prominent during the 1980s with the revelation of significant chemical and radioactive contamination at DOE weapons plants and laboratories as a result of a historic neglect of health, safety, and environmental issues by DOE and its predecessor agencies at these facilities⁹.

2. Major U.S. nuclear legislation

Concern over the environmental consequences of this extensive contamination reached the attention of federal policymakers during the late 1980s. These individuals drafted, implemented, and enforced legislation to try to assuage public concerns about nuclear waste. It is instructive to look at major nuclear legislation enacted by the U.S. government prior to creation of the Defense Nuclear Facilities Safety Board (DNFSB) as a means of gaining historical perspective on federal nuclear policies.

The first major nuclear era statute, the Atomic Energy Act of 1946, created the Atomic Energy Commission (AEC) to promote and regulate the defense and commercial functions of the emerging nuclear industry¹⁰. The President appointed the AEC's five members for five-

year terms and the Joint Committee on Atomic Energy oversaw commission operations. The AEC placed particular emphasis on maintaining secrecy about nuclear activities given their national security implications in the aftermath of World War II and the emerging Cold War confrontation with the Soviet Union¹¹.

In 1954 the Atomic Energy Act was amended and updated¹². The new legislation opened the nuclear power industry to the private sector and established procedures for licensing commercial nuclear power plants. It also gave the United States the authority to enter into cooperative nuclear energy agreements with other nations but provided little concrete guidance on setting public health and safety standards for nuclear facilities despite the presence of vague language within the statute on this issue¹³.

A third significant nuclear law was a 1957 amendment to the 1954 Atomic Energy Act known as the Price-Anderson Act¹⁴. This legislation made preliminary recognition of the potential dangers to public safety involved in nuclear weapons production by establishing a \$500 million liability fund as a supplement to an existing \$60 million private fund to compensate nuclear accident victims. Price-Anderson also contained language protecting the nuclear industry against unlimited liability if there were a catastrophic nuclear accident¹⁵.

Concern over the U.S. vulnerability to the 1973 oil embargo and concern over the dispersed energy-related activities of U.S. government agencies, led to the passage of the Energy Reorganization Act of 1974¹⁶. This legislation created the Energy Research and Development Administration (ERDA) as a means of centralizing and enhancing the efficiency of federal energy activities and policies. It also abolished the AEC and replaced it by creating the Nuclear Regulatory Commission (NRC), which assumed responsibility for regulatory oversight of commercial nuclear power plants. Administration of defense nuclear facilities was transferred to ERDA¹⁷. Further energy policy centralization occurred with the 1977 passage of the Department of Energy Organization Act creating the U.S. Department of Energy (DOE), which assumed responsibility for oversight of defense nuclear facilities¹⁸.

A final significant nuclear-related statute is the Nuclear Waste Policy Act of 1982¹⁹. The multiple provisions of this legislation included requiring the DOE to develop a comprehensive national policy for the interim storage and final disposal of commercial high-level radioactive waste, preparing and developing several possible waste storage facility sites within specified time periods, contracting with utilities to begin accepting waste at repositories on specified dates, assisting utilities with interim storage efforts through demonstrations of waste storage technologies, assuring sufficient managerial resources through creation of an independent single-purpose waste management organization, and incorporating defense waste into these commercial programs²⁰.

The legal and policy environment of nuclear waste disposal was further complicated in the 1980s through courtroom litigation. A particularly noteworthy development in this arena was an April 13, 1984, federal ruling by the Eastern District Court of Tennessee in the case *Legal Environmental Assistance Foundation, Inc. et. al. v. Hodel*²¹. A variety of environmental groups had filed suit against the DOE charging it with violating the Resource Conservation and Recovery Act (RCRA) provisions covering hazardous waste treatment, storage, transportation, and disposal along with provisions of the Clean Water Act in DOE operations of its nuclear weapons manufacturing Y-12 plant at Oak Ridge, Tennessee. DOE argued that RCRA did not apply to Y-12 operations because the Atomic Energy Act (AEA) precluded

state regulation of DOE, that the AEA places waste disposal authority with DOE, and that the AEA restricted dissemination of restricted nuclear weapons and materials data. However, Judge Robert L. Taylor rejected DOE's arguments, siding with the plaintiffs. Damages were not awarded in this case due to the national defense elements of Y-12's activities and DOE's willingness to reduce environmental damage²².

This ruling, nevertheless, contributed to creating a legal environment more conducive to litigation against governmental and private sector hazardous waste disposal activities. These nuclear statutes and further revelations about declining infrastructure and worker safety conditions at defense nuclear plants such as Rocky Flats²³, would create sufficient impetus for the creation of an agency to examine conditions and operations thoroughly at DOE's defense nuclear facilities.

3. Creating a conducive environment for a defense nuclear agency

A significant factor contributing to the creation of a defense nuclear oversight agency was the Soviet Union's Chernobyl accident in April 1986 with secondary stimulus provided by the March 1979 Three Mile Island accident in Pennsylvania. These events provided vivid demonstrations of the immediate and long-term consequences of a nuclear facilities accident. Immediate and subsequent evidence compiled on Chernobyl demonstrated that radioactive fallout from the Chernobyl plant spread to countries as diverse and widespread as Poland, Sweden, Germany, Switzerland, Italy, and Finland²⁴. Longer-term consequences of Chernobyl include Belarus receiving 70 percent of the accident's radioactive fallout, thyroid cancer among Belarussian children increasing by 285 times, Belarus devoting 25 percent of its government budget to Chernobyl-related issues, 270 square miles of Ukraine contaminated with plutonium-239, 4.6 million hectares of arable lands and 4.4 million hectares of Ukrainian forests contaminated with radioactive residues, and about one million cubic meters of radioactive materials stored in Ukrainian burial and temporary disposal sites²⁵.

Additional concern over the safety of U.S. nuclear plants was augmented by a long-standing practice of secrecy by the government and private sector operators of U.S. defense and civilian nuclear power plants. A 1986 hearing by the House Energy and Commerce Committee's Subcommittee on Energy Conservation and Power revealed that DOE and NRC officials instructed nuclear safety experts at their agencies to not discuss the Chernobyl accident with the press and to avoid comparing Chernobyl with U.S. nuclear reactors. The NRC also asked the subcommittee to keep secret details of accidents at 151 nuclear facilities in 14 countries besides the United States and Soviet Union between 1971 and 1984²⁶.

The Chernobyl accident and growing concerns over the possible occurrence of such an accident in the United States, coupled with the emergence of investigative reports on the environmental costs of nuclear plant emissions, would ensure the end of long-standing government and private sector secrecy concerning nuclear facility safety. A particularly important boost to legislative reform initiatives was the publication of a National Research Council report on defense nuclear facilities.

Safety Issues At the Defense Production Reactors: A Report to the U.S. Department of Energy was released in 1987. This report was requested by Secretary of Energy John S. Her-

rington to provide an independent assessment of Chernobyl's implications for safety at DOE reactors²⁷. Reviewers placed particular emphasis on safety and technical issues involving reactors at Savannah River and Hanford. Overall investigation findings revealed that DOE had relied almost exclusively on private sector contractors to identify safety concerns and propose remedial actions due to the superior expertise held in these areas by contractors instead of DOE personnel, that DOE's management approach to the mix of production and safety responsibilities fell short of reasonable expectation; that DOE's production reactor safety oversight was internal, not subject to public scrutiny, and vulnerable to DOE budget constraints. Investigation findings also led to the report's advocacy for an independent external safety oversight committee to be established to enhance public confidence in the safety of DOE defense production reactors, and that the majority of this committee's work should be unclassified and publicly available. An additional study of DOE operations also revealed that individual DOE contractors developed their own standards and testing methods for hazardous waste disposal with none of these methods receiving DOE approval²⁸.

Additional impetus for creation of a defense nuclear agency would also be provided by a 1989 Senate Governmental Affairs Committee study, *Early Health Problems of the U.S. Nuclear Weapons Industry and Their Implications For Today*. Findings from this report demonstrated that high-level AEC officials were aware of serious public health problems arising from worker exposure to highly radioactive particles and gases at AEC facilities such as Hanford between 1947 and 1954. This report also determined that a Centers for Disease Control (CDC) panel learned that the DuPont Company found Savannah River Plant workers experiencing excessive leukemia rates, that Oak Ridge National Laboratory workers faced increased risk of cancer death due to radiation exposures, that cancer deaths of Rocky Flats workers rose with increasing plutonium exposures, and that DOE's long-standing concern over legal liability had been an important deterrent affecting its health and safety research²⁹.

4. Creation of DNFBS

These revelations of worker safety and health deficiencies at DOE nuclear facilities, coupled with public concern over a possible repetition of the Chernobyl accident and the National Research Council report documenting significant weaknesses in DOE defense reactor safety management, created a political climate conducive to the introduction of reform legislation. The 100th Congress would see the introduction of numerous pieces of DOE nuclear oversight legislation³⁰.

On April 9, 1987, Representative Norman Dicks (D-WA) introduced H.R. 2047 to establish a Defense Nuclear Facilities Safety Agency, which was referred to the House Armed Services and Energy and Commerce Committee³¹. H.R. 2047 stressed that the Secretary of Energy would be required to provide any information requested by this agency. Its administrator would be authorized to hold hearings, conduct depositions, issue subpoenas, and to be able to suspend operations or construction at new or existing defense nuclear facilities if the administrator determined public health or safety were not reasonably protected³².

Senator John Glenn (D-OH) introduced S. 1085, the Senate version of this legislation, on April 23, 1987, as the Nuclear Protections and Safety Act of 1987³³. Testifying at a subsequent hearing, Glenn stated that the proposed defense nuclear safety agency would have six primary functions:

1. Ensuring the implementation of current DOE health and safety standards.
2. Issuing advisory recommendations in the content and application of DOE standards.
3. Investigating events at DOE facilities that the agency considers important due to their potential or actual adverse impact on public health or safety.
4. Recommending specific measures to prevent the occurrence of such events.
5. Issuing periodic unclassified public reports with its recommendations and the decision to implement corrective steps at DOE facilities.
6. Making recommendations and being consulted with to ensure that design, construction, health, and safety standards at DOE facilities are appropriate and comparable to those standards at comparable private sector nuclear facilities³⁴.

The Reagan administration provided a more mixed assessment of this legislation. At a Senate Armed Services Committee hearing on this legislation, Energy Department Undersecretary Joseph F. Salgado testified that DOE and the public would benefit from establishing an independent advisory board to oversee nuclear facility safety and emphasized DOE's existing environmental, safety, and health programs as well as its commitment to improving safety conditions at its nuclear facilities³⁵.

Salgado went on to maintain, though, that establishing a new oversight agency would create a new and unnecessary regulatory bureaucracy, that the Secretary of Energy would not have the flexibility to respond to the new agency's recommendations, and neither the Secretary nor the President would be able to exercise their statutory responsibilities over the nation's nuclear weapons program. He also asserted that DOE must be given more authority to consider whether the cost-effectiveness of recommended changes go beyond essential safety standards, that the new agency be required to use clearly defined safety goals in its recommendations, and that accountability was achievable through clearer performance standards and a process inviting public input and informing Congress of planned actions³⁶.

Title I of S. 1085 (the section creating an independent nuclear safety board) was reported by the Senate Governmental Affairs Committee on September 24, 1987, and referred to the Senate Armed Services Committee³⁷. This panel expressed concerns about the Governmental Affairs Committee's report on S. 1085. Armed Services Committee members questioned what they saw as a lack of clear priorities in the board's mission, the possibility that overly stringent safety standards could be applied by the board, and the considerable powers given the board provided it "with significant authority but insufficient responsibility for the consequences of its actions"³⁸.

Consequently, S. 1085's language was revised during five hearings held by the Senate Armed Services Committee in late 1987. This panel ultimately produced a report that established an organization with the following *modus operandi*:

The basic goals in establishing an independent safety oversight board are to assure and enhance the safety of operations of DOE's nuclear facilities and to restore public confidence that these facilities are operated without undue risk to public safety and health. The Committee does not believe that a safety board is a panacea for all DOE safety problems, or that it can in any way absolve the Secretary or the Department's contractors of their fundamental safety responsibilities. In fact, many witnesses testified that DOE's shortcomings largely reside within the Department's line management, and that there can be no substitute for capable and committed line management.

What the Board can do is provide critical expertise, technical vigor, and a sense of vigilance within the Department at all levels. The Board should be instrumental in helping DOE to develop appropriate and operationally meaningful safety standards, and in ensuring their translation into clear and consistent requirements for DOE management and contractors. The Board should assist in further developing and broadening facility risk assessments and in measuring those risks against safety standards. With reasonable safety criteria as an objective basis for evaluation, the Board should also help the Secretary make sound modernization decisions. Above all, the Board must have a primary mission to identify the nature and consequences of any significant potential threats to public health and safety, to elevate such issues to the highest levels of authority, and to inform the public³⁹.

Following these revisions and subsequent negotiations between Congress and the Reagan administration, S. 1085 was incorporated into the Department of Defense authorization bill for Fiscal Year 1989. It received final congressional approval from the House and Senate on September 28, 1988. President Reagan signed the legislation the next day⁴⁰.

4.1. Problematic public opinion on nuclear waste disposal

Numerous political problems confronted the DNFSB as it began setting up operations. The most important of these was deep public skepticism toward government institutions and those institutions involved in the disposal of nuclear waste. This skepticism received further reinforcement from the historically close relationship between DOE and its nuclear plant contractors, which saw DOE grant these contractors broad exemptions from financial and legal liability, providing significant financial awards to contractor employees at Rocky Flats despite DOE recognition of serious environmental and safety problems at that site, and DOE paying for contractor fines and penalties⁴¹.

Additional public displeasure stems from diverging cost estimates for cleaning up DOE's nuclear weapons complex. A 1991 Federal Reserve Bank of Richmond assessment mentioned divergent DOE and General Accounting Office (GAO) assessments of the cost in the range of \$100–130 billion but also hypothesized that annual expenditures of \$5 billion for 20 years might be required⁴².

The most visible manifestations of public displeasure toward government institutions saw the growth of public fear about risks affiliated with nuclear power and waste due to leaks at military storage facilities like the Hanford Plant, growing quantities of nuclear waste and storage space shortage at existing reactor sites, and the emergence of an avowed antinuclear movement in the United States following the 1979 Three Mile Island nuclear accident⁴³.

An example of a local demonstration of public opposition to nuclear waste disposal is at Nevada's Yucca Mountain. DOE had selected this site with congressional approval, as the nation's principal nuclear waste repository due to its distance from population centers and geographic isolation. Opposition to this decision from the State of Nevada was significant and resulted in a deterioration of relations between the state and DOE culminating with the Nevada legislature passing legislation vetoing placement of the repository in Nevada and banning highly radioactive waste storage within the state. This, in turn, led to courtroom litigation, which, although unsuccessful from Nevada's perspective, resulted in de facto termination of DOE activity at this site as the 1980s ended⁴⁴.

4.2. Setting up operations

This accumulated climate of public skepticism ranks as a significant backdrop to DNFSB's initial operating environment. As the DNFSB began operations in late 1989 and early 1990, it is important to understand what the agency perceived as its institutional purpose. In its first annual report to the Congress, the DNFSB used the following language to describe its *raison d'être*:

The Defense Nuclear Facilities Safety Board . . . was created to provide advice and formal recommendations to the President and Secretary of Energy regarding public health and safety issues at Department of Energy (DOE) defense nuclear facilities. By statute, the Board is required to review and evaluate 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. 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 is also required to review the design of all new defense nuclear facilities before construction begins, and recommend modifications necessary to protect health and safety. Board review and advisory responsibilities continue throughout the construction, testing, and operation of new facilities.

More broadly, the Board reviews operations, practices, and occurrences at DOE defense nuclear facilities and makes appropriate recommendations to protect health and safety. In the event that any aspect of operations, practices, or occurrences reviewed by the Board is determined to present an imminent or severe threat to public health or safety, the Board transmits its recommendations directly to the President⁴⁵.

Following the swearing in of presidentially appointed and Senate-confirmed members Edson Case, John Conway (Board Chair), John Crawford, Jr., A.J. Eggenberger, and Herbert Kouts, DNFSB operations began by visiting various DOE defense nuclear facilities to become acquainted with their operational issues. The first visit of DNFSB board members and accompanying expert consultants was to Savannah River from November 7–9, 1989. During this visit board members and the consultants examined plant operations and practices in seismic engineering, thermal-hydraulics, reactor piping and vessel integrity, operator training and qualification, and overall plant operational standards⁴⁶. Board members paid particular attention to the ability of the K, L, and P reactors at Savannah River to resist seismic and other external events that could potentially jeopardize public safety. These reactors would play an important role in DNFSB's first recommendation to DOE⁴⁷.

DNFSB board members paid additional exploratory visits to the Rocky Flats Plant, the Waste Isolation Pilot Project (WIPP) near Carlsbad, New Mexico, and Hanford during their early activities. Board members visited Rocky Flats the week of January 15, 1990, to gain knowledge of plant operations and potential public health and safety problems such operations might cause. During their visit, Board members met with Colorado Governor Roy Roemer, Representative David Skaggs, representatives from diverse citizen organizations with environmental and nuclear proliferation concerns, and labor union officials representing Rocky Flats workers⁴⁸.

The January 1990 visit to WIPP saw presentations from senior Westinghouse and DOE officials about the project's history and current management issues it faced. Board members toured the Waste Handling Building and underground areas used for experiments and site characterization. Plans were made for follow-up visits including those from expert consultants and board staff personnel. Three board members visited Hanford from December 11–13, 1989. They witnessed presentations by Richland Operations Office personnel and Westinghouse contractors on ongoing site clean-up activities, preparations for Purex Plant operations restarting, activity on the N-Reactor's dry standby status, Plutonium Finishing Plant work, and the possibility that existing high-level waste storage tanks might be subject to chemical explosion based on a concern expressed to the Board by Senator John Glenn (D-OH)⁴⁹.

Data derived from these initial site visits led to the issuance of the Board's first recommendation on February 22, 1990. This document (Recommendation 90-1) dealt with operator training at Savannah River prior to restarting that facility's K, L, and P reactors. Recommendation 90-1 advised that DOE:

- determine and specify the qualifications reactor plant operators and supervisors had to demonstrate before restarting the these reactors,
- identify any differences between its approved qualifications and those adopted by NRC for comparable civilian nuclear power positions, and
- conduct a comprehensive review of reactor operator and supervisor qualifications using written and oral exams in order to determine requisite training and knowledge for reactor restart.

It was also recommended that:

- there be accelerated implementation of a configuration management program to assure drawings of safety-related systems and procedures are available for operators and supervisors, and
- operators and supervisors are qualified in procedures to be used for normal operations and emergency situations⁵⁰.

Secretary of Energy James Watkins accepted Recommendation 90-1 on April 10, 1990, and his plan to implement this recommendation was received by DNFSB on July 13, 1990. The Board would be also be involved in follow-up monitoring of DOE implementation of this and subsequent recommendations it would issue⁵¹.

4.3. GAO evaluation of DNFSB's first year

A landmark development at the end of DNFSB's first year was the issuance of a General Accounting Office (GAO) report evaluating its first year of operations. Released in February 1991, this report was generally favorable in its assessment of the Board. The report noted that the Board had:

- established financial operations,
- issued recommendations involving major DOE facilities at Hanford, Rocky Flats, Savannah River, and WIPP, and
- addressed issues such as operator training, safety standards, and radioactive waste storage⁵².

GAO noted that DNFSB was limited in its ability to carry out its functions by being unable to offer sufficient salaries to attract qualified scientific and technical staff as reflected in the presence of only 10 technical staffers as of December 10, 1990. The report also noted that these salary restraints were no longer in effect due to the November 1990 passage of Public Law 101-510, giving DNFSB the requisite hiring authority to attract desired employees⁵³.

The GAO report also noted weaknesses in DNFSB practices. It stressed the need for the Board to ensure its independence from DOE, documenting its activities in ways conducive to congressional oversight and public information access, and to plan for future work priorities. Specific recommendations from GAO stressed that:

- DNFSB include written criteria to determine when DOE defense nuclear facility health and safety concerns would result in the issuance of formal recommendations to the Secretary of Energy,
- all hiring and contractual arrangements be reviewed to determine potential conflicts of interest between DOE and the contractor,
- DNFSB notify the public of all situations where potential conflict of interest situations are unavoidable and in the government's best interest,
- document all safety and health issue reviews of defense nuclear facilities including board meetings, discussions, analysis, and agreements with DOE, and
- DNFSB's Chair direct preparation of a strategic plan for identifying future Board work areas⁵⁴.

The DNFSB agreed with many of the GAO report recommendations. However, it took issue with the report's admonition that it stay "at arms length" from DOE by maintaining that oversight agencies such as GAO, agency Inspector General offices, and congressional committees work best when they are able to work in cooperation with officials of the agency under scrutiny. DNFSB contended that its not having an adversarial relationship with DOE and that it was not indicative of a failure to maintain its independence from DOE. Board members also criticized the usefulness of written procedures for determining when its recommendations were essential for adequate public health and safety by stating that a variety of circumstances could result in its issuing such recommendations⁵⁵.

Despite its disagreement with GAO recommendations in the aforementioned areas, the Board made a concrete demonstration of its commitment to public information access by creating a public reading room, providing information on Board activities through the reading room and Freedom of Information Act (FOIA) requests, opening public meetings under the Government in Sunshine Act⁵⁶, allowing public comment on Board recommendations, and consulting with workers' representatives at defense nuclear facilities and the general public⁵⁷.

4.4. DNFSB site recommendations

The recommendations DNFSB has issued and DOE has implemented are important to understand how defense nuclear policies are carried out by both of these organizations. These recommendations come about from ongoing site visits by DNFSB personnel to DOE defense nuclear facilities and are intended to correct ongoing or potential operational shortcomings that have the potential to threaten public safety. Examining the nature and content of these recom-

mentations can be demonstrated by the following summary of DNFSB recommendations toward specific defense nuclear facilities such as Savannah River, Rocky Flats, and Hanford.

4.4.1. Savannah River recommendations

Problems at the Savannah River site have played an ongoing role in DNFSB oversight activities and would often be a featured subject of the Board's attention. The first recommendation issued in conjunction with Savannah River activities and operations was Recommendation 91-2 on March 27, 1991, and concerned resolving safety issues prior to restarting the K-reactor. Specific contents of this recommendation were that each closure package describing the reasons for the K-reactor shutdown in the Reactor Operations Management Plan (ROMP) contain a succinct narrative discussion clarifying the meaning of the issue in question, describing steps taken to resolve past practice deficiencies, stating the reason for maintaining that closure packages have been achieved, that referenced documents support closure claims, and that DOE return to fully reviewing and concurring with determinations for each closure issue⁵⁸.

Recommendation 91-5 grappled with power limits for K-Reactor operations. Issued on December 19, 1991, this recommendation reviewed plans for this reactor, which included limiting its power to 30 percent (approximately 720 megawatts) of what had historically been its full operating power. DNFSB concluded that operation of this reactor at this 30 percent maximum would not impose an undue risk to public health and safety if all other requisite startup measures were completed and effectively implemented⁵⁹.

Additional provisions of this recommendation included DOE conducting more definitive studies on thermal-hydraulic methodology, criteria, and experimental test programs used in analyzing K-reactor core-cooling performance during unusual conditions, that any proposal to operate K-reactor at a level above 30 percent be supported by revised accident analysis thermal-hydraulic methodology, and that the evaluation model for postulated coolant accident loss be documented and controlled in accordance with *Code of Federal Regulations* Title 10, Section 50.46 standards⁶⁰.

The issuance of Recommendation 92-1 on May 21, 1992, saw DNFSB recommend that DOE defer resuming processing of the HB-Line of reactors pending issuance of a report on various safety and operational issues⁶¹. Eight days later DNFSB would issue a more detailed recommendation on this issue. Recommendation 92-3 asserted that the following steps should be taken prior to resuming HB-Line operations:

1. DOE direct its Westinghouse contractor to reopen its operational readiness review (ORR) in accordance with previous DNFSB recommendations and DOE implementation plans at other facilities.
2. Establishing comprehensive criteria documents for judging and measuring reactor restart readiness.
3. Westinghouse issue a Readiness to Proceed Memorandum requesting DOE approval to resume operations once it completed its ORR and determined appropriate safety issues are resolved.
4. DOE providing appropriate assistance to Westinghouse as it conducts the ORR.
5. A DOE ORR team conduct an independent and comprehensive ORR for HB-Line after Westinghouse conducts an ORR and issues a Readiness to Proceed Memorandum requesting DOE approval for operations resumption.

6. That DOE's ORR team consist of individuals experienced with all operational facets and be independent of HB-Line management responsibilities to achieve independent and unbiased assessments.
7. DOE and Westinghouse should prepare for the ORR by ensuring accident analyses include all credible scenarios, identifying appropriate on-site and off-site accident mitigation systems, and that updated Fire Hazards Analysis information is consistent with accident analyses.
8. Westinghouse and DOE should complete their compliance assessment of DOE safety orders at HB-Line and implement requisite compensatory measures to achieve order compliance and safe resumption of HB-Line operations⁶².

Recommendation 96-1, issued on August 14, 1996, dealt with Savannah River's In-Tank Precipitation System. This particular system plays an important role in removing high-level radioactive waste from storage tanks at this site. In this recommendation, DNFSB advised against proceeding with a process verification test without better understanding of benzene mechanisms formation, generation, and release, and that additional investigative effort should uncover the reason for the apparent decomposition of tetraphenylborate compounds, establish the chemical and physical mechanisms determining the extent of benzene retention in the waste slurry, and affirm the adequacy of existing safety measures⁶³.

4.4.2. Rocky Flats recommendations

DOE operations at Rocky Flats have long been a source of concern. A major fire in Buildings 776-777 during 1969 stemmed from the ignition of a briquette of machine turnings. This fire would ultimately produce several fire safety improvements throughout DOE's weapons complex including the area of plutonium metal fabrication⁶⁴. Plutonium storage pits were produced at Rocky Flats until 1989. Many environmentally dangerous chemicals can no longer be used for production and some of Rocky Flats' older technological processes cannot be transferred or reproduced consequently leaving significant quantities of dangerous plutonium waste at Rocky Flats⁶⁵.

These and other Rocky Flats problems would culminate in a June 1992 plea bargain agreement between Rocky Flats contractor, the Rockwell Corporation, and the U.S. Department of Justice (DOJ) following a five-year investigation by the Environmental Protection Agency (EPA) and the Federal Bureau of Investigation (FBI) against Rockwell. This investigation found that DOE and Rockwell failed to produce an adequate waste disposal analysis plan, did not store waste with a permit as required by the Resource Conservation Recovery Act (RCRA), failed to maintain an accurate operations record, and failed to provide written notification of incidents requiring a contingency plan⁶⁶.

This background of environmental and legal troubles influenced DNFSB's Rocky Flats activities. Its first recommendation covering Rocky Flats operations was issued May 3, 1990. Recommendation 90-4 decreed that there be an independent assessment of the adequacy and correctness of utility systems operating procedures at Rocky Flats, the need for an assessment of the knowledge level acquired during operator requalification, that test records and safety systems be examined and calibrated, all plant changes and vital safety system modifications be reviewed for potential impact on procedures, training, and requalification, and that examinations of each building's final safety analysis report ensure that

plant description, procedures, and accident analysis are consistent with the plant and safety related modifications⁶⁷.

Two weeks later the Board issued follow-up Recommendation 90-5. Focusing on Rocky Flats Systematic Evaluation Program (SEP), this pronouncement advised that Rocky Flats' SEP address and consider the effects of severe external developments such as seismic events and high winds on plant operations, the effects of severe internal events such as fire, ventilation system performance under severe external and internal events, equipment and structural interaction under such events, and the basis and procedures for implementing facility changes⁶⁸.

Recommendation 90-6, dated June 4, 1990, provides another demonstration of the emphasis DNFSB placed on Rocky Flats during its initial months. This recommendation examined criticality safety. It urged that DOE prepare a written program with commitments for addressing the cumulation of fissile and other ventilation duct materials prior to resuming plutonium operations. This program also needed to include a description of remediation actions deemed necessary for DOE resumption of plutonium operations at Rocky Flats, descriptions and justification of non-destructive assay techniques, calibration, modeling, and methodology, and estimating gamma ray and fast neutron radiation levels in occupancy areas⁶⁹.

Additional stipulations of Recommendation 90-6 included determinations of requisite design and operational changes in ventilation ducts and related systems to preclude further fissile material cumulation that could threaten public health and safety and establishing a monitoring program to guarantee the effectiveness of ventilation duct design and operational changes⁷⁰.

Recommendation 91-4, issued on September 30, 1991, noted that some corrective actions had been taken at Rocky Flats. This document went on to advise that DOE complete an Operational Readiness Review (ORR) for Building 559, that there be an assessment of knowledge levels achieved during operator requalification, that test records and safety calibration systems be examined, verification that all plant changes involving vital safety systems be reviewed for potential impacts on procedures and training, and that the ORR team's final report include description of remaining issues needing resolution before Building 559 can resume plutonium operations⁷¹.

September 26, 1994, saw DNFSB issue Recommendation 94-3 on Rocky Flats dealing with Building 371. This building was considered Rocky Flats' prime sight for plutonium storage. In its recommendation, DNFSB espoused the development of an integrated plan to address civil, structural, and seismic safety issues and evaluations concerning the planned plutonium storage use of Building 371, that this plan address and explain required changes to the current Safety Analysis Report, and how such changes would be accomplished. Additional stipulations of this recommendation included comprehensive structural analysis and methodology of building analysis standards as applied to Building 371, that hazard classification for this structure be supported by rational analysis, the classification of safety systems, the use of standards for evaluating natural and man-made hazards be similar to those used in commercial nuclear practice, and that program plan results be used to specify building upgrades consistent with Building 371's mission⁷².

4.4.3. Hanford recommendations

Hanford received early and frequent visits from DNFSB members during the Board's initial year of operations. An early topic of Board interest at Hanford was the susceptibility of

old single-shell high-level waste tanks to spontaneous explosion, which could release a large amount of radioactive material to the surrounding environment. During its investigations of this possibility at Hanford, the Board concluded that the possibility of such an explosion was low. At the same time, though, Board members held lingering concerns about uncertainty over the composition of Hanford waste tanks contents and their physical conditions.

These residual concerns led the DNFSB to issue Recommendation 90-3 on March 27, 1990. This recommendation advocated studying possible chemical reactions that could be the source of heat generation in Hanford's single-shell tanks, that DOE develop a continuous monitoring program to indicate possible development of unstable conditions in these tanks, providing alarm indicators in monitoring instruments to facilitate taking action to neutralize perceived abnormalities, and developing an action to plan to neutralize conditions signaled by these alarms⁷³.

DNFSB received notification of DOE's decision to comply with Recommendation 90-3 on May 10, 1990, and the Board received DOE's implementation plan for this recommendation on August 10, 1990. DNFSB members, though, decided that DOE's implementation plan was "insufficiently responsive" to its earlier recommendations. Consequently, they issued Recommendation 90-7 on October 11, 1990⁷⁴.

Reflecting the Board's intent that their earlier recommendations be adhered to, this particular recommendation went into considerable detail. Specific provisions included the need for immediate steps to be taken to add necessary single-shell tank instrumentation to establish whether hot spots exist or may develop in the stored waste, installing instrumentation to monitor cover gas composition and the possible presence of flammable gas, accelerating tank sampling contents programs, the need for a program to study the possibility of a violent chemical waste reaction, developing an action plan to neutralize conditions that may be signaled by alarms, and formulating and instituting a separate emergency plan in the event of an explosion or airborne release of radioactive material to protect onsite and external personnel⁷⁵.

The Board's next recommendation for Hanford was issued on July 6, 1992. Recommendation 92-4 dealt with a projected Multi-Function Waste Tank (MFWT) to be located at Hanford as a part of an existing tank waste remedial system program. DNFSB recommended that MFWT's design needed to be conservative in terms of safety and that it have clearly defined and coherent design criteria. Its design, construction, and start-up activities were to be executed by individuals who could provide the requisite quality for public health and safety protection. Additional components of this recommendation included advocacy of design continuity through all project phases, the responsible DOE organization having technically qualified personnel involved, participating DOE and contractor organizations having their functions and responsibilities clearly delineated in a single document, and identifying the design bases and engineering principles for the MFWT project that will show MFWT meeting existing quantitative safety goals of DOE's Nuclear Safety Policy⁷⁶.

The following year saw the issuance of Recommendation 93-5 concerning Hanford operations. Covering Hanford waste tanks characterization studies, this recommendation alluded to a recently released DOE audit noting significant weaknesses in Hanford's sampling, laboratory, and core management activities. Specific aspects of this recommendation were that DOE engage in a comprehensive reexamination and restructuring of Hanford characterization efforts and sampling schedules, develop a prioritized schedule of tanks to be sampled, increase laboratory capacity and activities dedicated to tank sample analysis, and explore the possible utility of

on-site and off-site laboratory services. Supplemental components of this recommendation included integrating the characterization effort into the tank waste remediation system engineering effort, critically examining the list of chemical analyses to the smallest set needed to fulfill safety requirements, and strengthening the management and conduct of sampling operations⁷⁷.

4.5. Other DNFSB recommendations

Although Savannah River, Rocky Flats, and Hanford have been the subject of much DNFSB activity and recommendations, other defense nuclear facilities and subjects have also received DNFSB scrutiny. One of these facilities is DOE's Waste Isolation Pilot Project (WIPP) located near Carlsbad, New Mexico. Congress authorized this controversial facility in 1979 to dispose of transuranic wastes generated during nuclear weapons production and to demonstrate that nuclear waste disposal facilities could protect the environment and public safety⁷⁸.

Introductory exploration and investigation of WIPP operations led the Board to issue Recommendation 91-3 on April 25, 1991. Contents of this recommendation required that DOE authorize an independent and comprehensive readiness review at WIPP before testing waste disposal procedures, that team members carrying out the readiness review be experienced in all facets of the operations involved and be independent of WIPP. The readiness review team was to confer with other DOE readiness review teams. Additional recommendation components stipulated assessing the adequacy and correctness of normal and emergency waste handling and utility systems procedures, assessing the knowledge level achieved during operator qualification reviews, assessing operational issues such as the interrelationships, delineated roles, and responsibilities among contractor and DOE units at Carlsbad and Sandia National Laboratory on issues involving WIPP⁷⁹.

Recommendation 92-6, dealing with operational readiness reviews, was issued on August 26, 1992. This recommendation advised that DOE quickly develop effective rules, procedures, orders, and directives to govern safety aspects of this review process, develop specific criteria for determining when ORRs are or are not required, and that the plan for each ORR incorporate such features as review team members not being involved in the work under review and an assessment of the technical qualifications of DOE field organization members providing direction and guidance to the participating contractor⁸⁰.

Four weeks later on September 22, 1992, DNFSB issued Recommendation 92-7. This document sought to issue guidance on the qualifications of technical personnel and supervisors and defense nuclear facilities. Its contents were particularly motivated by its determination that there were many individuals at such facilities lacking understanding of fundamental elements of engineering, chemistry, nuclear physics, and radiation protection to operate and maintain these sites safely. An additional finding buttressing this recommendation was that written examinations at many sites often consisted of unchallenging multiple choice and short answer questions that failed to assess adequately operator knowledge or correlate basic engineering principles with job-specific knowledge requirements⁸¹.

The Board recommended the following steps to resolve what it saw as training and qualification deficiencies at defense nuclear facilities:

- DOE take timely action to expand senior management's involvement in implementing training programs at defense nuclear facilities and enhancing senior management's

communication of the importance of effective training and qualification programs to all levels in relevant DOE and contractor organizations.

- DOE strengthen organizational units responsible for training and qualification at all applicable DOE entities.
- Accelerate internal DOE efforts to improve training and qualifications programs of operations, maintenance and technical support personnel at defense nuclear facilities.
- DOE and its contractors establish and implement measures to improve training and qualification programs as specified in Recommendation 90-1 concerning Savannah River⁸².

A related concern for personnel technical quality was also demonstrated in Recommendation 93-3 issued on June 1, 1993. In this document, the DNFSB advocated DOE establish a means to attract and retain exceptional scientific and technical personnel as a primary agency goal, that DOE seek excepted appointment authority for selected key engineering and scientific personnel in DOE program offices, line units, and defense nuclear complex oversight units, and that the Department develop a system for using personnel attrition to build technical capability. Additional recommendation provisions included reviewing the effectiveness of the technical employees performance appraisal system, using respected independent external organizations such as the National Research Council to assess DOE's present and planned future actions for attracting and retaining qualified technical personnel, perform an in-depth assessment of educational and experience requirements for key positions, and evaluate incumbents for their ability to meet qualification requirements⁸³.

Additional documentation of DNFSB concern about defense nuclear personnel technical qualification issues is reflected in the December 10, 1993, issuance of Recommendation 93-6. Dealing with maintaining access to nuclear weapons expertise in the defense nuclear complex, it placed particular emphasis on the need for retaining personnel with such knowledge for nuclear weapons disassembly at the Pantex site near Amarillo, Texas, and for nuclear explosives testing at the Nevada Test Site⁸⁴.

Provisions of this recommendation included that DOE initiate a formal process to identify the skills and knowledge needed to develop or verify safe dismantling or modification procedures for all remaining U.S. nuclear weapons types, start a similar process to identify the requisite skills and knowledge to conduct nuclear testing operations safely, review the personnel losses at nuclear weapons labs and the Nevada Test Site to determine which skills would be lost through personnel departure, and that DOE and defense nuclear contractors negotiate the continuing availability of personnel scheduled to leave whose skills and knowledge are determined to be important. Subsequent recommendation stipulations were the initiation of programs to obtain and record from these personnel undocumented anecdotal technical information that would enhance the technical knowledge of future personnel, developing procedures for safe weapons system disassembly while personnel with such expertise are still available, instituting a program for maintaining operational expertise for nuclear weapons testing if such testing is resumed in the future at the Nevada Test Site, and determining if traditional dependence on administrative controls to ensure nuclear explosive safety is adequate given the loss of experienced personnel and the potential future resumption of nuclear testing⁸⁵.

Safety management is an integral component of DNFSB's institutional purpose and this subject, as applied to DOE nuclear facilities, constitutes the heart of Recommendation 95-2

issued October 11, 1995. This recommendation, replacing Recommendations 90-2 and 92-5, saw DNFSB recommend that DOE institutionalize the process of incorporating environmental, safety, and health objectives and controls into the planning and execution of all major defense nuclear activity involving hazardous materials, requiring all operations and activities involving radioactive and other substantially hazardous substances in the defense nuclear complex to be subjected to appropriately graded Safety Management Plans, establishing a new list of facilities and activities prioritized on hazard and importance to defense clean-up activities, promulgating requirements and instructions for carrying out such clean-up and safety programs, and taking necessary measures to ensure that DOE has or acquires the technical expertise required to implement the recommended streamlined process⁸⁶.

Another noteworthy DNFSB recommendation is Recommendation 97-1. Issued on March 3, 1997, this document deals with the Uranium-233 (U-233) storage safety at DOE facilities. U.S. stockpiles of this man-made uranium isotope of approximately one ton are in DOE's possession and its applications included DOE's defense-related activities and nuclear reactor programs supported by DOE and commercial companies. U-233's storage under conditions in which its physical deterioration can occur and the multifaceted responsibility for U-233 throughout DOE prompted DNFSB's issuance of this recommendation. Provisions of this recommendation were that DOE establish a single organizational project to deal with U-233 safe storage issues, develop packaging, transport, and interim and long-term storage standards for U-233, characterize the quantity and condition of U-233 in DOE defense nuclear facilities, evaluate the appropriateness and condition of DOE's vaults and U-233 storage systems, initiate a program to remedy observed shortfalls in DOE's ability to maintain U-233 in acceptable interim storage, establish a plan of measures for eventually placing U-233 in safe permanent storage, and take measures to ensure that DOE retains the requisite technical knowledge and competence to carry out safe U-233 storage on a short- and long-term basis⁸⁷.

4.6. Recommendations summary

Board recommendations encompass the diverse array of activities at DOE's defense nuclear facilities. Many of these recommendations deal with specific operational issues at individual facilities such as reactor safety at Savannah River and plutonium storage usage at Rocky Flats. Other recommendations have dealt with potential future issues such as crisis management at individual facilities and taking measures to ensure that facility and contractor workforce personnel possess the requisite technical expertise for managing defense nuclear facilities. The detailed nature of these recommendations and the careful thought and analysis underlying these documents testifies to the importance Board members place upon their intrinsic intellectual credibility and upon fulfilling the Board's statutory obligation to ensure the safety of the United States' defense nuclear facilities.

5. Other noteworthy developments

A significant demonstration of DNFSB's high credibility with DOE is the Secretary of Energy's acceptance of all 38 Board recommendations issued during the DNFSB's institutional life even though Congress granted it action-forcing instead of regulatory powers. DOE

has completed implementation of a majority of Board recommendations and is making progress completing those that have not been implemented⁸⁸.

DNFSB carried out 300 site visits to DOE nuclear facilities in 1998 and Board members, staff, and contractor experts had made 1,398 cumulative site visits to these facilities between October 1989 and the end of 1998. These activities have also been carried out in an environment of ongoing administrative upheaval in DOE's highest echelons which is influenced by the political upheaval experienced by DOE during this period and by normal upper-level administrative turnover in cabinet departments. Documentation of this politically based instability is demonstrated by the presence of seven Secretaries or Acting Secretaries of Energy, six different Deputy or Acting Deputy Secretaries (a seventh has been nominated), and seven Under or Acting Under Secretaries of Energy during DNFSB's nine years of operation⁸⁹.

In contrast to this high-level administrative turnover in DOE, DNFSB Board membership has remained remarkably stable. Three of the Board's five initial members (Conway, Eggenberger, and Kouts) have been reappointed, reconfirmed, and remain members a decade later. Board member Edson Case died in 1991. Joseph DiNunno replaced Case upon Senate confirmation in 1992⁹⁰. John Mansfield, whose nomination, confirmation, and swearing in occurred in October and November 1997, replaced John Crawford⁹¹.

Although legally authorized to hire up to 150 full-time employees, the Board had hired only 90 full-time staff in addition to the five Board members to accomplish its activities by the beginning of 1999. Technical staff personnel have extensive experience in fields such as physics and nuclear, mechanical, electrical, chemical, structural, and metallurgical engineering. Twenty-five percent of the Board's technical staff possess Ph.D. degrees and an additional 72 percent have masters degrees. This educational experience is further augmented by staffers having practical nuclear experience from the U.S. Navy's nuclear propulsion program, the nuclear weapons field, and the civilian reactor industry⁹².

5.1. Controversy over external regulation

The political currents of larger agencies can affect the operations of smaller agencies that are supervised by the larger agency or have significant interaction with a larger agency. Political winds buffeting DOE during the 1990s affected DNFSB. Already documented instances of inept and imprudent nuclear materials handling by DOE, its predecessors, and contractors at DOE's defense nuclear complex created an environment conducive to congressional criticism of DOE operations.

One manifestation of these attacks on DOE nuclear policy came during the 103rd Congress (1993–1994). On February 28, 1994, Representative George Miller (D-CA), then chair of the House Committee on Natural Resources, introduced H.R. 3920. This bill, known as the "Federal Nuclear Facilities Licensing and Regulation Act," would have required the NRC to license all new DOE nuclear weapons and research facilities⁹³. Its provisions also provided for the creation of a presidential commission to review options for regulating existing DOE nuclear facilities, including the possibility of independent regulation. Although this commission's membership would include the DNFSB chair or a designated representative, the provision of the proposed bill creating a presidential study commission was dismissed by the Board as "duplicative and time-consuming"⁹⁴.

The House Natural Resources Committee held hearings on H.R. 3920 on March 1 and 8, 1994. Testifying before the committee, DNFSB chair Conway contended that DOE was not self-regulating in regards to its defense nuclear facilities. He mentioned that nuclear facilities were subject to federal environmental laws and were overseen by agencies as diverse as the EPA, the Department of Transportation, the Mine Safety and Health Administration, the NRC, the DNFSB's own recommendations, and state environmental statutes. He went on to maintain that safety at these facilities stemmed from technically qualified personnel adhering to clear and specific safety principles and standards and that licensing, regulation, external oversight, and enforcement authority could not create safe conditions on their own. This DNFSB opposition contributed to H.R. 3920's demise⁹⁵.

A 1998 governmental report on DOE nuclear facilities provides the following perspective on the historical and contemporary factors influencing DOE's regulatory regime and the emergence of legislation such as H.R. 3920.

Until the mid-1980s, DOE's regulatory history was shaped by the authorities for the principal missions of the Department and its predecessors: nuclear weapons and nuclear power. Under the authority [of] the Manhattan Project and the Atomic Energy Act (AEA) and its various amendments, for nearly half a century DOE and its predecessors operated the vast majority of the Federal government's nuclear research and production facilities essentially exempt from outside regulation. This self-regulation excluded other Federal agencies, States, local jurisdictions, and the general public from participation in health and safety oversight and decision-making for these activities. The 1970s and 1980s saw enactment of major environmental legislation applicable to DOE, growing public awareness and concern about the health and safety management of the DOE nuclear complex, successful lawsuits, and the winding down of the Cold War. As a result of these and other factors, DOE gradually has become subject to increasing environmental regulation and other forms of oversight. Nonetheless, today DOE *continues to self-regulate* major aspects of its nuclear operations, including all worker safety; almost all of the design, operation, and decommissioning of its nuclear facilities; and some of its environmental discharges and waste management⁹⁶.

5.2. Ahearne report

Legislative pressure, as manifest in H.R. 3920 and the accompanying hearing, as well as the political, legal, and regulatory environment, led to a January 1995 announcement by Energy Secretary Hazel O'Leary of the formation of a committee to explore placing DOE nuclear activities under additional federal agency regulation⁹⁷. This committee, chaired by Dr. John Ahearne of Duke University and known as the Ahearne Committee, met throughout that year and issued its report in December 1995.

The Ahearne report presents an exhaustive portrait of regulatory issues confronting DOE nuclear facilities. Focusing on the current regulatory roles played by NRC and DNFSB, this report examined what it saw as the strengths and weaknesses of each of these organizations. Committee members noted NRC's long experience in nuclear safety regulation, its possession of an existing regulatory structure, and the presence of numerous experienced personnel with relevant scientific and technical expertise along with flexible hiring authority. These

panelists also noted the potential for inertia at NRC in responding to new regulatory responsibilities and the difficulty it would face coping with the national security issues of DOE's defense nuclear facilities as opposed to the operating and regulatory environments of commercial nuclear facilities⁹⁸.

Concerning DNFSB, Ahearne panelists noted DNFSB's experienced scientific and technical personnel, its maturing knowledge of DOE's defense nuclear complex, and its relative newness contributing to greater latitude in its ability to adopt flexible regulatory models to accommodate the great diversity of DOE's nuclear facilities. Conversely, Ahearne committee members expressed concern about the DNFSB's lack of enforcement powers, a perception that it is not regarded as being sufficiently open and having to answer to the same checks and balances as other regulators, and the Board's limited size and budget⁹⁹.

These factors, coupled with concern over regulatory duplication between NRC and DNFSB, led to the following determination:

Neither NRC nor the DNFSB was designed to carry out the kinds of responsibilities required of a regulator of facility safety at the DOE nuclear complex. Both would have to undergo significant changes before they could adequately meet those responsibilities. The Committee did not determine which of the two agencies could more readily undergo these changes. Instead, we present two options for facility operator—NRC with a more flexible approach and incorporating the resources of the DNFSB, or a restructured and enlarged DNFSB. We urge that a prompt decision be made on which should be the facility regulator so that the move to external regulation of facility safety can proceed expeditiously. In the meantime, actions to implement external regulation of the two other areas of nuclear safety—worker safety and environmental protection—can and should proceed independently¹⁰⁰.

Given the context of this observation, the Ahearne report prescribed the following concerning DOE nuclear facility regulation and safety:

1. Nearly all safety aspects at DOE's nuclear facilities and sites should be externally regulated.
2. Existing agencies rather than a new agency should have this responsibility.
3. DOE needed to maintain a strong internal safety management system under any regulatory regime¹⁰¹.

The report elaborated on its reasons for reaching these findings by contending that DOE should be externally regulated for the same reasons industry and other federal facilities are and that external regulation could meet the demands of both safety and national security if managed properly. It went on to contend that credibility was critical to the success of safety regulation and DOE's missions and that safety regulation needed to be effective and promote efficiency. The following observation on regulatory credibility is particularly salient:

The inherent conflict of interest between mission and self-regulation of safety at DOE, aggravated by a long legacy of secrecy, is at the root of many of the safety problems in the nuclear complex. External regulation would end that conflict by placing regulatory authority in bodies that are, . . . independent, impartial, and competent. It would im-

prove public confidence in the safety of DOE operations by making them subject to the same kind of independent regulation that applies to other public and private operations. It would enable the public, States, and Tribes to have opportunities for effective involvement in the regulation of safety at DOE facilities—as they do with similar facilities in the private sector. Finally, only independent, external regulation can ensure the stable regulatory framework . . . that is required to ensure credibility. The Department has been unsuccessful in its attempts to achieve credibility under self-regulation and the level of frustration at the current regulatory regime remains high within the Department, its laboratories, and its contractors, just as the credibility of its safety efforts remains low in the world outside. We believe that external regulation is essential to earning the public confidence the Department seeks and needs to free itself to carry out its important national missions¹⁰².

Specific governmental organizational changes recommended in the Ahearne report were that an existing agency such as the NRC and the DNFSB regulate DOE nuclear facilities and that the Occupational Safety and Health Administration (OSHA) regulate worker protection at DOE nuclear facilities, unless such regulation would cause significant interference with maintaining facility safety. EPA should continue regulating environmental protection matters at DOE nuclear facilities under existing environmental laws, and states with EPA and OSHA authorized programs or individual facility safety regulators maintain existing roles in environmental protection, facility safety, and worker protection comparable to those now used in the private sector. Committee members contended that these and other recommended changes would strengthen, streamline, and simplify safety regulation at DOE nuclear facilities while drawing clearer and simpler lines of responsibility and accountability¹⁰³.

5.3. DNFSB's response to Ahearne

The Ahearne report did not receive a favorable evaluation at the DNFSB. Although agreeing with some report conclusions, it strongly disagreed with others. Testifying before the Senate Armed Services Committee on March 6, 1997, Board chair Conway commented that public trust in DOE would not be increased by establishing another federal agency to regulate its activities. He also questioned whether such additional regulation would improve safety at DOE nuclear facilities and cited figures from the NRC in which that agency contended it would need 1,100–1,600 additional full-time employees and an annual budget increase of \$150–200 million if it were to assume additional regulatory responsibility for DOE. Speaking for the Board, Conway went on to observe: “We know of no organization in government or private industry that reduces personnel or response costs when additional regulatory authorities are imposed upon it. The opposite occurs”¹⁰⁴.

DNFSB member Joseph DiNunno served on the Ahearne panel and was also critical of its findings. He criticized what he saw as insufficient factual rigor and objectivity in parts of the report. DiNunno went on to mention DOE's current subjection to many more statutory environmental requirements than in the period before 1980 when most conditions requiring environmental remediation were created. He also observed that regulatory processes involving statutorily provided public participation opportunities may need to be limited for national security reasons and for programs requiring expedited clean-up¹⁰⁵.

DiNunno also asserted that DOE should follow regulatory principles emphasizing the following characteristics:

1. Attacking current instead of historical regulatory problems.
2. Regulating only to the extent needed to achieve the desired behavior.
3. Facilitating technical solutions instead of constructing unnecessary process impediments.
4. Allowing flexibility in establishing requirements tailored to work hazards.
5. Structuring regulations to encourage good safety practices instead of fearing penalties.
6. Minimizing costs and maximizing benefits.
7. Minimizing regulatory overlap and duplication.
8. Encouraging intra-government cooperation¹⁰⁶.

Board opposition to external regulation of DOE nuclear facilities did not diminish with the passage of time. A November 1998 DNFSB report for Congress on this subject expanded on the Board's earlier opposition to external regulation. This document maintained that shifting regulatory control of its nuclear facilities to an external agency would diminish the importance of national security in DOE plant operations. It also observed that such external regulation would be incapable of handling DOE's nuclear weapons testing, maintenance, stewardship, and clean-up programs and commented on the improvements that the DNFSB and DOE had achieved over the past decade in defense nuclear facility safety and environmental protection programs¹⁰⁷.

This report also heralded what it regarded as the advantages of continuing DNFSB oversight of defense nuclear facilities. Specific benefits of continuing existing oversight arrangements included the lack of undue interference with critical national defense and security functions at these facilities and the enhanced cost-efficiency of Board oversight as evidenced by its total Fiscal Year (FY) 1999 budget of \$16.5 million for all defense nuclear facilities as opposed to the \$3 million spent by NRC per reactor per year in its commercial regulatory and licensing activities¹⁰⁸.

Additional advantages of maintaining the current regulatory regime cited by DNFSB were the flexibility provided by Board oversight, that DNFSB recommendations could be accepted or rejected, and that the Board is a neutral party interested in safety and achieving oversight success. Further attributes include the public availability of Board recommendations unless national security considerations prevail, the presence of a well-established DNFSB organizational structure and technical expertise, and that shifting regulatory structure would disrupt progress being made under Board recommendations¹⁰⁹.

DNFSB opposition to creating a new regulatory regime for defense nuclear facilities was also demonstrated by its assertion that a new regulatory structure would create a time-consuming and cumbersome legal framework, increase the costs of bringing facilities into compliance with new rules, result in less safety at defense nuclear facilities, and ultimately diminish DOE's stature as a center of nuclear technical excellence¹¹⁰.

6. Proposed DOE elimination

An additional complication for DNFSB arose with the onset of the 104th Congress in 1995. The declared intention of many members of the newly ascendant Republican majority was abolishing DOE and transferring some of its programs to other federal agencies while

privatizing others. On April 16, 1996, Senator Rod Grams (R-MN) introduced S. 1678 the "Department of Energy Abolition Act"¹¹¹. This legislation called for the establishment of an independent executive branch agency called the Energy Programs Resolution Agency that would oversee DOE's dismantlement. Where DNFSB activities are concerned, S. 1678 called for the creation of a Defense Nuclear Programs Agency that would be part of the Department of Defense (DOD) and have jurisdiction over military uses of nuclear energy and nuclear weapons, be responsible for environmental restoration at defense nuclear facilities, and supervise operations at Sandia, Los Alamos, and Lawrence Livermore National Laboratories¹¹².

This legislation did not pass during the 104th Congress due to DOE-initiated budget and staff reductions, DOE's vigorous defense of its mission, and divisions among congressional Republicans over DOE's future but it did prompt legislation with similar intent in the 105th Congress¹¹³. Rep. Todd Tiahrt (R-KS) introduced H.R. 1577 on May 8, 1997, with 45 cosponsors. Although this legislation also failed to pass, the presence of a significant number of cosponsors and the persistence of anti-DOE sentiment within Congress were clear warning signs to DOE and federal agencies doing business with DOE (such as DNFSB) of the need to change ongoing operations¹¹⁴.

Congressional concerns with DOE covered a variety of issues. During a September 19, 1996, House National Security Committee DOE oversight hearing, Rep. Duncan Hunter (R-CA) maintained that DOE was not fulfilling its commitments to maintain the safety, security, and reliability of the U.S. nuclear weapons stockpile. Hunter went on to criticize the Clinton administration for giving DOE weapons scientists, engineers, and skilled laborers the impossible mission of maintaining a safe and reliable nuclear stockpile without nuclear testing, giving complex workers insufficient resources and support to modernize the nuclear weapons complex, and allowing the departure of skilled personnel from DOE's nuclear weapons programs¹¹⁵.

A Senate Energy and Natural Resources Committee hearing on September 4, 1996, provided some insight into DNFSB thinking on the possible abolition of DOE. Testifying before the committee, Board member John Crawford stated that it would be ill advised to transfer DNFSB functions to DOD since it would not be possible for the Board to provide independent and critical evaluation of defense nuclear facilities. Crawford also maintained that Congress had made a wise decision in crafting the 1946 Atomic Energy Act when it created a separation between DOD and the AEC for the production, delivery, and possible use of nuclear weapons¹¹⁶.

He also asserted that there had been a decline in the qualifications of military officers assigned to DOE's nuclear weapons programs which he partially attributed to a belief among military officers that nuclear weapons specialization was not career enhancing. In addition, he stressed his belief that current overall capabilities of DOE nuclear weapons personnel did not meet the requisite high standards. A way Crawford saw of rectifying this technical qualifications problem would be the creation of a joint nuclear weapons directorate. A military officer or civilian would head such an organization and would report directly to the Secretaries of Energy and Defense and serve a term of six-to-eight years¹¹⁷.

A trenchant critique of DOE operations was provided by the testimony of Jerry Taylor the Natural Resources Studies director from the libertarian think-tank, the Cato Institute. Tay-

lor's critique favored eliminating DOE and replacing the DNFSB with a National Nuclear Weapons Agency (NNWA) under the direction of a sub-cabinet civilian official to supervise national nuclear weapons programs, civilian radioactive waste, and weapons clean-up operations. NNWA would operate under DOD's budget and weapons program review. The Cato Institute analysis also expressed the belief that transferring weapons-related programming from DOE to DOD was preferred because defense-related activities belonged to the agency and budget responsible for national defense, putting such programs in an existing department would prevent bureaucratic "mission creep" which it saw as occurring with nuclear weapons at the AEC, and merging nuclear weapons producers and customers produced enhanced national strategy coordination. This merged administrative structure would, in Taylor's assessment, give the American public a more honest accounting of national defense expenditures instead of spreading them throughout the federal budget¹¹⁸.

7. DOE-NRC external regulation pilot project

Ahearne Committee report findings concerning external regulation of DOE nuclear facilities were accepted and endorsed by Energy Secretary O'Leary. She responded by creating a DOE Working Group on External Regulation, which issued a December 1996 report to provide recommendations for implementing Ahearne report findings in this area. DOE's Working Group determined that NRC should be the principal external regulator and that moving to external regulation should be phased in over 10 years. Following interagency negotiations between DOE and NRC, Federico Pena (O'Leary's successor) and NRC Chair Shirley Jackson agreed to the following measures:

- To pursue NRC regulation of DOE nuclear facilities at a June 1997 meeting.
- DOE and NRC signed a Memorandum of Understanding (MOU) in November 1997 designating the Lawrence Berkeley National Laboratory (LBNL) as the site of the first pilot project.
- Individual facilities at Oak Ridge at Savannah River designated as future sites of NRC external regulation¹¹⁹.

Testifying before a House Commerce Committee subcommittee on February 11, 1997, Acting Energy Secretary Charles Curtis said DOE would submit legislation to Congress that year on implementing external regulation¹²⁰. Such relatively quick movement by DOE produced an initially positive congressional response to external regulation of DOE nuclear facilities. House Commerce Committee Subcommittee on Energy and Power Chair Rep. Dan Schaefer (R-CO) expressed such sentiment in a May 20, 1998 hearing:

I want to say from the start that I feel this is one of the most significant issues facing the Department of Energy today. Independent regulation gets at the crux of DOE's biggest management problem—the cleanup of sites within the nuclear weapons complex. If the Department knew that a regulator with full enforcement authority was watching over its shoulders, many DOE sites would be managed more efficiently and safely. Had such a watchdog been required for DOE sites from the beginning I think we could have avoided many of the massive environmental problems that the DOE complex faces today¹²¹.

8. GAO evaluation of DOE external regulation

A less sanguine assessment of DOE's external regulation strategy was provided by a May 1998 GAO report for the House Science Committee. This report contended that DOE's actual position on external regulation was unclear because its decision to conduct pilot projects (such as the NRC MOU) represented a shift in its formerly strong endorsement of external regulation of all DOE facilities. GAO observed that this change by DOE caused both the NRC and OSHA to question DOE's actual commitment to external regulation¹²².

Additional GAO findings asserted that while the DOE-NRC pilot project at LBNL would provide useful insights, it did not represent the size and complexity of DOE's overall nuclear complex and would not yield the practical data necessary for addressing numerous critical external regulation issues. For instance, the LBNL, Oak Ridge, and Savannah River sites covered by the pilot projects do not contain nuclear reactors, weapons plants, or heavily contaminated facilities. Such defense and environmental sites constitute 80 percent of DOE's nuclear complex and represent the environments responsible for initiating DOE exploration of external regulation¹²³.

GAO also criticized DOE for not integrating OSHA with NRC in its pilot projects. The absence of such integration, according to GAO, resulted in the creation of several working groups and steering committees on external regulation of DOE facilities within these agencies. A consequent result of these multifaceted administrative approaches sees these three agencies proceeding on different tracks and schedules toward external regulation without having a single structure to integrate their respective positions and strategies¹²⁴.

GAO's evaluation of the DOE-NRC pilot project also observed that defense nuclear facilities represent a significant part of DOE's nuclear complex and the substantive contributions of DNFSB in improving safety at these facilities would have to be included if DOE desired a complete exploration of all relevant external regulation issues¹²⁵.

DOE Deputy Secretary of Energy Elizabeth A. Moler criticized GAO's finding that DOE's position on external regulation was unclear or inconsistent. Moler maintained that there would be clear benefits from external regulation of DOE facilities and that the transition to external regulation required careful design and management. She also asserted that DOE intended to overcome legal, institutional, and technical difficulties on external regulation by working closely with the NRC and OSHA to propose classes of DOE facilities that could be subjected to a "responsibly implemented" external regulatory regime¹²⁶.

Moler's comments, though, could not prevent a change in the initially favorable congressional response to proposed external regulation of DOE nuclear facilities to which the critical GAO report probably contributed. This shift in sentiment is best expressed in the Senate Armed Services Committee's May 11, 1998, report on the 1999 Defense Department budget authorization section covering DNFSB:

The committee is not convinced that external regulation of new or existing DOE defense nuclear facilities will increase safety, decrease cost, or improve operational efficiency at such facilities. The committee notes that transfer of the Paducah gaseous diffusion plant from DOE to NRC regulation cost over \$200 million and took three years to complete.

The committee is concerned that the implementation of an additional external regulation approach could draw scarce resources away from high priority, compliance driven clean-up

actions and critical national security activities, with little added benefit. The committee believes that no decisions should be made or actions taken until the findings of the DNFSB and the comments of the Secretary of Energy and Chairman of the Nuclear Regulatory Commission have been provided and the ongoing external regulation pilot program is completed. The committee will be extensively involved in any movement toward an alternative external regulation approach¹²⁷.

9. Congressional assessments of DNFSB performance

DNFSB's congressional oversight committees have generally given favorable appraisals of Board activities. The Senate Armed Services committee 1999 budget authorization report for DNFSB noted that the Board "continues to provide exceptional and effective external oversight with a budget that equals about one-tenth of one percent of total Atomic Energy Defense funding"¹²⁸. The previous year this committee also praised DNFSB for successfully pushing DOE to improve nuclear safety and that the Board's non-punitive review process created an improved safety culture at DOE facilities. An additional committee endorsement of DNFSB accomplishments was its assertion that the Board plays an essential role in improving DOE operations and making them more accountable and that DNFSB should continue in its current role¹²⁹.

The best illustration of DNFSB's political capital is reflected in its budget authorizations over its first decade. From an initial appropriation of \$7 million for FY 1989, the Board's budget reached a total of \$17 million for FY 1998 representing remarkable growth during a decade noted for emphasizing federal budgetary deficits and spending rate growth reductions for numerous federal agencies¹³⁰.

10. Concern over DOE nuclear complex technical expertise

In addition to its clean-up and safety oversight responsibilities, DNFSB members will have to contend with numerous additional issues in the years ahead. One of these issues concerns the technical qualifications of workers in the defense nuclear complex to which the Board alluded in Recommendation 93-6. Testifying before the Senate Armed Services Committee on March 23, 1994, Conway expressed his concern about this emerging issue:

One of the biggest technical challenges and uncertainties results from the physical condition of facilities in the nuclear weapons complex. As facilities age and less attention is paid to their maintenance and upkeep, their condition will degrade. As key operating personnel depart, knowledge of facility and weapons designs and contents will erode, and safety will be reduced¹³¹.

DOE itself in an October 1998 report by that agency's Inspector General noted the precarious state of technical knowledge and expertise. This report acknowledged that DOE had not developed a coordinated or integrated program to preserve the knowledge base of a downsized nuclear weapons complex. The report went on to show that while individual nuclear sites were conducting archiving and knowledge capture activities, there was little consistency among these sites in terms of planning, approach, and progress achieved. This situation, consequently,

stemmed from DOE's Office of Defense Programs not assigning programmatic responsibility for developing and implementing a plan for knowledge preservation activities¹³².

A consequence of not having a coordinated knowledge preservation approach in view of retirements and downsizing at DOE nuclear facilities was also expressed in this report:

Without a coordinated, integrated program for knowledge preservation, the Department risks not identifying and using all information that would provide continued high confidence in the nuclear stockpile. Specifically, the Department cannot ensure that all relevant information will be included in a comprehensive, well organized, and easily accessible knowledge base, and that priorities for the capture of data, information, and knowledge, are appropriate and consistent throughout the nuclear weapons complex. In addition, disparities in knowledge preservation planning, approach, and progress may raise impediments to the integration of various site activities¹³³.

Concern over the future quality and viability of DOE's nuclear workers were not confined to DNFSB or DOE. They extended to Congress as well, which authorized the creation of a Commission on Maintaining United States Nuclear Weapons Expertise in the 1997 and 1998 National Defense Authorization Acts¹³⁴. The Commission was charged with developing a plan for recruiting and retaining requisite scientific, engineering, and technical personnel within DOE's nuclear complex in order for DOE to maintain a safe, reliable, and long-term nuclear weapons stockpile without underground nuclear testing. After a year of work, the Commission issued its report to Congress and the Secretary of Energy on March 1, 1999¹³⁵.

The Commission's report contained many positive findings such as stable funding, the coherence of the Stockpile Stewardship Program intended to assure the safety and reliability of U.S. nuclear weapons in the absence of testing, and the dedication and talent of the current workforce at U.S. defense nuclear facilities. However, these attributes were weakened by numerous deficiencies including an aging workforce, a tight job market for requisite professional skills, and the absence of a long-term hiring plan¹³⁶.

Specific Commission findings reveal a workforce uncertain of its future in light of downsizing and a perception that nuclear weapons production is a declining industry, the demographic aging of a workforce with between one-third and one-half of the workforce at five facilities being between 45 and 65, engineering undergraduates not being knowledgeable about DOE laboratories and production facilities, undergraduate enrollments in science and engineering declining by 19 percent since the peak year of 1983, frustration from DOE workplace micromanagement, and insufficient contractor flexibility in hiring and retaining qualified personnel¹³⁷.

Three particularly salient commission findings stand out. One deals with defense nuclear workforce concerns about the strength of the U.S. government's long-term commitment to nuclear deterrence and stockpile stewardship, doubts about the continued existence of some existing nuclear weapons complex facilities, and fear of further personnel reductions in the nuclear weapons workforce. A second point is the declining number of college students in relevant science and engineering fields at a time when overall economic needs for these graduates are growing. A final noteworthy development is the significant percentage of international students in nuclear graduate programs, which complicates recruitment in a profession requiring a security clearance and U.S. citizenship¹³⁸.

Several recommendations were proposed by the Commission to rectify these shortcomings. These included Congress and the administration reinforcing the national commitment and sense of mission to the nuclear weapons complex of its vital role in national security; completing an integrated, long-term weapons stockpile life extension plan; strengthening the DOD–DOE relationship to ensure enhanced budget and program coordination for national security needs; taking immediate action to achieve greater DOE laboratory coordination; and expediting improvements and the efficient use of the nuclear weapons production complex. Additional Commission recommendations included establishing clear authority lines within DOE, establishing and implementing a priority plan for replenishing crucial technical workforce needs, giving contractors greater freedom in personnel matters, expanding training and career planning programs to accommodate a dramatically changed workforce environment, expanding the use of former nuclear weapons program employees, creating a permanent Defense Programs Advisory Committee within DOE, and enhancing congressional oversight of the nuclear weapons program¹³⁹.

11. Conclusion

The responsibilities of overseeing safety conditions at defense nuclear facilities and cleaning up environmental damage at these sites will remain a long-term commitment of DNFSB, DOE, U.S. government environmental policy, and U.S. taxpayers. A 1996 DOE environmental issues analysis revealed that the final projected clean-up dates for the five most expensive nuclear facility clean-up sites would be 2070 for Hanford, 2045 for the Idaho National Engineering Laboratory, 2070 for Oak Ridge, 2055 for Rocky Flats, and 2050 for Savannah River. Surveillance and monitoring activities at these facilities will continue beyond these dates with these particular programs projected to conclude by 2070¹⁴⁰.

Besides its ongoing statutory responsibilities, DNFSB members and personnel will operate in a continually changing political and environmental policy cauldron. Protracted uncertainty over the status of the DOE-NRC external regulation pilot project and what this may mean for the Board's future operations will remain on the radar screen of DNFSB personnel for the foreseeable future.

Attempts to eliminate DOE have failed for now. However, the fact that such attempts were made and attracted the support of numerous members of Congress illustrates that DOE's political capital within the present Congress is not high. DNFSB appears to have sufficient credibility in Congress to survive a now hypothetical termination of DOE. The Board's status and responsibilities in the event of this occurring, though, cannot be predicted.

Another event that could affect the DNFSB would be an accident at a defense nuclear facility that threatens public safety outside the boundaries of the facility. A prompt and effective response to such an incident could bolster DNFSB's credibility in public opinion even if such a catastrophic occurrence was damaging to a DOE laboratory, the DOE, or other responsible political entities. Conversely, the slightest public or governmental perception of an inept response to such an incident by the DNFSB, could produce fatal consequences to its institutional and political survival.

Significant changes in the international security environment will also affect DNFSB operations. In a five-year strategic plan released on September 30, 1997, the Board listed the following two items as key assumptions:

1. Current U.S. national security policy affecting DOE nuclear weapons stockpile stewardship and management remains unchanged.
2. The administration maintains its moratorium on the underground testing of nuclear weapons. Resumption of full-scale underground testing would require a major shift in Board resources for oversight¹⁴¹.

Making and holding such assumptions during the middle of the Clinton administration is probably a sign of political prudence. However, recent events such as the 1998 nuclear tests conducted by India and Pakistan could weaken U.S. willingness to continue its nuclear weapons testing moratorium. In addition, concern over possible Chinese espionage at DOE laboratories has increased worries about the security of the United States' nuclear deterrent.

The Stockpile Stewardship Program (SSP) administered by DOE's Los Alamos, Lawrence Livermore, and Sandia laboratories provides ongoing maintenance and reliability of the U.S. nuclear deterrent. This program uses scientific advances in computer and experimental simulation to assess U.S. nuclear weapons reliability without weapons testing¹⁴². Despite Clinton administration support, this program's feasibility and reliability have been subjected to severe criticism.

A 1998 National Defense University and Lawrence Livermore National Laboratory report on the future direction of U.S. nuclear policy was extremely critical of SSP. This document noted that maintaining the safety, reliability, and performance of U.S. nuclear weapons without underground nuclear testing represented the highest risk of U.S. nuclear deterrence strategy, that U.S. nuclear weapons were not designed for indefinite stockpile life, and that no program that could substitute for nuclear weapons testing prior to the United States 1992 test moratorium decision. Additional criticisms of this report include SSP conclusions being high-risk because they cannot be validated by nuclear testing, diminished nuclear stockpile diversity due to nuclear disarmament treaties, concern over retaining personnel with technical expertise for weapons development and maintenance, the inability of the U.S. manufacturing complex to support serial nuclear weapons production, and the need for tritium production to sustain the nuclear weapons stockpile given tritium's limited half-life and the restricted ability to recycle tritium from dismantled nuclear weapons¹⁴³.

It is possible these and other potential national security concerns may lead the next presidential administration to resume nuclear testing. Such an event would have a significant impact on DNFSB operations requiring additional congressional appropriations and hiring qualified personnel to execute the Board's newly expanded responsibilities.

An additional issue with which the DNFSB will have to contend is the matter of nuclear waste repository siting. The Nuclear Waste Policy Act is due to be renewed in 1999 with Nevada's Yucca Mountain appearing to be the prime candidate for the United States' permanent nuclear waste repository. The need to resolve this issue has been accelerated by an October 1998 federal court decision holding DOE liable for radioactive waste storage costs at three closed New England nuclear power plants. Opposition to selecting Yucca Mountain has come from the Clinton administration and Nevada's congressional delegation, led by Senator Harry Reid (D-NV)¹⁴⁴.

Such opposition to Yucca Mountain failed to stop the House Commerce Committee's 40-5 vote on April 21, 1999, to approve the shipment of nuclear waste to the Nevada Test Site by June 30, 2003. The Senate approved this legislation 64-34 on February 10, 2000 and the House approved it 252-167 on March 22, 2000. This legislation had not received presidential approval or veto at the end of April 2000¹⁴⁵.

Whatever happens in the decision over establishing a permanent nuclear waste repository will involve DNFSB personnel in a significant way as they monitor the transportation, disposal, and storage of nuclear waste. It will also force the American public and its leaders to face the reality that a safe and permanent disposal location for nuclear waste must be found regardless of the emotional opposition such disposal will inevitably generate. The continuing and ongoing involvement of the DNFSB in consulting with local leaders and communities in affected areas can enhance public understanding of this issue and potentially alleviate uncertainty and concerns among the affected populations about possible health, safety, and environmental impacts of such disposal¹⁴⁶.

Board operations could also be improved by reducing the number of congressional committees to which they report. Depending on the issue(s) in question, DNFSB board members must testify before the appropriations, armed services, and energy committees of the House and Senate as well as other committees as circumstances may require. Assigning one congressional committee in each of these bodies to oversee DNFSB operations would reduce congressional costs as well as DNFSB's cost and allow for more efficient oversight of Board activities.

Public knowledge of DNFSB activities has been enhanced in several ways. The Board held 29 public meetings at or near defense nuclear facilities between 1990 and 1997 and an additional 29 public meetings in Washington, DC, during this period. It maintains a public reading room in Washington, DC, and bound volumes of public meeting transcripts between 1990 and 1997 generated nearly 7,000 pages of material and represent a portion of the approximately 1.75 million pages of records made available for public viewing during this period¹⁴⁷.

The agency's Website <<http://www.dnfsb.gov/>> is also a useful research source. It contains all of the Board's annual reports, recommendations, correspondence, technical issue reports, weekly reports on staff visits to affected defense nuclear facilities such as Hanford, Oak Ridge, Pantex, Rocky Flats, and Savannah River, Freedom of Information Act (FOIA) policies and procedures, and biographical information on Board members.

The Defense Nuclear Facilities Safety Board was created in response to concern over the safety of the United States' defense nuclear facilities. It has been relatively successful in fulfilling its responsibilities and maintaining a good relationship with both the DOE and Congress. Uncertainty over possible future developments in national security, energy policy, environmental policy, and congressional attitudes toward DOE make predicting DNFSB's long-term future uncertain. Nevertheless, it appears likely that the DNFSB or a comparable organization will be a part of the U.S. government landscape for the foreseeable future given the long-term importance of ensuring safe operations at the United States' defense nuclear facilities.

Notes

1. See A. Costandina Titus, *Bombs in the Backyard: Atomic Testing and American Politics* (Reno, NV: University of Nevada Press, 1986), 11–21, on how a combination of secrecy and technical accomplishment over nuclear weapons production and testing would seek to downplay possible negative environmental and public health consequences of this activity. See also A. Costandina Titus, "Selling the Bomb: Public Relations Efforts by the Atomic Energy Commission During the 1950's and 1960's," *Government Publications Review* 16, no. 1 (January/February 1989):15–29.

2. U.S. Congress, Congressional Budget Office, *Cleaning Up the Department of Energy's Nuclear Weapons Complex* (Washington, DC: Government Printing Office, 1994), 1 (SuDoc no: Y 10.2:C 58/2).
3. U.S. Congress, Office of Technology Assessment, *Complex Cleanup: The Environmental Legacy of Nuclear Weapons Production* (Washington, DC: Government Printing Office, 1991), 15 (SuDoc no: Y 3.T 22/2:2 C 58/3). See also U.S. Advisory Committee on External Regulation of Department of Energy Nuclear Safety, *Improving Regulation of Safety at DOE Nuclear Facilities* (Washington, DC: Department of Energy, 1995), 2, Internet version <<http://www.em.doe.gov/acd/finchp2.html>> for coverage of the diverse size of DOE nuclear facilities that range from 1,450 acres for Fernald in Ohio to 192,000 acres for Savannah River, 360,000 acres for Hanford, and 570,000 acres for the Idaho National Engineering Laboratory.
4. *Complex Cleanup*, 18–19. See also Richard E. Rowberg and Clifford Lau, *The Department of Energy's Tritium Production Program* [CRS Issue Brief 97002], (Washington, DC: Library of Congress, Congressional Research Service, 1997), 1–15 for information on one of the components involved in nuclear weapons production at DOE nuclear facilities.
5. Rowberg and Lau, 97002; *The Department of Energy's Tritium Production Program*, 18–19.
6. Michele Stenehjem Gerber, *On the Home Front: The Cold War Legacy of the Hanford Nuclear Site* (Lincoln, NE: University of Nebraska Press, 1992), 3.
7. Gerber, 3–4.
8. See Michael E. Kraft, Eugene A. Rosa, and Riley E. Dunlap, “Public Opinion and Nuclear Waste Policy-making,” in *Public Reactions to Nuclear Waste: Citizens' Views of Repository Siting*, eds. Riley E. Dunlap et. al. (Durham, NC: Duke University Press, 1993), 3.
9. Kraft, Rosa, and Dunlap, 3–4.
10. “An Act for the Development and Control of Atomic Energy,” Public Law 75-585, 61 *U.S. Statutes at Large* 755.
11. See U.S. Congress, Office of Technology Assessment, *Managing the Nation's Commercial High-Level Radioactive Waste* (Washington, DC: Government Printing Office, 1985), 83–84 (SuDoc no: Y 3.T 22/2:2 R 11/2/985). See also Titus, *Bombs in the Backyard*, 22–31; Eugene A. Rosa and William Freudenburg, “The Historical Development of Public Reactions to Nuclear Power: Implications for Nuclear Waste Policy,” in *Public Reactions to Nuclear Waste*, 33 for additional coverage of the creation and significance of the 1946 Atomic Energy Act.
12. “Atomic Energy Act of 1954,” Public Law 83-703, 68 *U.S. Statutes at Large* 921.
13. See *Managing the Nation's Commercial High-Level Radioactive Waste*, 83; Titus, *Bombs in the Backyard*, 32–33; and Rosa and Freudenburg, *Public Reactions to Nuclear Waste*, 34.
14. “To Amend the Atomic Energy Act of 1954, as Amended, and for Other Purposes,” Public Law 85-256, 71 *U.S. Statutes at Large* 576.
15. See Rosa and Freudenburg, 34–35 and Titus, *Bombs in the Backyard*, 134.
16. “An Act to Reorganize and Consolidate Certain Functions of the Federal Government in a New Energy Research and Development Administration and in a New Nuclear Regulatory Commission in Order to Promote More Efficient Management of Such Functions,” Public Law 93-438, 88 *U.S. Statutes at Large*, 438.
17. U.S. Congress, House Committee on Commerce, *Compilation of Selected Energy Related Legislation: Nuclear Energy and Radioactive Waste*, 105th Cong., 1st sess., Committee Print (Washington, DC: Government Printing Office, 1997), 185–186 (SuDoc no: Y 4.C 73/8:105-F).
18. “To Establish a Department of Energy in the Executive Branch by the Reorganization of Energy Functions Within the Federal Government in Order to Secure Effective Management to Assure a Coordinated National Energy Policy, and for Other Purposes,” Public Law 95-91, 91 *U.S. Statutes at Large*, 565.
19. “An Act to Provide for the Development of Repositories for the Disposal of High-Level Radioactive Waste and Spent Nuclear Fuel, to Establish a Program of Research, Development, and Demonstration Regarding the Disposal of High-Level Radioactive Waste and Spent Nuclear Fuel, and for Other Purposes,” Public Law 97-425, 96 *U.S. Statutes at Large*, 2201.
20. *Managing the Nation's High-Level Commercial Radioactive Waste*, 101–108.
21. *Legal Environmental Assistance Foundation Inc. v. Hodel*, 586 F.Supp. 1163, (Eastern District Tennessee) (1984).
22. For coverage of additional legal issues that have or may involve DOE's nuclear weapons complex, see

Mark Holt, *Nuclear Weapons Production Complex: Environmental Compliance and Waste Management* [CRS Issue Brief 90074, updated], (Washington, DC: Library of Congress, Congressional Research Service, 1990, 1997), 2, 8–11, <<http://www.cnie.org/nle/waste-3.html>>, (accessed February 2000).

23. See U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy Conservation and Power, *Nuclear Reactor Safety*, 99th Cong., 2nd sess. (Washington, DC: Government Printing Office), 3; and U.S. Congress, House Committee on Science, Space, and Technology, Subcommittee on Investigations and Oversight, *Environmental Crimes at the Rocky Flats Nuclear Weapons Facility*, 102nd Cong., 2nd sess. (Washington, DC: Government Printing Office, 1992), 9–31 et seq. (SuDoc no: Y 4.Sci 2:102/163).

24. *Nuclear Reactor Safety*, 66–67.

25. U.S. Congress, Commission on Security and Cooperation in Europe, *The Legacy of Chernobyl 1986 to 1996 and Beyond*, 104th Cong., 2nd sess. (Washington, DC: Government Printing Office, 1996), 32–34, 44–45, 47 (SuDoc no: Y 4.Se 2:104-1-12).

26. *Nuclear Reactor Safety*, 3.

27. National Research Council, *Safety Issues at the Defense Production Reactors: A Report to the U.S. Department of Energy* (Washington, DC: National Academy Press, 1987), vii.

28. *Safety Issues at the Defense Production Reactors*, vii, 76, 78, 80–82. See also U.S. Department of Labor, Occupational Safety and Health Administration, *Evaluation of the U.S. Department of Energy's Occupational Safety and Health Program for its Government-Owned Contractor-Operated Facilities* (Washington, DC: Government Printing Office, 1990), i–iv, 1–10, 55–58 (SuDoc no: L 35.2:Ev 1) for another detailed assessment of DOE occupational safety practices. For documentation of separate DOE contractor hazardous waste disposal standards and test methods, see U.S. Congress, House, Committee on Interior and Insular Affairs, *The Department of Energy's Failure to Police Standards for Radioactivity in Hazardous Waste*, 102nd Cong., 2nd sess., Committee Print (Washington, DC: Government Printing Office, 1992), 7 (SuDoc no: Y 4.In 8/14:En 2/6).

29. U.S. Congress, Senate Committee on Governmental Affairs, *Early Health Problems of the U.S. Nuclear Weapons Industry and Their Implications for Today*, 101st Cong., 1st sess., Committee Print (Washington, DC: Government Printing Office, 1989), 1, 13–15 (SuDoc no: Y 4.G 74/9:S.prt. 101-63).

30. See Robert L. Civiak, *DOE Nuclear Facilities Safety Oversight: Comparison of Four House Bills* (Washington, DC: Congressional Research Service, Library of Congress, 1988), 1–8, for analysis of some of this legislation.

31. U.S. Congress, House Committee on Armed Services, *Hearings on National Defense Authorization Act For Fiscal Year 1989-H.R. 4264 and Oversight of Previously Authorized Programs Department of Energy National Security Programs before the Procurement and Military Nuclear Systems Subcommittee*, 100th Cong., 2nd sess., March 1–3, 1988, 6 (SuDoc no: Y 4.Ar 5/2a:987-88/76).

32. *Hearings on National Defense Authorization Act for Fiscal Year 1989-H.R. 4264 and Oversight of Previously Authorized Programs Department of Energy National Security Programs*. For additional background on DOE nuclear facility safety issue see also U.S. Congress, House, Committee on Energy and Commerce, *Safety of DOE Nuclear Facilities: Hearing Before the Subcommittee on Energy and Power*, 101st Cong., 1st sess., February 22, 1989, 1–49 (SuDoc no: Y 4.En 2/3:101-1).

33. Senator John Glenn, “The Nuclear Protections and Safety Act of 1987,” *Congressional Record* 133, no. 63 (April 23, 1987): S5421–S5426.

34. U.S. Congress, Senate, Committee on Armed Services, Subcommittee on Strategic Forces and Nuclear Deterrence, *Safety Oversight for Department of Energy Nuclear Facilities*, 100th Cong., 1st sess. (Washington, DC: Government Printing Office, 1988), 61 (SuDoc no: Y 4.Ar 5/3:S.Hrg. 100-560).

35. *Safety Oversight for Department of Energy Nuclear Facilities*, 165–170.

36. *Safety Oversight for Department of Energy Nuclear Facilities*, 171–176.

37. See U.S. Congress, Senate, Committee on Governmental Affairs, *Nuclear Protections and Safety Act of 1987*, Senate Report 100-173 (Washington, DC: Government Printing Office, 1987), 1–48; U.S. Congress, Senate, Committee on Armed Services, *Nuclear Protections and Safety Act of 1987*, Senate Report 100-232 (Washington, DC: Government Printing Office, 1987), 2, for the principal congressional reports on DNFSB's legislative history.

38. Senate, Committee on Armed Services, *Nuclear Protections and Safety Act of 1987*, Senate Report 100-232, 11.

39. Senate, Committee on Armed Services, *Nuclear Protections and Safety Act of 1987*, Senate Report 100-232, 2, 20–21.

40. See "Conference Report on H.R. 4481, Defense Savings Act of 1988," *Congressional Record* 134, no. 135 (September 28, 1988): H8845. For the full text of this law, see P.L. 100-456, "National Defense Authorization Act, Fiscal Year 1989," 102 *U.S. Statutes at Large*, 1918. Although President Reagan made no specific public reference to DNFSB's creation, see U.S. National Archives and Records Administration, *Public Papers of the Presidents Ronald Reagan 1988-89: Book II-July 2, 1988 to January 19, 1989* (Washington, DC: Government Printing Office, 1991), 1262, 1813 for references to presidential signing of the 1989 Defense Authorization Act (SuDoc no: AE 2.114:988-89).

41. U.S. Congress, House, Committee on Government Operations, Subcommittee on Environment, Energy, and Natural Resources, *Contractor Accountability at Department of Energy Nuclear Facilities*, 101st Cong., 1st sess. (Washington, DC: Government Printing Office, 1991), 1-2 (SuDoc no: Y 4.G 74/7:C 82/8). Contractor problems at DOE nuclear sites have proven to be an ongoing issue for DNFSB. See U.S. Congress, House, Committee on Energy and Commerce, Subcommittee on Oversight and Investigations, *Contracting Problems at DOE's Fernald Site*, 103rd Cong., 1st sess. (Washington, DC: Government Printing Office, 1994), 24-47 (SuDoc no: Y 4.En 2/3:103-85) for additional documentation of contractor problems at Ohio's Fernald plant and DNFSB's response.

42. Roy H. Webb, "The Stealth Budget: Unfunded Liabilities of the Federal Government," *Economic Review: Federal Reserve Bank of Richmond* 77, no. 3 (May/June 1991):28-29.

43. Kraft, Rosa, and Dunlap, "Public Opinion and Nuclear Waste Policymaking," in *Public Reactions to Nuclear Waste: Citizens' Views of Repository Siting*, 7-8.

44. Kraft, Rosa, and Dunlap, 17. For the principal court ruling against Nevada's efforts to stop DOE activities at Yucca Mountain, see *State of Nevada et. al v. James D. Watkins, Secretary of the United States Department of Energy*, 914 F.2d 1545 (U.S. Court of Appeals 9th Circuit), (1990). See also U.S. General Accounting Office, *Nuclear Waste: DOE's Repository Site Investigations, a Long and Difficult Task* (Washington, DC: Government Printing Office, 1992), 2-5, 10-19 (SuDoc no: GA 1.13:RCED-92-73) for background and analysis of the Yucca Mountain program and the roles played by Congress and DOE.

45. U.S. Defense Nuclear Facilities Safety Board, *Annual Report to Congress: February 1991*, 3 (SuDoc no: Y 3.D 36/3:1/991) Internet version <<http://www.dnfsb.gov/annual/annual1.html>>. Although covering DOE nuclear facilities and operations, DNFSB's jurisdiction does not cover U.S. Navy nuclear programs.

46. See *Weekly Compilation of Presidential Documents*, vol. 25, no. 25 (June 26, 1989), 969 for the nomination announcement of DNFSB members. See also U.S. Congress, Senate, Committee on Armed Services, *Nominations Before the Senate Armed Services Committee, First Session, 101st Congress*, March 14, 16, April 5, 18-19, May 3, 4, 16, 18, 1989, 717-789 (SuDoc no: Y 4. Ar 5/3:S.Hrg. 101-537) for biographical information and confirmation hearing questioning of DNFSB members. See also U.S. Congress, Senate, Committee on Armed Services, *Plans, Progress, and Experience to Date of the Defense Nuclear Facilities Safety Board: Hearing Before the Subcommittee on Strategic Forces and Nuclear Deterrence*, 101st Cong., 2nd sess., March 28, 1990, 17-18 (SuDoc no: Y 4.Ar 5/3:S.Hrg. 101-879).

47. *Annual Report to Congress: February 1991*, 19.

48. *Plans, Progress, and Experience to Date of the Defense Nuclear Facilities Safety Board*, 19.

49. *Plans, Progress, and Experience to Date of the Defense Nuclear Facilities Safety Board*, 19-20.

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