

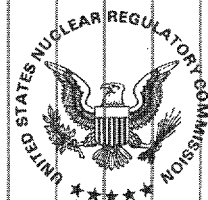
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NRC Annual Report Statutory Reporting Requirements

ENERGY REORGANIZATION ACT OF 1974, AS AMENDED

Section 307(c) directs the Commission to include in its Annual Report statements and descriptions concerning:

"...the short-range and long-range goals, priorities, and plans of the Commission as they are related to the benefits, costs, and risks of nuclear power." (See Chapters 1, 2, 3, 4, 6, 9, and 11.)

"...the Commission's activities and findings in the following areas—

"(1) insuring the safe design of nuclear power plants and other licensed facilities...." (For reactor design, see Chapters 2 and 9; for materials facilities, devices, and transportation packaging, see Chapters 4 and 5; for waste disposal facilities, see Chapters 6 and 9.)

"(2) investigating abnormal occurrences and defects in nuclear power plants and other licensed facilities...." (See Chapters 2, 3, and 4.)

"(3) safeguarding special nuclear materials at all stages of the nuclear fuel cycle...." (See Chapters 5, 8, and 9.)

"(4) investigating suspected, attempted, or actual thefts of special nuclear materials in the licensed sector and developing contingency plans for dealing with such incidents...." (See Chapters 5 and 9.)

"(5) insuring the safe, permanent disposal of high-level radioactive wastes through the licensing of nuclear activities and facilities...." (See Chapters 6 and 9.)

"(6) protecting the public against the hazards of low-level radioactive emissions from licensed nuclear activities and facilities...." (See Chapters 2, 4, and 6.)

Section 205 requires development of "a long term plan for projects for the development of new or improved safety systems for nuclear power plants" and an annual updating of that plan. (See Chapter 9.)

Section 209 requires the Commission to include in each Annual Report a chapter describing the status of the NRC's domestic safeguards program. (See Chapter 5.)

Section 210 requires the Commission to submit "a plan providing for the specification and analysis of unresolved safety issues relating to nuclear reactors," and to include progress reports in the Annual Report thereafter concerning corrective actions. (See Chapter 9.)

NUCLEAR NONPROLIFERATION ACT OF 1978

Section 602 requires annual reports by the Commission and the Department of Energy to "include views and recommendations regarding the policies and actions of the United States to prevent proliferation which are the statutory responsibilities of those agencies...." (See Chapter 8.)

ATOMIC ENERGY ACT OF 1954, AS AMENDED

Section 170(i) directs the Commission to report annually on indemnity action implementing the Price-Anderson Act which provides a system to pay public indemnity claims in the event of a nuclear accident. (See Chapter 2.)

PUBLIC LAW 96-295

Section 303 directs the Commission to report annually a statement of—

(1) the direct and indirect costs to the Commission for the issuance of any license or permit and for the inspection of any facility; and

(2) the fees paid to the Commission for the issuance of any license and for the inspection of any facility." (See Chapter 1.)

Chapter 1

NRC
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Highlights for Fiscal Year 1996

This 22nd annual report of the U.S. Nuclear Regulatory Commission (NRC) describes accomplishments, activities, and plans made during Fiscal Year 1996 (FY 1996)—October 1, 1995, through September 30, 1996. Significant activities that occurred early in FY 1997 are also described, particularly changes in the Commission and organization of the NRC.

Section 307(c) of the Energy Reorganization Act of 1974, as amended, requires that an annual report be submitted to the President for transmittal to the Congress. This report also fulfills other statutory requirements listed on pages xiii and xiv.

The NRC, an independent agency of the Federal Government, was created by the Energy Reorganization Act of 1974. The President nominates five NRC Commissioners, who are confirmed by the U. S. Senate, and appoints the Chairman from among these Commissioners.

The mission of the NRC is to ensure that civilian uses of nuclear materials in the United States are carried out with adequate protection of public health and safety, the environment, and national security. These uses include the operation of nuclear power plants and fuel cycle plants and medical, industrial, and research applications. Additionally, the NRC contributes to combating the proliferation of nuclear weapons material worldwide.

The NRC licenses and regulates commercial nuclear reactor operations and research reactors and other activities involving the possession and use of nuclear materials and wastes. It also

protects nuclear materials used in operations and facilities from theft or sabotage. To accomplish its statutorily mandated regulatory mission, the NRC issues rules and standards, inspects facilities and operations, and issues any required enforcement actions.

CHANGES IN THE COMMISSION AND THE ORGANIZATION

On December 22, 1995, the Senate confirmed Greta J. Dicus as NRC Commissioner. She was sworn in as Commissioner by Chairman Jackson on February 15, 1996; her term will expire June 30, 1998. The Senate also confirmed Nils J. Diaz and Edward McGaffigan, Jr., as NRC Commissioners on August 2, 1996. Commissioner Diaz was sworn in on August 23, 1996; his term will expire June 30, 2001. Commissioner McGaffigan was sworn in by Chairman Jackson on August 28, 1996; his term will expire June 30, 2000.

On December 2, 1996, Chairman Jackson announced several major organizational changes in the agency. The Office of the Chief Financial Officer was created, joining the Office of the Chief Information Officer that had been established earlier in the year. Jesse L. Funches was appointed as the Chief Financial Officer and Anthony J. Galante as the agency's first Chief Information Officer. Both offices will report directly to the Chairman. Several changes affecting the personnel and structure of the Office of the Executive Director for Operations (EDO) were also

announced. L. Joseph Callan was selected as the new EDO. Three deputy executive directors will report to him. Edward J. Jordan is the Deputy Executive Director for Regulatory Effectiveness; Hugh L. Thompson, Jr., is the Deputy Executive Director for Regulatory Programs; and Patricia G. Norry is the Deputy Executive Director for Management Services.

In addition to these changes, several key executives retired: James M. Taylor was succeeded as EDO by L. Joseph Callan; James L. Milhoan retired as Deputy Executive Director for Nuclear Reactor Regulation, Regional Operations, and Research; Stewart D. Ebnetter was succeeded as Administrator for Region II by Luis A. Reyes; William T. Russell, Director of Nuclear Reactor Regulation, was succeeded by Frank J. Miraglia as Acting Director

pending the assignment of Samuel J. Collins as Director of the Office; and Vandy L. Miller, Director of Small Business and Civil Rights, was succeeded by Irene P. Little.

In other organizational changes, Hubert T. Bell, Jr., succeeded David C. Williams as Inspector General; Hubert J. Miller succeeded Thomas T. Martin as Administrator for Region I; and Arthur Bill Beach succeeded Hubert J. Miller as Administrator for Region III; and, finally, Ellis W. Merschoff succeeded L. Joseph Callan as Administrator for Region IV when Mr. Callan was appointed EDO. In addition to Regional Administrator successors, Edward L. Halman succeeded Patricia G. Norry as Director of the Office of Administration.

The current NRC organization is shown in Appendix 1.



Figure 1.1 The Chairman and the Commissioners of the U.S. Nuclear Regulatory Commission
 Left to right are Kenneth C. Rogers (Retired); Nils J. Diaz (standing); Shirley Ann Jackson, Chairman; Edward McGaffigan, Jr. (standing); and Greta J. Dicus.

STRATEGIC ASSESSMENT AND REBASELINING INITIATIVE

The environment in which the NRC conducts its activities is rapidly changing as a result of many influences. These included resource restraints, changes in the industry that NRC regulates, and the potential for new and revised mission requirements. Against this backdrop of change in the agency's regulatory and fiscal environment, the Chairman established the Strategic Assessment and Rebaselining Initiative. To oversee this activity, a Strategic Assessment and Rebaselining Steering Committee (Steering Committee) was formed of senior agency managers. The Steering Committee is assessing where the NRC is today and developing options that the Commission can consider in determining the agency's future path. This assessment was initiated in August 1995 and is being conducted in four phases. The four broad phases will be carried out sequentially, each phase building on the preceding phase:

- Phase I: Strategic Assessment,
- Phase II: Rebaselining and Issue Papers,
- Phase III: Development of the Strategic Plan, and
- Phase IV: Implementation.

Phase I: Strategic Assessment

The first phase, the Strategic Assessment phase, began in August 1995 and was completed in April 1996. The Steering Committee began with a bottom-up approach for assessing where the agency is today, examining current NRC functions and activities. This assessment included approximately 4,500 activities that the Steering Committee reviewed to thoroughly understand what the agency is doing, why the agency is doing it, and what factors

most need to be considered in providing options for change. Starting with this information, the Steering Committee applied top-down strategic thinking to define strategic and direction-setting issues whose resolution will influence the future direction of the agency.

Phase II: Rebaselining and Issue Papers

The second phase built on the strategic issues and the direction-setting issues (DSIs) defined in Phase I. Issue papers were prepared to discuss a broad range of potential options that the Commission would consider for each DSI. Following initial Commission review, preliminary Commission views were identified. The issue papers, including the Commission's preliminary views, were published to allow NRC staff (internal stakeholders) and members of the public (external stakeholders) to review the information and to comment on the issues before the Commission made any final decisions. A summary of the comments received on the DSIs was given to the Commission for consideration in reaching final decisions on these issues. These decisions will be used as the guidance for the FY 1999 budget and the basis for the NRC's Strategic Plan, which will result in a rebaselining or a resetting of the agency's goals.

Phase III: Development of the Strategic Plan

In Phase III, the Strategic Plan will be developed from the agency's mission statement, its strategic vision, general goals, and the Commission's decisions on the issue papers. The development of the Strategic Plan will be guided by the requirements contained in the Government Performance and Results Act. The Strategic Plan will be the agency's tool for setting priorities and allocating resources consistent with the vision and the goals of the agency. The NRC anticipates completing the Strategic Plan in 1997.

Phase IV: Implementation

Phase IV, the implementation phase, is currently underway. The implementation phase includes implementing the Commission's decisions, generating Commission papers to resolve related strategic issues, and complying with Commission guidance based on the Strategic Plan. The implementation phase will also include developing a framework that allows for updating the Strategic Plan and for integrating the Strategic Plan with—

- the budget process,
- performance monitoring and reporting processes, and
- the process for developing future Commission decisions.

NRC LICENSE AND ANNUAL FEES

The Omnibus Budget Reconciliation Act of 1990 (Public Law 101-508) requires that in FY 96, the NRC collect fees (under 10 CFR Part 170) and annual fees (under 10 CFR Part 171) that approximate 100 percent of the agency's budget authority, less the amount appropriated to the NRC from the Nuclear Waste Fund. Public Law 104-46 appropriated approximately \$473.3 million to the NRC for FY 1996, and Public Law 104-134 (Omnibus Consolidated Rescissions and Appropriations) enacted a rescission of \$714,000 for a net FY 1996 appropriation of \$472.6 million. Approximately \$11 million of the budget was appropriated from the Nuclear Waste Fund. Of the remaining \$461.6 million, NRC collected 98 percent through fees and annual charges. A detailed account of NRC financial management, with an audited financial report, is provided in the Fiscal Year 1996 Accountability Report (NUREG-1542, Volume 2), which became available in May 1997.

SPENT FUEL STORAGE AND TRANSPORTATION

In April 1995, the Nuclear Regulatory Commission (NRC) created the Spent Fuel Project Office (SFPO) in the Office of Nuclear Material Safety and Safeguards (NMSS). The SFPO has responsibility for the agency's regulatory, licensing, and inspection program for the storage of nuclear reactor spent fuel and for the domestic and international transportation of radioactive materials. Specifically, the SFPO is responsible for the safety and environmental reviews of—

1. Commercial spent fuel transportation and storage cask designs, including certification of storage systems under the general license provisions of 10 CFR Part 72, Subpart K,
2. Commercial non-spent fuel transportation container designs for uranium hexafluoride, fresh fuel, oxides, contaminated wastes, sealed sources, and Naval Reactor shipments, and
3. Interim spent fuel and high-level waste storage facilities, including the licensing of nuclear utility specific facilities, private facilities, and any U.S. Department of Energy (DOE) storage facilities.

Also during Fiscal Year (FY) 1995, the Office of Nuclear Reactor Regulation (NRR) and NMSS signed a Memorandum of Understanding to clarify the interactions, licensing program management responsibilities, and support functions for the decommissioning of nuclear reactor sites. NRR retains regulatory project management, oversight, and inspection support responsibilities until all spent fuel is permanently transferred from the spent fuel pool to an independent spent fuel storage installation (ISFSI) or to an offsite storage facility. After the spent fuel is permanently transferred to the ISFSI or offsite storage facility, NMSS assumes regulatory project management, oversight, and inspection responsibility for the ISFSI casks, facilities, and their construction, vendors, and respective inspections. The SFPO is also responsible for inspections of the implementation of quality assurance programs by users, suppliers, and fabricators of NRC-certified transport container designs and dry storage systems.

INTERNATIONAL COOPERATION

The following sections describe these highlights of the NRC's major international involvement in nuclear safety, along with other noteworthy activities during the reporting period.

During Fiscal Year (FY) 1996, NRC's international program included the following noteworthy activities:

- Supporting meetings of the U.S.-Russia Joint Commission on Technological Cooperation in Energy and Space, chaired by Vice President Gore and Russian Prime Minister Chernomyrdin. NRC activities with Russia regarding nuclear safety and security issues continued to constitute an important element of this bilateral initiative.
- Participating actively in the policy and implementation aspects of nuclear safety initiatives under the Group of Seven (G-7) industrialized nations, the Group of 24 (G-24) Nuclear Safety Coordination mechanism, and the Nuclear Safety Account (NSA) administered by the European Bank for Reconstruction and Development (EBRD). These institutions have focused on coordinating international efforts to enhance nuclear safety in countries using Soviet-designed nuclear power reactors.
- Participating in the Sustainable Energy Committee of the Vice President Gore-Deputy President Mbeki Binational Commission, which focuses on achieving high-level dialogue on nuclear safety topics such as strengthening nuclear safety regulation and South African participation in international nuclear safety research, as well as implementing NRC's agency-to-agency nuclear safety exchange arrangement with South Africa's regulatory organization.
- Continuing important nuclear safety cooperation with the New Independent States (NIS) of the former Soviet Union (FSU) and countries of Central and Eastern Europe (CEE). These activities included strengthening their regulatory organizations, training foreign inspectors, and working together in the areas of operational safety and risk reduction. NRC's regulatory assistance program to Armenia's Nuclear Regulatory Authority is a new part of this effort.
- Continuing NRC's efforts to help the FSU regulatory organizations—particularly in Russia, Ukraine, and Kazakhstan—to improve their regulatory programs and systems for protecting, controlling, and accounting for nuclear materials within the framework of agreements signed by the United States with these countries in the fall of 1993.
- Continuing efforts to work (in conjunction with other U.S. Government and related entities) with Russia, Ukraine, and Belarus to study the health effects of exposure to ionizing radiation resulting from the Chernobyl accident and from Russian defense-related activities.
- Enhancing regulatory cooperation with several Pacific Rim countries conducting, or considering, new or expanded nuclear power programs (specifically Indonesia, China, the Republic of Korea, and Taiwan).
- Maintaining active information exchanges with countries that have substantial nuclear programs and with multilateral organizations promoting international nuclear safety, as well as continuing activities in support of significant international initiatives in the interest of nuclear safety.
- Playing a leading role in resolving implementation issues for the International Convention on Nuclear Safety, which became effective in October 1996. Once the United States becomes a party, implementation of U.S. obligations will be carried out primarily by the NRC.
- Participating in efforts to develop a separate Convention on the Safety of Radioactive Waste Management now being actively considered internationally.
- Continuing active, cooperative nuclear safety research with other nations having major nuclear power programs, including France, Germany, Japan, and the United Kingdom.

The NRC staff has also been participating as a member of the U.S. delegation negotiating an International Convention on the Safety of Radio-

active Waste Management. The Convention, when in force, will promote a high level of safety worldwide in the management of radioactive waste through enhancement of national measures and international cooperation. The staff participated in three meetings during 1996, developing a draft convention that is planned to be opened for signature in late 1997.

POWER REACTOR REGULATION

Special Inspection and Oversight of Northeast Utilities Millstone and Haddam Neck

A special inspection team, led by a senior NRC manager, was formed in January 1996 to assess the operations, engineering and licensing activities and management oversight at the Millstone site as they related to the resolution of degraded and nonconforming conditions. The team inspected Millstone Units 2 and 3 and Haddam Neck, in part, because of findings from a February 1996 Northeast Utilities (NU) internal root-cause evaluation that questioned whether fundamental design and licensing concerns identified at Unit 1 could exist at these other units. In June 1996, the NRC designated the units at Millstone as Category 3 plants on the NRC's watch list. Plants in this category have significant weaknesses that warrant maintaining them in a shutdown condition until the licensee can demonstrate to the NRC that it has both established and implemented adequate programs to ensure substantial improvement. Plants in this category require Commission authorization to resume operations. On November 3, 1996, the NRC created the Special Projects Office (SPO) to provide a specific management focus on future NRC activities associated with the Millstone units. The SPO's responsibility for future activities at Millstone includes all licensing and inspection activities required to support an NRC decision on restart of the Millstone units. On December 4, 1996, NU announced its decision to

permanently shut down Haddam Neck before the expiration of its 40-year operating license (June 29, 2007).

Effects of Electric Industry Deregulation on Nuclear Power Plants

The Public Utility Regulatory Policies Act of 1978 and the Energy Policy Act of 1992 opened the way for a number of State Public Utility Commissions (PUCs) and the Federal Energy Regulatory Commission (FERC) to initiate actions leading to the deregulation of the electric utility industry. The industry is moving away from traditional rate-based regulation toward increased competition. This movement could potentially have profound impacts on the long-term ability of NRC's power reactor licensees to obtain adequate funds to operate and to decommission their plants safely. Although the NRC is not normally involved in economic or rate regulation, the agency has recognized over the years a possible relationship between access to capital and safety of operations. While there is much evidence that an efficiently operated facility is a safe facility, the NRC must be increasingly vigilant to ensure that economic pressures do not result in a degradation in safety at operating plants.

Use of Risk Analysis

During 1996, the staff continued to implement the Commission's Final Policy Statement on the Use of Probabilistic Risk Assessment (PRA) in Nuclear Regulatory Activities (60 FR 42622; August 16, 1995). The staff also continued to work on and complete activities described in the staff's PRA Implementation Plan, including the review of several ongoing PRA pilot programs in the areas of graded quality assurance, risk-informed inservice testing, risk-informed inservice inspection, and risk-informed technical specification improvements. These PRA pilot programs are scheduled to be completed by Fiscal Year 1998. In addition, the staff completed its review of Individual Plant Examinations (IPEs) and developed a report summarizing the results of the IPE program and

providing staff perspectives on reactor safety and plant performance.

Power Reactor Licensing Actions

A low-power operating license was issued to the Tennessee Valley Authority (TVA) on November 9, 1995, for the Watts Bar Nuclear Plant, Unit 1. The full-power operating license was issued on February 7, 1996.

Either routine activity or unexpected events at a nuclear facility can result in a need for the NRC to take licensing actions. Routine actions occurring after a license issuance include license amendment requests, possibly involving public hearings; requests for exemption from regulations; new regulations requiring "backfit" modifications to operating reactors; and orders for modification of a license. During FY 1996, the NRC's Office of Nuclear Reactor Regulation completed about 1418 licensing actions and the inventory of licensing actions under review increased from 1000 to 1101.

Maintenance Rule Implementation

On July 10, 1991, the Commission published in the *Federal Register* (56 FR 31306) a new maintenance rule 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." This rule took effect on July 10, 1996, and requires commercial nuclear power plant licensees to monitor the effectiveness of maintenance activities for safety-significant plant equipment in order to minimize the likelihood of failure and of events caused by the lack of effective maintenance.

NUCLEAR MATERIALS REGULATION

Nuclear materials regulation during Fiscal Year (FY) 1996 comprised—

- about 4600 licensing actions. Of these, 289 were new licenses, 3043 were amendments, 1009 were license renewals, and 238 were sealed source and device reviews; and
- about 2100 materials licensee inspections. NRC regional staffs completed these inspections.

The NRC currently administers approximately 6400 licenses for the possession and use of nuclear materials in medical and industrial applications. This represents a reduction of about 100 licenses in the past year. The 29 Agreement States administer about 15,000 licenses (see Chapter 8).

Materials Licensing Business Process Reengineering

In October 1994, the staff began to examine the process used to issue materials licenses and to identify ways to improve the process. In Phase I of this improvement process, the staff developed a generalized version of the proposed new process.

During Phase II, which started in November 1995, the team began the detailed design and testing of the new licensing process. During 1996, the staff focused its efforts on (1) completing a pilot project to develop performance-based guidance using a team approach and (2) developing pilot projects to demonstrate the issues involved in testing a computer-assisted method for licensing portable gauges. In addition, the licensing pilot projects will determine the method's usefulness in handling similar types of applications (e.g., fixed gauges, gas chromatographs, and self-shielded irradiators). These broad use areas were chosen for the initial development effort since approximately 60 percent of the NRC's 6400 material licensees fall into one of these four categories.

FUEL CYCLE LICENSING AND INSPECTION

By the end of FY 1996, the NRC had completed 93 fuel cycle licensing actions. The following table shows these licensing actions by category.

Fuel Cycle Licensing Actions (Safety/Safeguards) Completed in FY 1996	
<i>Category</i>	<i>No. of Actions</i>
Fuel Fabrication and Conversion	48
Critical Mass Materials	1
Fuel Research, Development, Pilot, and Fresh Fuel Storage	12
Other Source Materials	5
Material Control and Accounting	16
Physical Security	7
West Valley Demonstration	3
Department of Energy Waste Processing	1

Gaseous Diffusion Plants

The Energy Policy Act of 1992 created the United States Enrichment Corporation (USEC) and directed the Department of Energy (DOE) to lease the two gaseous diffusion plants (GDPs) located in Portsmouth, Ohio, and Paducah, Kentucky, to the USEC. This act further provides that the NRC shall regulate safety and safeguards at the GDPs operated by the USEC and, consequently, establish a certification process to ensure that the USEC complies with the regulations. After compilation of the certification process, the NRC issued certificates of compliance for the GDPs located in Ohio and Kentucky in November 1996 (see Chapter 6).

Fuel Cycle Safety

HEADQUARTERS-BASED INSPECTION ACTIVITIES

Since February 7, 1993, Headquarters staff has conducted chemical process safety, nuclear criticality safety, and material control and accounting (MC&A) inspections, and has developed and initiated the chemical process safety inspection program. A total of 15 criticality safety and chemical safety inspections and assessments were performed during FY 1996.

REGION-BASED INSPECTION ACTIVITIES

The four regional offices conducted more than 108 safety inspections at 18 operating and decommissioning fuel cycle facilities during FY 1996. This includes resident inspector activities at one facility. The areas covered by the regional staff included criticality safety, radiation protection, emergency preparedness, environmental safety, and transportation.

Fuel Cycle Safeguards Inspections

During FY 1996, the Headquarters staff conducted 29 comprehensive MC&A inspections or observations at the fuel cycle and gaseous diffusion plants (GDP) facilities, while the regional and resident inspectors performed 21 physical security inspections or observations at major fuel fabrication and GDP facilities. Performance-based inspection procedures were used by the physical security inspectors during all of these inspections.

Transportation Safeguards

Spent Fuel Shipments. Safeguards requirements were applied to 14 shipments of irradiated spent reactor fuel made over approved routes during FY 1996. (Ten shipments were by rail.) Two of the shipments were imports and one was an export.

WASTE MANAGEMENT

Uranium Recovery and Mill Tailings

Of 26 NRC-licensed uranium recovery facilities, 18 are uranium mills, 5 are in situ leach facilities, 1 is an ion-exchange facility, 1 is a heap leach, and 1 is a mill tailings waste disposal facility. At the close of FY 1996, three commercial in situ mining operations were in operation, and two were under construction. One conventional uranium mill was in operation, one was processing mine water, two were in standby, and the remainder were in decommissioning and reclamation. The market price of uranium has risen considerably during FY 1996 and many industry analysts expect it to remain relatively high. As a result, industry has become interested in increasing uranium production. Two existing in situ facilities are undergoing expansion; there are two applications for new in situ solution mining facilities currently under licensing review; and there are indications that six additional applications may soon be submitted. In addition, one conventional mill on standby has submitted an application, environmental report, and revised designs in anticipation of resuming operations, while the second mill on standby anticipates making the necessary submittals in late FY 1997.

Licensing and Inspection Activities

In FY 1996, Region IV performed 31 inspections of uranium recovery facilities; each site was inspected at least once. Headquarters led the final inspection of the ARCO site in Grants, New Mexico, which was performed as part of the review for license termination scheduled for early 1997. During the fiscal year, the NRC issued 103 license amendments. TVA's license for the Edgemont, South Dakota, site has been terminated. It became the first Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) Title II site transferred to the DOE for long-term care under the

general license in Section 40.28 of Title 10 of the Code of Federal Regulations.

Remedial Action at Inactive Sites

During FY 1996, NRC staff completed 39 review actions pursuant to its responsibilities at sites under Title I of UMTRCA. These included 2 inspection plan reviews, 2 remedial action plan (RAP) reviews, 9 RAP modification reviews, 7 other site-specific reviews, 2 completion/certification report reviews, and 17 reviews of generic items. The staff prepared two completion review reports documenting its review of DOE's remedial action completion for sites in Durango, Colorado, and Tuba City, Arizona.

RESEARCH ACTIVITIES

During FY 1996, the NRC identified 21 new generic issues, prioritized 17 issues yet to be resolved, and resolved 3 GSIs (see Chapter 10).

Source Terms

"Source Terms" refer to the magnitudes of the radioactive materials released from a nuclear reactor core to the containment atmosphere. The NRC's involvement in research in this area is primarily through participation in the PHEBUS-FP (fission product) program. This program is sponsored by the Commissariat à l'Energie Atomique of France (CEA) and the Commission of the European Communities. On July 26, 1996, the second PHEBUS-FP test was successfully conducted. This test was similar to the first test but differed in the use of pre-irradiated fuel. Ongoing activities include analysis of the test data and assessment of codes against the measurements of both tests. Planning continued for the next test—a rubble bed configuration of core material.

Chapter 2

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Spent Fuel Project Office

SPENT FUEL STORAGE AND TRANSPORTATION

In April 1995, the Nuclear Regulatory Commission (NRC) created the Spent Fuel Project Office (SFPO) in the Office of Nuclear Material Safety and Safeguards (NMSS). The SFPO has responsibility for the agency's regulatory, licensing, and inspection program for the storage of nuclear reactor spent fuel and for the domestic and international transportation of radioactive materials. Specifically, the SFPO is responsible for the safety and environmental reviews of—

1. Commercial spent fuel transportation and storage cask designs, including certification of storage systems under the general license provisions of 10 CFR Part 72, Subpart K
2. Commercial non-spent fuel transportation container designs for uranium hexafluoride, fresh fuel, oxides, contaminated wastes, sealed sources, and Naval Reactor shipments
3. Interim spent fuel and high-level waste storage facilities, including the licensing of nuclear utility specific facilities, private facilities, and any U.S. Department of Energy (DOE) storage facilities.

Also during Fiscal Year (FY) 1995, the Office of Nuclear Reactor Regulation (NRR) and NMSS signed a Memorandum of Understanding to clarify the interactions, licensing program management responsibilities, and support functions for the decommissioning of nuclear

reactor sites. NRR retains regulatory project management, oversight, and inspection support responsibilities until all spent fuel is permanently transferred from the spent fuel pool to an independent spent fuel storage installation (ISFSI) or to an offsite storage facility. After the spent fuel is permanently transferred to the ISFSI or offsite storage facility, NMSS assumes regulatory project management, oversight, and inspection responsibility for the ISFSI casks, facilities, and their construction, vendors, and respective inspections. The SFPO is also responsible for inspections of the implementation of quality assurance programs by users, suppliers, and fabricators of NRC-certified transport container designs and dry storage systems.

SPENT FUEL STORAGE PROGRAM

Regulations and Guidance

RULEMAKINGS FOR 10 CFR PART 72

During FY 1996, the SFPO staff continued work on two rulemakings to address the following issues: (1) revising 10 CFR 72.82(e), "Inspections and Tests," to modify the requirements for submitting preoperational test acceptance criteria and test results to the NRC, and (2) revising 10 CFR 72.12, "Deliberate Misconduct," to modify the scope of persons covered by this rule.

In FY 1996, the SFPO staff initiated six new rulemakings related to 10 CFR Part 72 to address several issues and to clarify existing requirements. These rulemakings are intended to address the following issues:

1. Allowing "greater-than-class C" radioactive waste to be stored in an ISFSI or monitored retrievable storage (MRS) facility.
2. Adopting current 10 CFR Part 20 dose methodology to Part 72.
3. Expanding the scope of the NRC enforcement authority to include non-licensees (e.g., certificate of compliance holders, contractors, and subcontractors).
4. Determining whether Part 72 should be revised to conform with 10 CFR Part 100, Appendix A, or if Part 72 should be revised to include seismic criteria specifically for ISFSIs.
5. Clarifying which portions of Part 72 apply to general licensees and which apply to specific licensees. This would—
 - allow specific licensees to use casks approved by rulemaking under Part 72, Subpart L, for general license use, without submitting a separate Safety Analyses Report (SAR) for SFPO re-review;
 - allow applicants to initiate construction of storage casks before a certificate of compliance is issued; and
 - clarify licensee and certificate holder roles and responsibilities for maintaining SARs up to date and the method to accomplish this task.
6. Miscellaneous changes in cask shielding and surveillance and criticality requirements.

These rulemakings were initiated only recently and development of rulemaking plans was underway at the end of the fiscal year. SFPO plans to publish the rulemaking plans for these issues in the *Federal Register* in FY 1997.

DRY CASK STORAGE ACTION PLAN

During 1995, as more utilities began to pursue construction and operation of ISFSIs, some utilities using dry cask storage of their spent fuel stated that NRC expectations in this area were unclear and outdated. In addition, more NRC staff was becoming involved in the inspection of dry cask storage system components and requested clarification of the design bases and inspection requirements for such storage systems. After careful consideration, the NRC agreed that available guidance in the areas of design review and inspection of dry cask storage systems needed revision and clarification.

In response to these concerns, in July 1995, NMSS, NRR, and the Regional Offices developed the Dry Cask Storage Action Plan to address issues associated with the design, fabrication, construction, licensing, and pre-operational testing of licensee-owned dry cask storage facilities. The Action Plan was organized into four areas: technical near-term actions, technical long-term actions, communications, and procedural issues. Many of the near-term issues were resolved before the January 1996 update of the Action Plan. Progress continued on resolution of the remaining issues and, at the end of FY 1996, all except three issues had been closed. The remaining near-term issue concerns whether cranes at power plants are qualified to handle loaded spent fuel casks. The remaining long-term issue involves development of guidelines for the storage of failed fuel or fuel otherwise susceptible to cladding failure. The remaining procedural issue involves clarification of the method for approving changes to cask SARs under the provisions of 10 CFR 72.48. These issues are being addressed by NRR, NMSS, and the Office of Nuclear Regulatory Research, respectively, with completion expected in early 1997. An update of item status will be published in mid-FY 1997 with completion of the Dry Cask Storage Action Plan expected before the end of FY 1997.

Several major issues identified in the Dry Cask Storage Action Plan were completed during FY 1996. First, NMSS updated and expanded staff guidance in the area of inspection, as well as design and licensing reviews. Five inspection procedures for the oversight of design, fabrication, testing, and operation of dry cask storage systems were published in February 1996. Second, draft Standard Review Plans (SRPs) for the review of

dry cask storage systems and spent fuel dry storage facilities were issued for public comment in February and October of 1996, respectively. Third, communications among NRC staff involved with dry cask storage activities, licensees, cask vendors, and members of the public were improved in the following ways:

1. Early in FY 1996, SFPO developed and conducted training for SFPO staff, NRR Project Managers, and affected staff in Regions I and IV on the design and licensing bases for dry cask storage system certification;
2. A reference handbook providing background information on dry cask storage was published in January 1997; and
3. SFPO staff participated in a number of meetings sponsored by the NRC and by the industry to explicitly communicate the agency's expectations of licensees, cask vendors, and cask component fabricators. The most noteworthy of these meetings was the May 17, 1996, Spent Fuel Transportation and Storage Workshop. Each of these accomplishments is discussed in greater detail later in this chapter.

SRP FOR DRY CASK STORAGE SYSTEMS AND SPENT FUEL DRY STORAGE FACILITIES

Dry Cask Storage Systems SRP. The Dry Cask Storage Systems Standard Review Plan (DCSS SRP) was prepared to assist the staff in performing safety reviews of applications for spent fuel storage cask systems. The principal purpose of the DCSS SRP is to ensure the quality and uniformity of NRC staff reviews. In addition, the DCSS SRP serves to disseminate information about regulatory matters, to improve communication, and to aid interested members of the public and the nuclear power industry in better understanding the NRC staff review process. The SRP was issued in draft form for public comment in February 1996 (NUREG-1536). Over 700 comments were received and are currently being addressed. The staff plans to publish the SRP in final form in FY 1997.

Spent Fuel Dry Storage Facilities SRP. The SFPO also began developing the SRP for Spent Fuel Dry Storage Facilities (FSRP) this year. The FSRP will provide guidance to the NRC staff in performing safety reviews of applications for license approvals and renewals for either an ISFSI or an MRS licensed to the DOE. The FSRP was issued in draft form for public comment in early FY 1997 (NUREG-1567).

INSPECTION PROCEDURES AND INSPECTION PROGRAM

In February 1996, the SFPO issued five new procedures for inspecting ISFSIs. These five new procedures (NRC Inspection Manual Procedures 60851 through 60856) replace the existing guidance for inspecting the dry storage of spent reactor fuel at ISFSIs. The procedures provide guidance in the areas of design control processes, fabrication of dry cask storage system components, construction of the ISFSI, preoperational testing of the ISFSI, and operation of the ISFSI. The SFPO is developing additional inspection procedures for reviewing evaluations performed by a licensee under the provisions of 10 CFR 72.48 (licensee approval of changes, test, or experiments) and 10 CFR 72.212(b) (licensee evaluation of the acceptability of an NRC-certified cask for use at a specific power reactor site) and plans to issue these procedures in FY 1997.

In January 1997, the SFPO issued a complete revision to the overall program for inspecting the dry storage of spent reactor fuel at ISFSIs (NRC Inspection Manual Chapter 2690). The objectives of this revision are to increase accountability and to improve NRC oversight of ISFSI activities by—

1. Clarifying the NMSS and NRR roles and responsibilities in performing inspection activities and reviewing technical issues at ISFSIs;
2. Improving early communications between the NRC and applicants for ISFSIs, vendors, and fabricators; and
3. Improving the scheduling, planning, and tracking of inspections performed at ISFSIs.

SFPO WORKSHOP

On May 17, 1996, the SFPO held a one-day Spent Fuel Transportation and Storage Workshop at

NRC Headquarters. Over 300 representatives of licensees; applicants; vendors; other Federal agencies involved in the transportation, storage, and disposal of spent fuel; several of the national laboratories; State, local, and Tribal governments; trade associations; and the trade press attended this workshop. The workshop focused on lessons learned by the NRC and some of the first utilities to become involved in dry cask storage. The impetus for holding the workshop was recognition that a large number of power plants will need dry cask storage of spent fuel pending the availability of the high-level waste repository. The workshop was designed to assist utilities in estimating the time and effort required to prepare for an ISFSI—specifically the time needed for—

- development of a high-quality license application;
- review of the license application by the NRC staff;
- development and fabrication of casks; and
- construction of the ISFSI. The workshop was jointly chaired by the Directors of NRR and NMSS.

Licensing Actions

Utilities may operate an ISFSI under two different types of licenses—general and site-specific. The procedure for acquiring a site-specific license is similar to that for acquiring a license for a reactor in that the technical merit of the design is assessed by the NRC, and utilities may customize the cask design in the initial stages to meet their specific needs. A key provision for operation of an ISFSI under a general license is that licensees must use a cask design that has previously been approved by the NRC, and must have a current Part 50 license. A list of the approved cask designs is found in 10 CFR Part 72, Subpart K. A dual-purpose cask is one that has been reviewed and approved for meeting the regulatory requirement for transportation and storage under 10 CFR Parts 71 and 72. Figure 2.1 shows the locations of ISFSIs in the United States.

LICENSES AND CERTIFICATES ISSUED

No cask certificates of compliance or site-specific licenses for ISFSIs were issued during FY 1996. Using the general license provisions of 10 CFR Part 72, Subpart K, three nuclear utilities prepared to establish ISFSIs and begin initial cask loading during 1997. The Arkansas Nuclear One plant is planning to use the Sierra Nuclear Corporation's ventilated storage cask system, VSC-24 cask under the general license, and the Oyster Creek and Susquehanna plants will use Vectra's NUHOMS-52B modular vault canister system. These sites will be the first users of the NUHOMS canister system, which is designed for boiling-water reactor spent fuel.

TOPICAL REPORT REVIEWS

One topical report review was completed during FY 1996. In November 1995, the staff approved the Topical Safety Analysis Report (TSAR) for the Castor X/28-33 storage system from General Nuclear Systems, Inc. At the end of FY 1996, the staff had nearly completed its review of Transnuclear, Inc.'s TSAR for the TN-32 dry storage cask. The TN-32 is a metal cask designed to store 32 pressurized-water reactor (PWR) spent fuel assemblies in a vertical mode. Virginia Power plans to use this cask at the Surry ISFSI. In November 1996, the staff issued a Safety Evaluation Report for the TN-32 TSAR and a license amendment for its use at the Surry ISFSI.

CURRENT CASEWORK

Trojan ISFSI. Portland General Electric Company submitted an application in March 1996 for an ISFSI at Trojan. The Trojan ISFSI will use the TranStor dual-purpose cask design, although use will be limited to Trojan PWR spent fuel, fuel debris, and "greater-than-Class C" waste. The staff is currently reviewing the technical and environmental aspects of this application.

Rancho Seco ISFSI. Sacramento Municipal Utility District (SMUD) initially submitted an application in October 1991 for an ISFSI at Rancho Seco. Substantial changes, including a new cask and vendor, were later submitted. Rancho Seco plans to use a system based on Vectra's NUHOMS-24P cask, but with significant changes. The storage system will be designed to accommodate failed fuel, and the system will use

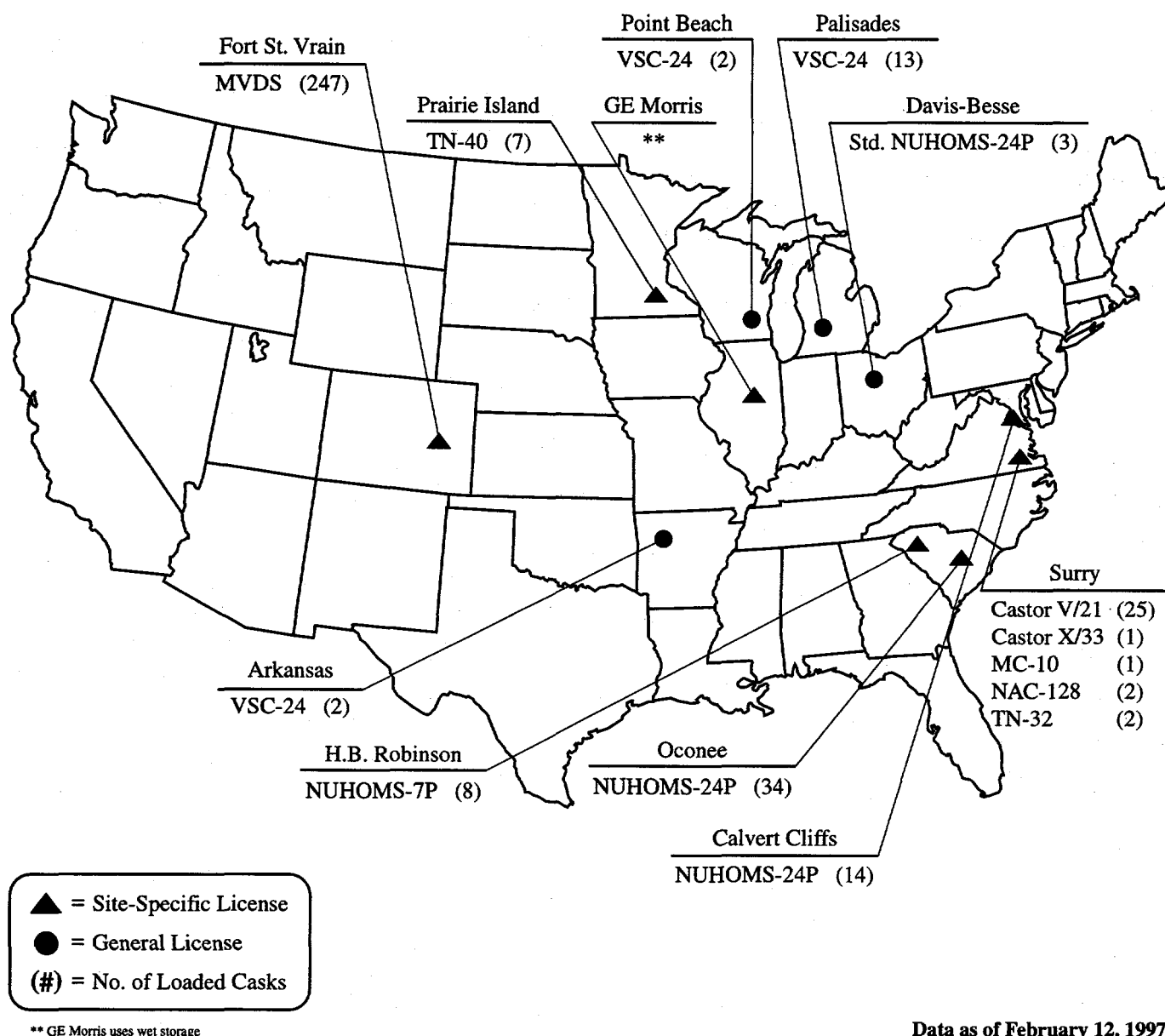


Figure 2.1 Operating Independent Spent Fuel Storage Installations

the overpack from Vectra's multi-purpose transport cask (MP-187) in the event of canister leakage. The staff is currently awaiting cask design changes from the vendor, and review of the application will continue after the information is received.

North Anna ISFSI. The staff's review of Virginia Power's application for an ISFSI at North Anna continued during FY 1996. The staff expects to conclude review of the application and begin

preparation of the Environmental Assessment in FY 1997. This facility will use the Transnuclear TN-32 cask, and the ISFSI application incorporates the TN-32 TSAR by reference. As previously noted, this topical report is scheduled for approval in early FY 1997.

Prairie Island Offsite ISFSI. A Minnesota State law requires that Northern States Power Company (NSP) construct an away-from-reactor ISFSI to replace the existing Prairie Island Nuclear

Generating Plant (PINGP) onsite ISFSI licensed by the NRC for the dry storage of up to 48 casks. The State law requires that a site be found for the facility in Goodhue County, Minnesota—which is the jurisdiction in which PINGP is located. An application for the Goodhue County ISFSI facility was submitted to the NRC in August 1996. The development of the facility is of great interest to the local communities. The Prairie Island Dakota Indian Tribe's Reservation borders the PINGP reactor site. The Tribe favors the Goodhue County facility, as selection of this facility would move the spent fuel to a location farther away from the Tribe's homes and businesses. At the end of FY 1996, actions taken by the Minnesota Environmental Quality Board effectively halted siting of the Goodhue County facility, resulting in a lawsuit being filed by the Tribe. NSP then requested a suspension of the NRC review of the Goodhue County facility license application, pending resolution of the litigation. The NRC granted the suspension.

General Licenses. During FY 1996, no power reactor licensees began initial loading of spent fuel casks under the general license issued in accordance with 10 CFR 72.210. However, the staff anticipates three licensees will begin initial cask loading during 1997. Arkansas Nuclear One will begin using the VSC-24 cask under the general license, and Oyster Creek and Susquehanna will begin using the NUHOMS-52B modular vault canister system.

TranStor Dual-Purpose Cask. Sierra Nuclear Corporation submitted its TranStor dual-purpose cask design application in FY 1996. The application for the transportation component was submitted in December 1995, and the application for the storage component was submitted in June 1996. In addition to the transportation and storage certificates of compliance, the applicant desires that rulemaking be undertaken to add the TranStor storage system to 10 CFR Part 72, Subpart K, which would allow it to be used under the general license. The SFPO staff is currently reviewing both TranStor cask system applications.

MP-187 Dual-Purpose Cask. Vectra has requested certification for the MP-187 cask as a dual-purpose system based on the NUHOMS storage cask design. This certification would result from review of the two separate applications: one

for a transportation certificate of compliance, and one for a site-specific ISFSI at the Rancho Seco site. The ISFSI application requests approval to store the Rancho Seco canisters horizontally in the NUHOMS-52B modular vault canister system, as well as vertically in the MP-187 overpack. Sacramento Municipal Utility District (SMUD), the operator of the Rancho Seco plant, plans to decommission the facility and terminate the 10 CFR Part 50 license once the spent fuel is loaded into the canisters. Before decommissioning the spent fuel pool, SMUD requires the transport certification for the MP-187 to demonstrate the ability to transfer the spent fuel for later storage or disposal without additional on-site handling. In addition, the transportation overpack of the MP-187 could be used in accident recovery in the unlikely event of damage to a Rancho Seco storage canister. Because of the complex review process, SMUD has indicated that the MP-187 will not be used for storage purposes until the NRC issues both the certificate of compliance for transport and the site-specific license for the Rancho Seco ISFSI. Both the MP-187 transportation application and the Rancho Seco ISFSI application are currently under review by the SFPO staff.

Histar-100 Dual-Purpose Cask. Holtec Inc., is seeking both transportation and storage certification for the Histar-100 cask. After returning the initial, incomplete certification application to Holtec in FY 1995, the SFPO received a revised application in October 1995. The SFPO staff is currently reviewing this application, including the additional information requested and received from Holtec.

Amendment to Sierra Nuclear VSC-24 Certificate for Storage. The VSC-24 cask design is being changed, primarily to accommodate longer and heavier fuel assemblies, as well as control components. Other minor design changes are also included in the amendment. The SFPO staff is reviewing the amendment request.

Amendment to Vectra NUHOMS Certificate for Storage. Vectra requested an amendment to its certificate of compliance for the NUHOMS-52B modular vault canister system. Vectra wishes to modify the technical specifications governing the types of spent fuel approved for storage in this cask design. The SFPO staff is currently reviewing the amendment request, including additional

information requested from and provided by Vectra.

Department of Energy Activities. During FY 1996, the SFPO staff had preliminary discussions with DOE staff on several license applications DOE was preparing. During the first quarter of FY 1997, the SFPO staff received three license applications from DOE and will continue to review these applications during FY 1997. The first application was for a spent fuel dry transfer system. This facility will be used to transfer spent fuel between casks without using a spent fuel pool. The second application was for an ISFSI at the Idaho National Engineering Laboratory to store the core debris from Three Mile Island Unit 2. This debris is presently in wet storage, but will be moved to dry storage at the planned ISFSI. The third application was for the transfer of the Fort St. Vrain ISFSI license from the Public Service Company of Colorado to DOE. Also during FY 1996, the SFPO staff had preliminary discussions with the DOE staff on a topical report for centralized interim storage of spent fuel that is expected to be submitted in the second half of FY 1997. This topical report will not be site-specific, since Congress has not yet authorized a centralized interim storage site.

DUAL-PURPOSE CASK PROCESS REVIEW STUDY

In view of the significant changes implemented by the SFPO in the review of spent fuel transportation and dry storage systems, technical assistance was obtained from Pacific Northwest National Laboratory (PNNL) in FY 1996 to review the SFPO work processes used in performing reviews of dual-purpose systems. PNNL interviewed NRC staff members, contractor staff, and a licensee involved in the dual-purpose cask review process used before the creation of the SFPO, as well as NRC staff members involved in the current dual-purpose cask review process. In April 1996, PNNL issued a report documenting NRC staff review processes, identifying issues encountered in NRC staff reviews, and providing recommendations to

address these issues and to improve staff review work processes. The SFPO staff is currently addressing the issues and recommendations identified in the report.

Cooperation With Other Government Regulatory Bodies

In July 1996, the SFPO Director and a senior project manager conducted a three-day workshop on the licensing of spent fuel storage and transportation casks and ISFSIs for the Taiwanese nuclear regulatory agency. The workshop was also attended by Taiwanese industry representatives and licensees. Topics included an overview for the spent fuel storage systems licensed for use in the United States, the NRC's licensing process, and experience gained by the NRC in the field of storage and transportation of spent nuclear fuel. In addition, a review of the evolution of the U.S. regulations governing spent fuel transportation and storage was provided, with an emphasis on the staff's recently issued draft DCSS SRP.

In September 1996, the SFPO Director and the Spent Fuel Licensing Section Chief participated in the International Conference on Spent Fuel Storage in the Nuclear Fuel Cycle in Manchester, England. The two-day conference, hosted by the International Mechanical Engineering Society, was attended by over 125 representatives from various countries' regulatory agencies and from industry. Speakers representing over a dozen countries presented papers at this conference. The SFPO Director presented a paper entitled "Licensing of Spent Fuel Storage Systems and Facilities in the United States." The Section Chief presented a paper entitled "The Standard Review Plan for Dry Cask Storage Systems." After the conference, both SFPO staff members toured the Sellafield facility, focusing on the spent fuel storage and reprocessing activities conducted at the facility.

RADIOACTIVE MATERIAL TRANSPORTATION PROGRAM

Regulations and Guidance

RULEMAKING FOR 10 CFR PART 71

The NRC's revision of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," became effective on April 1, 1996. Together with revisions to U.S. Department of Transportation (DOT) regulations, these changes make the U.S. transportation regulations generally compatible with the 1985 International Atomic Energy Agency (IAEA) regulations. Among the changes are fissile material class simplification and the establishment of the transport index as a primary control over the number of packages that may be transported together for criticality safety. To implement the requirements of the revised Part 71, the NRC, on its own initiative, decided to amend approximately 90 certificates of compliance. In March 1996, the NRC reissued these certificates delineating the new transport index for criticality control. The certificates became effective on April 1, 1996.

In September 1996, an NRC licensee notified the SFPO that a deficiency existed in the regulations contained in 10 CFR 71.53, "Fissile Exempt Materials." This deficiency related to potential shipments of radioactive material containing high-enriched uranium combined with a super-moderating material (beryllium) that would not be safe with respect to the subcriticality of the material in all circumstances. The SFPO staff reviewed the issue, verified its validity, and initiated expedited rulemaking to resolve the issue. The SFPO anticipates issuing the revision to Part 71 to resolve this issue in FY 1997. Other SFPO actions in response to this action are discussed in the **Significant Events** section of this chapter.

SRPS FOR TRANSPORTATION AND FISSILE CONTAINERS

In FY 1996, the SFPO initiated the development of two Standard Review Plans (SRPs) for review of transportation casks certified under Part 71. The SRP for Transportation Packages for Spent Nuclear Fuel will cover spent fuel casks. The SRP for Transportation Packages for Radioactive Materials (Other than Spent Nuclear Fuel) will cover all other certified casks. The staff will use these two SRPs in evaluating cask Safety Analysis Reports (SARs) submitted by applicants for Part 71 certification. The SFPO plans to issue both SRPs for public comment during FY 1997.

INSPECTION PROCEDURES AND INSPECTION PROGRAM

Associated with the April 1996 revision to Part 71, the SFPO has revised the Inspection Manual Chapters for inspecting both material and reactor licensees' transportation programs. The Inspection Manual was reorganized based on the type of material shipped, and includes Department of Transportation (DOT) emergency response and training requirements. Note that, pursuant to 10 CFR 71.5, NRC is responsible for inspecting licensees for compliance with DOT requirements.

During February and March 1996, the SFPO staff provided six 1-day training sessions on the revised Part 71 requirement to both NRC and Agreement State inspectors and supervisors. These training sessions were conducted at NRC Headquarters and in the NRC Regional Offices.

ENFORCEMENT GUIDANCE

Responding to the April 1996 revision to Part 71, the SFPO has revised the standard enforcement citations used by NRC inspection staff in preparing notices of violation relating to the transportation of radioactive materials.

HAZARDS COMMUNICATIONS CARDS

The SFPO has developed, and issued for use by NRC inspectors, a set of three field reference charts that correlate the various DOT and NRC regulations governing hazard communications (i.e., shipping papers, marking and labeling

packages, and placarding vehicles); packaging; and radiation and contamination control relating to the shipment of radioactive material. These charts provide a concise summary of the various DOT and NRC regulations for NRC inspectors in the field.

GENERIC COMMUNICATIONS TO INDUSTRY

After the April 1996 revision to Part 71, the SFPO issued NRC Generic Letter 96-07, "Interim Guidance on Transportation of Steam Generators," to inform licensees of the new DOT and NRC requirements for shipment of large radioactive components such as steam generators as *surface-contaminated objects*.

Licensing Actions

During FY 1996, the staff completed work on 88 applications for packages to transport radioactive materials. Of these, 5 were for new package designs, 53 were for amendments to previously approved designs, and 30 were renewals of previously approved designs.

At the end of FY 1996, 40 applications were under review for packages to transport radioactive materials. Of these, 2 were for new package designs, 19 were for amendments to previously approved designs, 10 were for renewals of previously approved designs, and 9 were in connection with technical assistance being provided to DOT.

Cooperation With Other Federal Agencies

The responsibility for regulating safety in the transportation of radioactive material is shared by DOT and the NRC. Although not responsible for safety regulations, DOE is a major shipper of radioactive materials and is granted authority by DOT to certify package designs. The three agencies (DOT, DOE, and NRC) have established an Interagency Transportation Safety Working

Group to exchange information on transportation issues. This Working Group meets monthly to develop positions on international and domestic regulations, to review shipment operations—including incidents and enforcement matters—and to plan and manage research activities. Representatives from industry are invited to present information on particular issues or problems at the meetings. Through its participation in the Working Group, the SFPO assists in the development of consistent U.S. approaches to radioactive material transportation issues.

Cooperation With International Agencies

Although DOT is the U.S. competent authority for dealing with international agencies regarding transportation of hazardous materials, including radioactive materials, the SFPO assists the DOT in fulfilling this responsibility by serving as a technical advisor on radioactive materials. Although DOT interacts with several international agencies, the principal interaction in the radioactive materials area is with the International Atomic Energy Agency (IAEA) in Vienna, Austria. This year the SFPO supported DOT's role at various IAEA meetings, culminating in the IAEA Board of Governors' approval of the 1996 Edition of IAEA's *Regulations for the Safe Transport of Radioactive Material* (Safety Series No. 6).

Cooperation With Other Government Regulatory Bodies

Although the IAEA produces general standards for radioactive material transportation safety, the manner in which individual nations adopt the standards domestically is unique. The NRC and other Federal agencies are often called on by foreign nations to provide detailed explanations of U.S. domestic provisions or to provide guidance to developing nations on the structure of the safety regulatory system. In October 1995, a team of

SFPO, DOT, and DOE representatives conducted a transportation safety training seminar in Kiev for representatives from the Ukrainian government and nuclear industry. A delegation from Russia was also briefed on the U.S. transportation regulations at NRC Headquarters. The SFPO staff shared NRC experience in dry spent fuel storage and transportation packaging quality assurance requirements, inspection results, and lessons learned with delegations from the Slovak Republic, the Ukraine, and the Czech Republic who were visiting the NRC as members of the IAEA.

SPENT FUEL STORAGE AND TRANSPORTATION INSPECTION AND SUPPORT

Vendor Inspections

In April 1996, inspection responsibilities for spent fuel storage cask and transportation package vendors, fabricators, licensees, and certificate of compliance holders were transferred from the NMSS Division of Industrial and Medical Nuclear Safety to the SFPO.

During FY 1996, the SFPO expanded the scope of inspection activities related to storage and transportation to ensure that design, fabrication, testing, maintenance, and operations were conducted in accordance with commitments made to the NRC. In particular, inspections were increased for design control activities of dry spent fuel storage systems certified and licensed by the NRC. Inspections were performed at 12 suppliers and users of dry storage systems and transportation containers. These suppliers represent a broad spectrum of the industry, including designers, fabricators, and vendors of dry storage systems and transportation packagings. Five of the 12 inspections were focused on the two spent fuel storage designs used extensively throughout the United States and

other countries. The inspections identified numerous instances during which dry storage system and transportation packaging suppliers did not sufficiently implement the control measures to ensure that the resulting product met the commitments made in the NRC-approved design. The inspection program was also refined to include inspection efforts at early stages of the design and fabrication processes because inspection findings indicated the need to promote effective corrective actions at an early stage.

The inspection program is structured to provide information on whether the suppliers and users comply with technical specifications and design requirements and with the provisions of 10 CFR Parts 71 and 72. The inspections were performance-based and focused on activities affecting safety and reliability. The safety inspection teams consisted of individuals certified and experienced in fabrication technologies, design requirements, quality assurance practices, and other technical specialties. Further, the SFPO staff developed a program for assessing performance of vendors and fabricators of ISFSIs, and this program will be initiated in FY 1997.

Support for Regional Inspections

SFPO safety inspection staff participated in other activities, such as supporting a number of Regional inspections of loading and unloading procedures for new ISFSIs. In May 1996, SFPO staff assisted Region IV on an inspection of the Arkansas Nuclear One facility. The SFPO staff helped to provide around-the-clock coverage during the licensee's dry run before cask loading. The inspection also examined cask loading and unloading procedures, as well as ISFSI design changes. In June 1996, SFPO staff assisted Region I on an inspection of the Oyster Creek Nuclear Generating Station. The GPU Nuclear Corporation plans to use the Vectra NUHOMS storage system at Oyster Creek under the general license. The inspectors examined licensee oversight of Vectra's ISFSI activities, including the evaluation of ISFSI design changes. Oyster Creek oversight was found to be good, with the possible exception of the use of quartz as fine aggregate in constructing the horizontal modules.

Significant Events

On May 28, 1996, hydrogen ignited while Wisconsin Electric employees were welding a shield lid on a loaded multi-assembly sealed basket (MSB) of a VSC-24 spent fuel storage cask at the Point Beach nuclear power plant. Although the 2890 kilogram (6390 pound) lid was displaced and tipped at a slight angle, there was no apparent damage to the MSB or to the spent fuel, and there were no injuries. Approximately 30 gallons of borated spent fuel pool water had been drained from the MSB to facilitate welding of the shield lid, creating an air space below the lid. The hydrogen ignited when the welding was initiated, approximately 11 hours after the loaded MSB had been removed from the spent fuel pool. The licensee determined that the hydrogen was generated by the oxidation of zinc in the Carbo Zinc 11 coating inside the cask while in contact with the borated water of the spent fuel pool. After this event, the SFPO staff issued Bulletin 96-04, "Chemical, Galvanic, or Other Reactions in Spent Fuel Storage and Transportation Casks." The action addressees for this bulletin were licensees with ISFSIs, vendors of spent fuel storage or transport casks, and holders of certificates of compliance for spent fuel storage or transport casks. The bulletin requested the action addressees to review their cask materials for potential adverse reactions, evaluate the short- and long-term effects of any identified reactions, and determine the adequacy of cask operating procedures to minimize the consequences of any identified reactions. Twenty action addressees responded, addressing 28 different spent fuel storage and transportation cask designs.

In September 1996, an NRC licensee notified the SFPO that a deficiency existed in the regulations contained in 10 CFR 71.53, "Fissile Exempt Materials." This deficiency related to potential shipments of radioactive material containing

high-enriched uranium combined with a super-moderating material (beryllium), which would not be safe with respect to the subcriticality of the material in all circumstances. In December 1996, NMSS issued a Confirmatory Order to the affected licensee to require specific, prior approval by the NRC for any shipments of beryllium and high-enriched uranium material pending the issuance of the rulemaking to amend Part 71 fissile exempt material shipping requirements. This action was taken based on the potential public health and safety significance of the issue. The SFPO also issued NRC Information Notice 96-63, "Potential Safety Issue Regarding the Shipment of Fissile Material," to other selected licensees to alert them to this problem. As previously noted, 10 CFR 71.53 will be revised early in FY 1997 to prevent the shipment of such materials.

Enforcement Actions

The inspections conducted during FY 1996 identified numerous instances during which the provisions of NRC requirements were not met. In some of these instances the safety issues were sufficiently significant that further enforcement actions were taken. In one instance, a civil penalty was issued to a certificate holder who made shipments over an extended time in packagings that did not conform to the certificate of compliance issued by the NRC for the package. In another instance, an inspector identified poor implementation of the certificate holder's quality assurance program for maintenance, testing, use, and design modification of transportation packagings. The NRC issued a confirmatory action letter to the certificate holder, confirming that the certificate holder had agreed to perform specified maintenance and to implement corrective actions before further use of the packagings for transportation of radioactive material.

Chapter 3

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Nuclear Reactor Regulation

The NRC's Office of Nuclear Reactor Regulation (NRR) is responsible for overseeing all aspects of licensing and inspection of the Nation's nuclear power and research reactors. The NRC does not regulate reactors operated by the Department of Energy (DOE) that furnish fissionable materials for use in nuclear weapons.

NRR develops policy and inspection guidance for programs assigned to the regional offices and assesses the effectiveness and uniformity of each region's implementation of those programs. NRR also performs the technical review, certification, and licensing of advanced nuclear reactor facilities and the renewal of current power reactor operating licenses. In the course of these activities, NRR identifies conditions and licensee performance that may adversely affect public health and safety, the environment, or the safeguarding of nuclear facilities. When such conditions arise, including incidents and accidents, NRR takes action in coordination with the responsible regional offices. In addition, NRR assesses licensing issues and regulatory policies concerning: reactor operators (including the initial licensing examination and requalification examinations); emergency preparedness (including participation in emergency drills with Federal, State, and local agencies); radiation protection; facility security and safeguards (including fitness for duty); and inspection of nuclear component supplier facilities.

LICENSING AND REGULATING THE NUCLEAR POWER PLANT

Operating Plant Highlights

Commonwealth Edison Company. The Commonwealth Edison Company (ComEd) owns and operates 12 nuclear power plants at six different sites in Illinois. The plants are Braidwood, Byron, Dresden, LaSalle, Quad Cities, and Zion and range in time of operation from 9 years for Braidwood to 26 years for Dresden. Two operating reactors are located at each site, giving the utility a total nuclear generating capacity of about 11,500 megawatts (electric).

Cyclical performance of ComEd plants has concerned the Commission for some time. The NRC placed Dresden on the Watch List from June 1987 until December 1988 and again in January 1992. Zion was on the Watch List from January 1991 until January 1993. In 1992, the NRC staff found several probable root causes for the utility's difficulties and discussed these probable causes with the utilities' senior managers. In response, ComEd developed and began to implement an Integrated Management Action Plan to improve organizational and management effectiveness,

NUCLEAR REACTOR LICENSING PROCESS

The Nuclear Regulatory Commission (NRC) is responsible for, among other things, regulating the licensing and operation of nuclear power plants. In the past, nuclear power plants were licensed under a two-step licensing process set forth in 10 CFR Part 50. This process requires both a construction permit and an operating license. The new 10 CFR Part 52 provides several alternative licensing processes. One of these is a combined license that combines a construction permit and an operating license with conditions into one license. In either process, before a nuclear power plant can be built and operated, approval must be obtained from the NRC.

In order to receive NRC approval to construct or operate a nuclear power plant, an applicant must submit a Safety Analysis Report (SAR). The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent accidents or, if they should occur, to mitigate their effects on both the public and the facility's employees. In addition, the application must contain a comprehensive Environmental Report providing a basis for the evaluation of the environmental impact of the proposed plant. Further, information must be submitted for use in reviews of the antitrust aspects of the proposed plant.

When an application to construct a nuclear power plant is received, it is first subjected to an acceptance review by the NRC staff to determine whether it contains sufficient information to satisfy the Commission requirements for a detailed review. After the application is accepted for review, the NRC staff holds a general introductory meeting in the area of the proposed site in order to familiarize the public with the safety and environmental aspects of the proposed application, including the planned location and type of plant, the regulatory process, and the provisions for public participation in the licensing process. Numerous public meetings of this type are held during the course of the reactor licensing process. Another public convenience is that all documents and correspondence related to the application are placed in the NRC Public Document Rooms (PDRs). One of these PDRs is located near the nuclear power plant. Also, a press release announcing receipt of the application is issued by the NRC and copies are sent to Federal, State, and local officials and a notice of receipt of the application is published in the *Federal Register* and a local newspaper.

The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations (10 CFR Parts 20, 50, 73, and 100). The NRC staff's review includes, in part, the characteristics

of the site, including surrounding population, seismology, meteorology, geology and hydrology; the nuclear plant design; the anticipated response of the plant to postulated accidents; the plant operations, including the applicant's technical qualifications to operate the plant; radiological effluents; and emergency planning. When the staff completes its review and evaluation, a Safety Evaluation Report (SER) is prepared. This report contains a summary of the staff's review relative to the anticipated effect of the proposed facility on public health and safety.

The Advisory Committee on Reactor Safeguards (ACRS), an independent statutory committee established to provide advice to the NRC on reactor safety, reviews each application to construct or operate a nuclear power plant. The ACRS is kept informed of the review process. The ACRS review begins early in the licensing process by selecting appropriate stages in the review to begin a series of meetings with the applicant and the NRC staff. When the Committee has completed its review, its report is submitted to the Commission by a letter to the Chairman of the NRC.

Also, an environment review is performed by the NRC staff in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential environmental impacts and benefits of the proposed plant. After completion of this review, a Draft Environmental Statement is issued for comment by the appropriate Federal, State, and local agencies as well as by the public. Then a Final Environmental Statement (FES) is issued and made public. All comments that are received are addressed in the FES.

The law requires that a public hearing be held before a construction permit or a combined license may be issued for a nuclear power plant. The public hearing is conducted by a three-member Atomic Safety and Licensing Board. The board is composed of one lawyer, who acts as chairperson, and two technically qualified persons. Members of the public may submit written or oral statements to the licensing board to be entered into the hearing record or they may petition for leave to intervene as full parties in the hearing.

The NRC may authorize a limited amount of work to be carried out on site before the issuance of a construction permit or a combined license. This authorization is known as a Limited Work Authorization (LWA). An LWA may be granted only after the licensing board has made all of the NEPA findings required by the Commission's regulations for authorizing construction and has determined that there is reasonable assurance that the proposed site is a suitable location, from a radiological health and safety standpoint, for a nuclear power reactor of the general size and type proposed.

NUCLEAR REACTOR LICENSING PROCESS (Continued)

At some point after a construction permit is issued under 10 CFR Part 50, the applicant must, if not part of the original application, submit the Final Safety Analysis Report (FSAR) in support of an application for an operating license. The FSAR sets forth the details on the final design of the facility. The FSAR also provides plans for operation and procedures for coping with emergencies.

Again the staff makes a detailed review of the information. Amendments to the application and reports may be submitted from time to time. The staff prepares a Final Safety Evaluation Report for the operating license and, as during the construction permit stage, the ACRS makes an independent evaluation and presents its advice to the Commission. A public hearing is not mandatory or automatic with respect to the operating license application under 10 CFR Part 50. However, soon after acceptance for review of the operating license application, the Commission publishes notice that it is considering issuance of the license. The notice provides that any person whose interest might be affected by the proceeding may petition the NRC for a hearing. If a public hearing is held, the same decision process described for the construction permit hearing is applicable.

A combined license, issued under Subpart C of 10 CFR Part 52, authorizes construction of the facility in a manner similar to a construction permit under 10 CFR Part 50. However, the combined license will specify the inspections, tests, and analyses that the licensee shall perform and the acceptance criteria that, if met, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license and the applicable regulations. After issuance of a combined license, the Commission will verify that the required inspections, tests, and analyses were performed and, before operation of the facility, find that the acceptance criteria were met. At periodic intervals during construction, the NRC staff will publish notices of the successful completion of inspections, tests, and analyses in the *Federal Register*. Then, not less than 180 days before the date scheduled for initial loading of fuel, a notice of intended operation of the facility shall be published in the *Federal Register*. An opportunity for hearing exists following construction, but petitions for a hearing will only be considered if the petitioner demonstrates that the acceptance criteria have not been met. Before the plant can operate, the Commission shall determine that the acceptance criteria were met.

In both licensing processes (10 CFR Part 50 and Part 52), the NRC maintains surveillance over the construction and operation of a facility throughout its lifetime to ensure compliance with the Commission's regulations for the protection of public health and safety and the environment.

The licensing process under 10 CFR Part 52 also provides for Early Site Permits (Subpart A), Standard Design Certifications (Subpart B), and Standard Design Approvals (Appendix O).

An early site permit provides for resolution of site safety, environmental protection, and emergency preparedness issues, independent of a specific nuclear plant review. The early site permit application must address the safety and environmental characteristics of the site and evaluate potential physical impediments to the development of an emergency plan. The staff's findings on site safety characteristics and emergency planning are documented in an SER and on environmental protection issues in Draft and Final Environmental Statements. The early site permit also has provisions for an LWA to perform non-safety site preparation activities, subject to redress, in advance of issuance of a combined license. After the NRC staff and the ACRC completes its safety review, the NRC will issue a *Federal Register* notice for a mandatory public hearing. The early site permit is valid for no less than 10 nor more than 20 years and can be renewed for 10 to 20 years.

A standard plant design may be certified and approved by the NRC through a rulemaking, independent of a specific site. The design certification is valid for 15 years. The issues that are resolved in a design certification have a more restrictive backfit requirement than issues that are resolved under other licenses. That is, a certified design cannot be modified by the NRC unless the modification is necessary to meet the applicable regulations, in effect at the time of the design certification, or to assure adequate protection of the public health and safety. An application for a combined license under 10 CFR Part 52 can incorporate by reference a design certification and/or an early site permit. The advantage of this approach is that the issues resolved by the design certification rulemaking process and those resolved during the early site permit hearing process are precluded from reconsideration at the combined license stage.

business planning, and issue management. Despite these initiatives, the NRC issued letters to ComEd expressing concerns about adverse performance trends at both the LaSalle and Quad Cities stations in January and June 1994 and to Quad Cities in January 1995. ComEd then developed and implemented a series of more focused and much more effective initiatives. Because of positive steps taken by the new management teams, LaSalle and Quad Cities were removed, in January and June 1995, respectively, from the list of plants with adverse performance trends.

Throughout 1996, performance of activities at the Byron plant was generally excellent. Overall performance at Braidwood was good. Several key management changes were made in an effort to improve performance in specific technical areas.

Quad Cities continued to improve in overall plant performance, as demonstrated by sustained progress in plant operations and radiation protection and the improved material condition and self-assessment capability of the station. Some progress was also seen in improving engineering and maintenance support to the station. Overall station operation continued to challenge plant managers; they were contending with weaknesses in safety system performance, inadequate corrective actions for some long-standing issues, weak root-cause evaluations, and cumbersome work control.

Although performance at LaSalle was adequate in 1996, a safety-significant service water event occurred in June indicating that significant performance weaknesses continued to exist in a number of areas. In September 1996, both units were shut down; Unit 1 to repair a turbine control valve and resolve operability concerns with a service water system heat exchanger, and Unit 2 for a refueling outage. In December, the licensee decided to extend the outages for both units to resolve several design deficiencies and to address performance issues revealed by the service water event, NRC findings, and licensee self-assessment initiatives. The units remained shut down at the end of 1996, with restart currently scheduled for spring 1997.

Performance at Zion during 1996 was adequate, however, the effectiveness of licensee improvement initiatives was limited as evidenced by continued personnel errors, configuration control problems,

material condition issues, work control process problems, and weaknesses in various engineering activities.

In December 1996, ComEd contracted to have an Independent Safety Assessment performed at both LaSalle and Zion by a team of industry peers and Institute of Nuclear Power Operations representatives. The team's charter was to determine the reasons previous improvement initiatives had not been successful at these facilities. The team identified numerous explanations for historical performance problems.

Dresden performed adequately in 1996, but the pace of improvement continued to be slow, and Dresden remained on the Watch List. Because Dresden had been on the Watch List since January 1992, the NRC decided to conduct an Independent Safety Inspection (ISI) to determine whether the licensee was steadily and sufficiently improving the overall safety performance of the plant. The inspection focused on the licensee's effectiveness in four different areas, including—

1. Correcting deficiencies,
2. Conforming to licensing and design basis requirements,
3. Conducting maintenance, and
4. Operating the plant in a safe and reliable manner.

The multidiscipline ISI team concluded that improvements were made in all the inspected areas. However, improvements were incremental and their rate varied significantly among Dresden Station's organizations. Although safety performance significantly improved in plant operations, the level of improvement in engineering has not yet resulted in fully effective problem identification and resolution. This was evidenced by the failure to identify significant weaknesses in the control and maintenance of design basis calculations, and the failure to resolve a number of long-standing problems affecting safety systems. The efficacy of improvement initiatives in radiological protection, maintenance, testing, and self-assessment was mixed.

Corrective actions to resolve the lack of control and maintenance of design basis calculations are now being implemented. Because of the

significance of the engineering and design basis issues, ComEd committed to a number of actions to provide further confidence in the adequacy of the design basis and engineering activities at Dresden Station and the other ComEd nuclear sites. The short-term actions for Dresden were confirmed by an NRC Confirmatory Action Letter.

Maine Yankee. The Maine Yankee Atomic Power Station is a single-unit, 915-megawatt (electric) Combustion Engineering (CE) facility, located in Lincoln County, Maine. The plant is owned and operated by the Maine Yankee Atomic Power Company (the licensee).

In December 1995, in response to anonymous allegations regarding the adequacy of safety analyses provided by Yankee Atomic Electric Company to support power uprate amendments for Maine Yankee, the NRC staff audited the licensing basis analyses used to demonstrate the adequacy of the Maine Yankee emergency core cooling systems (ECCSs) pursuant to 10 CFR 50.46. The staff concluded that the licensee did not demonstrate that the computer code used for analysis of the small-break loss-of-coolant accident (SBLOCA) would reliably calculate the peak cladding temperature for all break sizes in the SBLOCA spectrum for Maine Yankee. By Order dated January 3, 1996, the NRC staff restricted operation of Maine Yankee to 2440 megawatts thermal (MWt). The previous license limit was 2700 MWt. The basis for acceptable operation with the power restriction is described in the Order.

At the direction of the Chairman of the NRC, in cooperation with the State of Maine, an Independent Safety Assessment (ISA) of the Maine Yankee Atomic Power Company was performed during the summer of 1996. The purpose of the ISA was—

- to determine whether Maine Yankee was in conformity with its design and licensing bases;
- to assess operational safety performance; and
- to evaluate Maine Yankee's self-assessment, corrective actions, and plans for improvement.

Overall performance at Maine Yankee was considered adequate for operation at power levels

up to 2440 MWt. However, a number of significant weaknesses and deficiencies were identified. The ISA concluded that these weaknesses and deficiencies appeared to be related to two root causes: economic pressures to contain costs and poor problem identification as a result of complacency and the lack of a questioning attitude. The ISA report was issued on October 7, 1996.

Fermi 2. The Fermi 2 Nuclear Plant is a single-unit, 1139-megawatt (electric) General Electric boiling-water reactor facility located in Monroe County, Michigan. The plant is owned and operated by the Detroit Edison Company (the licensee).

On December 23, 1993, the Fermi 2 plant suffered a catastrophic failure of the main turbine while the plant was at 93-percent reactor power. The Region III Administrator issued a confirmatory action letter (CAL) on December 28, 1993, and formed a restart panel in accordance with NRC Manual Chapter 0350, "Staff Guidelines for Restart Approval," to evaluate and track the licensee's investigative and recovery actions before restart. Because of the long lead time required to replace turbine rotors, the licensee decided to remove the seventh- and eighth-stage blades from all three low-pressure turbines, replacing the blades with pressure plates, even though this would result in derating the unit. By letter dated December 14, 1994, the licensee notified the NRC of its resolution of the restart action items. By letter also dated December 14, 1994, the region notified the licensee that the CAL was rescinded and that the licensee was free to restart the Fermi 2 plant. On December 19, 1994, nearly one year after the turbine failure, the licensee restarted the Fermi 2 plant.

After restart, the licensee began startup testing, power ascension, and turbine balancing. The licensee experienced numerous power reductions and reactor trips during the startup testing program and did not complete the turbine balancing until June 1995. The turbine vibration on the highest bearing (no. 8) subsequently ran slightly higher (8 to 9 mils) than the goal of 6 mils. The plant operated the balance of the fuel cycle at a power level somewhat below 100 percent (approximately 96-percent reactor power until the summer of 1996 when gradually increasing turbine vibration required power reductions as low as 83-percent power). The licensee shut the plant down in September 1996 for the fifth refueling outage. During

this outage, the licensee replaced all three low-pressure rotors in the main turbine. At the end of 1996, the licensee was in the process of balancing the new rotors before proceeding to full-power operation.

Clinton Power Station. Clinton Power Station is a single unit, 933-megawatt (electric) GE BWR facility, located in DeWitt County, Illinois. The plant is owned and operated by Illinois Power Company (the licensee).

The Clinton Power Station experienced two significant operating events during 1996 with the latter event resulting in an extended plant shutdown continuing into early 1997. On April 9, 1996, the reactor scrammed from 100-percent power as the result of maintenance activities in the switchyard. This resulted in the temporary loss of offsite power to plant support systems. Restoration of the condenser as a heat sink was delayed, which was caused by poor performance by the operators. During the event, decay heat was rejected to the suppression pool for 30 hours via safety relief valves (SRVs). The SRVs were cycled for a total of 85 times during this 30-hour period.

Following plant restart from the April trip, the licensee began to observe an increasing trend of unidentified reactor coolant system (RCS) leakage. The licensee believed that the RCS leakage was from the "B" reactor recirculation pump seal and that this may have been a consequence of interrupting the flow of cooling water to the pump seals during the April event. A manual plant scram in June, which was also caused by online maintenance activities, provided the licensee with an opportunity to replace the leaking seal. However, the licensee chose to return the plant to power in lieu of addressing the degrading recirculation pump seal package. By early September, unidentified RCS leakage was approaching the technical specification limit of 5 gallons per minute.

On September 5, 1996, control room personnel attempted to shift the operation of the reactor recirculation system from two-loop to single-loop operation. The intent of this action was to isolate the RCS leak in the "B" loop and maintain this plant configuration until the refueling outage that was scheduled for mid-October. During the course of this evolution, operations managers chose a non-conservative course of action that resulted in

rapid degradation of the seal package and in unidentified RCS leakage exceeding technical specification limits, thus requiring plant shutdown. The licensee was slow to react to the significance of this event. Only after the NRC had extensively intervened through a number of calls with senior plant managers over a period of several days did the licensee take action to initiate a thorough and comprehensive assessment.

The licensee's own assessment of this event included the following findings:

1. Management personnel were not conservative in the operation of the plant. Numerous opportunities existed for management to evaluate uncertainties and the need for continued reactor operation, but these were not recognized or acted upon;
2. Management did not properly establish, enforce, or set the proper example for procedure compliance;
3. Oversight of the overall picture of plant conditions and actions surrounding the event was ineffective;
4. There was inadequate planning and evaluation of the potential consequences before performing an infrequently performed operation;
5. Management tolerated long-standing equipment problems that contributed to uncertainty of some plant conditions; and
6. Illinois Power personnel were not timely in identifying a potential non-compliance with a procedure and management did not sufficiently pursue other indications that would lead to management recognition of the significance of non-conservative reactor operation.

The NRC's Operational Safety Team Inspection following this event identified deficiencies throughout the licensee's organization. Deficiencies included problems with the adequacy of procedures and adhering to them, lack of rigor in conducting plant operations, weak engineering support to operations, and serious lapses in safety focus by both plant managers and staff. CALs were issued to the licensee in September 1996 and January 1997 that required the licensee to address these

findings and to meet with the staff before plant restart.

In addressing the identified problems, the licensee made a number of management changes and developed its Startup Readiness Action Plan (SRAP). The intent of the SRAP is to initiate a shift in safety culture at Clinton Power Station to ensure that decisions and actions in the plant are made with safety as the first and overriding concern. The SRAP focuses on procedure compliance/adequacy; conservative decision making/human performance; management oversight; and plant material condition. By the end of 1996, the staff was monitoring SRAP implementation and assessing its effectiveness to ensure that personnel and equipment performance is acceptable before plant restart.

Wolf Creek Generating Station. Wolf Creek is a single-unit, 1167-megawatt (electric) Westinghouse PWR facility, located in Coffey County, Kansas. The plant is jointly owned by Kansas Gas and Electric Company, Kansas City Power and Light Company, and Kansas Electric Power Cooperative, Incorporated, and is operated by the Wolf Creek Nuclear Operating Corporation. A 5000-acre lake supplies normal cooling water to the facility's main circulating water system and the service water system. A separate portion of the lake is designated the ultimate heat sink and supplies water to the essential service water (ESW) system, which is the safety-related source of cooling water.

At approximately 2 a.m. CST on January 30, 1996, with the unit operating at 98-percent power, operators received alarms that indicated increased differential pressure across the circulating water system/service water system traveling screens, thereby indicating a reduction in system flow. The site watch reported that the traveling screens for Bays 1 and 3 of the intake structure were covered with ice and that water levels in the bays downstream of the traveling screens, were approximately 8 feet below normal. The ESW system was started with the intent of separating the ESW system from the service water system. At about 3:30 a.m., operators received a service water low-pressure alarm (the circulating water and service water systems take suction from the same bays, which were found to have decreased another 4 feet to a total of 12 feet below normal). The shift supervisor directed a manual reactor/turbine trip. The

circulating water system was taken out of service because of the low level in the intake bays. The loss of level in the circulating/service water bays was determined to be caused by ice that formed on the traveling screens when water from the spray wash system froze and partially blocked the flow of water into the bays. However, flow into the bays was adequate to allow the operation of one service water pump.

Both trains of the ESW system continued to operate satisfactorily until 7:47 a.m. when flow anomalies were observed in train "A" of the ESW system. Train "A" was declared inoperable at that time. During the day on January 30, 1996, the licensee installed temporary heating equipment in both the ESW intake structure and the main circulating/service water intake structure. Late in the day, the "A" train of the ESW system was filled, vented, and placed in operation. At about 7:30 p.m., the "A" train of the ESW system was stopped because of flow and pressure oscillations. The intake bay of the "A" train was found to be 10 feet below normal. Throughout the night of January 30 and the early morning of January 31, 1996, the operators tried unsuccessfully to restore train "A" of the ESW system. On the morning of January 31, 1996, divers were sent into the intake bay of the "A" train of the ESW system. Ice was found to have completely blocked the trash racks of the "A" train. The licensee installed air spargers in the intake of the "A" train of the ESW system that cleared the ice from the trash racks and 2 feet beyond them. The "A" train of the ESW system was declared operable and the reactor was cooled to below 200 °F. Throughout this period, the "B" train of the ESW system continued to operate satisfactorily.

The icing of the ESW system was caused by the formation of frazil ice in the lake causing the blockage of the ESW system intake. Frazil ice is a phenomenon that occurs in lakes and rivers in cold regions. The process starts when heat is lost from a large surface such as a lake with open water (no ice cover) causing the water to become subcooled a few hundredths of a degree. High winds contribute to the subcooling and enhances mixing of the subcooled water to depths as great as 20 to 30 feet. Frazil ice, which consists of very small crystals of ice with little buoyancy, is carried along in the water. When it contacts unheated structures such as the trash racks, it sticks. The ice grows rapidly until the space between the bars on

the trash racks is bridged, effectively cutting off flow.

Before and during the event, low temperatures at Wolf Creek approached 6 °F after midnight, and winds gusted from the northwest in excess of 24 miles per hour. Daytime temperatures did not exceed 25 °F on January 28 or 29, 1996. An ice cover had not fully developed on the Wolf Creek Lake. However, the bulk water temperature of the lake was approaching 32 °F.

The cause of the ice blockage in the ESW system was found to be design errors that reduced the amount of warming line flow to below the required amount to prevent ice formation on the trash racks. Subsequent to the event, design modifications were completed that ensured adequate warming line flow in the ESW system.

The NRC has reported this event to Congress in the Abnormal Occurrence Report and to the International Atomic Energy Agency, using the International Nuclear Event Scale that rates events from 1 to 7, with 7 being the most severe. This event was classified as "level 2" on the International Nuclear Event Scale.

Palisades Dry Cask Storage. In 1993, the NRC amended 10 CFR Part 72 by adding the VSC-24 model to the list of approved spent fuel storage casks. Consumers Power Company (CPCo) became the first utility to store spent fuel under the general license when it began using the VSC-24 cask for storage at its Palisades Nuclear Power Plant in Michigan. In July 1994, while reviewing radiographs, a CPCo inspector found two crack-like indications in the vertical weld of storage cask #4, which had already been loaded with spent fuel. Although the cask was adequate for containing the fuel, CPCo announced that it would offload the fuel from cask #4 at an early opportunity.

To prepare for the unloading operation, the licensee identified a number of technical issues to be addressed through modifications and additions to the original cask unloading procedure, including measures to ensure that worker exposures are maintained as low as reasonably achievable. Based upon these and other issues pertaining to the original unloading procedure, a petition was filed pursuant to 10 CFR 2.206 by Don't Waste Michi-

gan and Lake Michigan Federation in September 1995. The petition requests that the NRC find that the original procedure violated NRC requirements and impose enforcement sanctions against the licensee. On the basis of the results of staff evaluation of the original unloading procedure during Fiscal Year (FY) 1996, the NRC will issue a Director's Decision pertaining to the petition in early FY 1997.

In FY 1996, the staff also initiated a special team inspection to evaluate the revised Palisades cask unloading procedure. The revised procedure incorporated changes to the original procedure to address previously identified technical issues. Before the conclusion of this inspection, however, an event occurred at the Point Beach Nuclear Power Plant in Wisconsin involving the ignition of hydrogen gas generated by a chemical reaction between a VSC-24 cask's protective coating and the mildly acidic spent fuel storage pool water. The ignition occurred during welding operations, which are a routine part of the VSC-24 cask loading process. As a result of this event, the special team inspection remained open at the close of FY 1996, pending the completion of corrective actions to prevent a similar occurrence at Palisades, including any necessary revisions to the unloading procedure.

Palisades Reactor Vessel Annealing. Consumers Power Company (CPCo) concluded on the basis of material tests and analyses performed during fall 1994 that the degree of embrittlement of the Palisades reactor pressure vessel (RPV) could be higher than previously calculated in accordance with 10 CFR 50.61, the pressurized thermal shock (PTS) rule. The licensee calculated that this increased embrittlement would result in the Palisades RPV reaching the PTS rule screening criteria at the end of the plant's 14th refueling outage scheduled for late 1999. CPCo proposed in 1995 to anneal the Palisades RPV in 1998, using an indirect gas heating system. Details of the CPCo annealing plan were given in the 1995 Annual Report.

An annealing demonstration project (ADP), using the indirect gas heating method, was completed in July 1996 at Marble Hill, a four-loop Westinghouse plant. The demonstration project is independent of the Palisades annealing program, but is expected to yield information useful to the Palisades project. Owing to DOE funding cuts, completion

of the Marble Hill ADP final report has been indefinitely deferred.

CPCo began submitting sections of the Palisades Thermal Annealing Report (TAR) for staff review in October 1995. All sections of the TAR have been submitted and are under staff review. A final TAR submittal is scheduled for January 1997 that would incorporate information from the Marble Hill ADP final report; however, the deferral of the Marble Hill ADP final report will delay the submittal of the Palisades final TAR.

Concurrently with the preparations to anneal the RPV, the licensee completed a revised evaluation of the calculated RPV neutron fluence exposure. RPV fluence exposure constitutes one component of the PTS rule screening criteria calculation. The revised fluence evaluation, submitted to the NRC in April 1996, calculated a 25-percent reduction in the fluence exposure. The calculated reduction consists of changes due to refined measurement of physical plant parameters and changes resulting from application of revised analytical procedures. The licensee calculated that the revised fluence exposure results in the Palisades RPV will reach the PTS rule screening criteria in 2011, which is beyond the current license expiration date of 2007. Staff acceptance of the licensee's revised fluence evaluation would therefore permit the licensee to operate the facility to the end of the license term without performing RPV annealing.

The staff completed an initial review of the revised fluence evaluation in December 1996. The staff approved an 8-percent reduction in the calculated RPV fluence owing to the refined physical plant parameter measurements, which would result in the Palisades RPV reaching the PTS rule screening criteria in 2003. The staff is continuing to review the revised analytical procedures applied to the fluence evaluation to determine whether further reduction of the calculated RPV fluence exposure is acceptable.

As a result of the delay in completion of the final TAR and the change in the PTS rule screening criteria date, CPCo is currently evaluating whether changes to the RPV annealing project schedule are warranted.

Crystal River 3 Performance and Design Concerns. The Crystal River 3 (CR3) plant is currently in an extended shutdown to address

several design and performance weaknesses. Crystal River is situated on the Gulf of Mexico in the northwestern portion of Citrus County, Florida, and is approximately 70 miles north of Tampa. The region is predominantly agricultural in nature. Based on the 1973 census, one population center of 25,000 or more is within a radius of 50 miles.

At this site, Florida Power Corporation (FPC) owns and operates five electric generation units, four coal-fired, and one nuclear-fueled (CR3) unit. The five units together produce approximately 3,000 megawatts of electricity. CR3 is a pressurized light-water reactor designed by Babcock and Wilcox (now known as Framatome) and is licensed to produce 885 megawatts of electricity.

Since its commercial operation in 1977, the unit generally performed well. However, over the past two years, the NRC observed a trend of declining performance and has identified certain design concerns at the facility. In response, FPC initiated corrective action to address CR3 performance concerns. The NRC is monitoring FPC's implementation of the corrective actions. In 1996, in accordance with NRC Inspection Procedure 93808 "Integrated Performance Assessment Process" (IPAP), the NRC conducted an inspection coupled with a safety system functional review of a specific safety system to assess FPC's performance over a period of approximately two years. On August 21, 1996, the inspection team issued its report and also presented its results of the assessment in a public exit meeting on August 6, 1996. The inspection team identified concerns in six general areas, including engineering design weaknesses and overall management performance weaknesses. The inspection team concluded that while several of FPC's initiatives focused on the right issues, many of the programs were largely ineffective.

In September 1996, while CR3 was shut down for certain pipe repairs, FPC voluntarily decided to remain shut down until the identified concerns are corrected. FPC initiatives are directed at restoring design margins in several safety systems and addressing human and organizational performance concerns.

In accordance with NRC Inspection Manual Chapter 0350 (Staff Guidelines for Restart Approval), the NRC has established a Restart Panel to review issues surrounding CR3

performance before the plant restarts. The Restart Panel is composed of NRC technical staff members from NRC Region II in Atlanta and from the agency's Headquarters in Rockville, Maryland.

Watts Bar Unit 1 Begins Commercial Operation.

During FY 1996, TVA continued its activities to complete Watts Bar Unit 1, including starting up and bringing the unit to full-power operation.

The NRC issued a low-power license to TVA on November 9, 1995, which authorized TVA to load fuel and operate Unit 1 up to 5-percent of rated power. In October and November 1995, the staff published Supplements 18 and 19 to the Watts Bar Safety Evaluation Report (NUREG-0847). These supplements reported the resolution of additional issues required for the full-power operation of the unit. In February 1996, the staff published its final supplement (Supplement 20) to NUREG-0847, concluding that an operating license could be granted authorizing operation up to 100-percent power. This full-power license was issued on February 7, 1996.

Watts Bar Unit 1 proceeded with a planned startup test program in the spring of 1996 and declared the unit to be in commercial operation on May 27, 1996. The unit completed a period of continuous power operation on September 28 when it entered a planned mid-cycle outage for maintenance and surveillance testing. The unit completed this outage on October 16 and returned to power operations at that time.

Salem Restart Efforts. Salem Units 1 and 2 were shut down for not meeting Technical Specification requirements in May and June of 1995, respectively, to address equipment operability problems. As a result of a history of continued performance deficiencies over the past several years characterized by equipment failures, human error, weak managerial oversight, and ineffective communications, Public Service Electric and Gas Company (PSE&G) decided to keep the units shut down to fix these longstanding concerns. The NRC issued a CAL on June 9, 1995, to confirm PSE&G's agreement not to restart without NRC approval. The CAL delineated licensee commitments that must be satisfied before the restart of either Salem unit. In February 1996, the Salem Unit 1 restart schedule was delayed because unacceptable degradations were discovered in the steam generators. Since the

Salem Unit 2 steam generators did not exhibit unacceptable degradation, the licensee directed its restart efforts to Salem Unit 2. The Salem Unit 1 steam generators are scheduled to be replaced in early 1997, with unit startup being projected six to twelve months after Salem Unit 2. Salem Unit 2 is scheduled to start up during the first quarter of 1997.

In July 1995, the staff initiated actions to monitor the licensee's restart plans in accordance with NRC Manual Chapter 0350, "Staff Guidelines for Restart Approval." On February 23, 1996, the NRC issued its Restart Action Plan after soliciting comments from the public during a December 1995 meeting and from representatives from the State of New Jersey during two meetings in January 1996.

Throughout 1996, the NRC has continued to implement the controls described in NRC Manual Chapter 0350 and revised its Restart Action Plan on August 3, 1996, and December 26, 1996. A number of inspections in 1996 focused on and oversaw design and licensing bases conformance, an integrated test program, the corrective action program, plant material condition, operator performance and workarounds, employee concerns, and steam generators. Inspections will continue into 1997 to support the NRC's decision regarding the restart of both Salem units.

Oconee Emergency Electrical System Concerns. Emergency power at the Oconee Nuclear Power Station (located 30 miles west of Greenville, South Carolina, and operated by Duke Power Company) is provided by two hydroelectric units at the Keowee Station, located approximately one-half mile from Oconee. This system differs from emergency power systems at other nuclear power stations in that diesel generators are not used and, following a loss of offsite power, redundant safety trains of all three Oconee units may be connected to one of the two Keowee units. The size of the hydroelectric generators makes the emergency ac power system capable of powering a large complement of non-safety equipment. Two gas turbines located at the Lee substation can provide an additional source of emergency ac power.

For several years, the staff has been concerned with the ability of the Keowee hydro units to function as desired because of the complexity of the electrical circuitry needed to deliver the power

from the units to the Oconee emergency systems, and the fact that the licensee had never performed an integrated test of the entire emergency electrical power system.

In July 1996, following about two years of staff evaluation, NRR and the Office for Analysis and Evaluation of Operational Data (AEOD) issued draft reports on the design and operational characteristics of the emergency electrical supply system. During these evaluations, the staff assessed the overall reliability of the Oconee emergency power system as it currently exists to determine whether any additional staff actions might be required to address unacceptable vulnerabilities or risks that may exist in the design or operation of the Oconee emergency electrical power system. They performed a risk-informed deterministic evaluation to determine whether any unacceptable vulnerabilities might still exist in the design of the Oconee plant emergency power system or standby shutdown facility that could prevent these systems from performing their safety functions. A probabilistic evaluation was included to determine whether any unacceptable risks might exist in the design or operation of the emergency power system that would require further staff action. The staff identified in reports of these evaluations a number of recommended improvements to the design, testing, and operation of the Oconee emergency power systems.

The licensee responded to the reports by addressing most of the staff's concerns. However, in order to provide additional confidence in response to staff concerns and in the ability of the emergency electrical distribution systems to function as designed, Duke Power Company designed a series of six tests to demonstrate performance of the systems under a broad range of scenarios for which they were designed to perform. The tests were performed between January 2 and January 5, 1997. All emergency systems appeared to operate as designed, and no discrepancies were found. Data resulting from the tests are being evaluated by Duke Power Company. They will be submitted for staff review and use in finalizing the staff's review of concerns raised in the draft reports.

BWR Power Upgrades. In the 1960s and early 1970s, plants were commonly licensed to operate at a power rating below the plant design rating while licensees gained experience with new plant designs. As they gained this operating experience, many

licensees for BWRs and PWRs have sought power uprating to make the authorized maximum power level closer or equal to the plant design rating. Thus far, the NRC has issued more than 30 such power uprating license amendments.

In February 1995, the General Electric Company (GE), the vendor for BWRs, submitted to the NRC a licensing topical report proposing generic review guidelines for extended power uprating of BWRs. The GE report gives generic criteria, methods, assumptions, and scope-of-work estimates required for power uprates to nominally 20 percent over the original licensed thermal power. Benefiting from the previous power uprate program, GE's proposed extended power uprate is based on analytical techniques using more realistic assumptions and models (computer codes), plant performance feedback, and new fuel designs. These factors have significantly increased the difference between calculated safety analysis results and licensing limits. GE stated in the report that this available difference, combined with the as-built equipment, system, and component capability, would allow most BWRs to increase their thermal power rating by between 5 and 15 percent without making major hardware modifications to the nuclear steam supply system.

The NRC issued a staff position paper in February 1996 on extended power uprating for BWRs, based in part on the NRC review of the GE licensing topical report. This staff position paper provides industry guidance for developing license amendment applications for extended power uprate, as well as NRC staff guidance for reviewing those applications.

GE also submitted additional licensing topical reports containing generic bounding analyses for specific aspects of BWRs. Monticello, the lead plant for the extended power uprate program, submitted its license amendment application to the NRC in July 1996, requesting to increase the authorized maximum thermal power of Monticello by about 6.3 percent.

Two GE-designed BWRs in Switzerland completed extended power uprate licensing actions. The Kernkraftwerk Muehlberg plant (BWR-4) started operating at 15 percent above original power in 1994. The Kernkraftwerk Liebstadt (BWR-6) plant received approval for a 20-percent uprate in 1996. The Swiss nuclear regulatory authority and the NRC have been actively involved in a program to

exchange information, including information about the extended power uprates.

Special Inspection and Oversight of Northeast Utilities' Millstone and Haddam Neck

A special inspection team, led by a senior NRC manager, was formed in January 1996 to assess the operations, engineering, and licensing activities and managerial oversight at the Millstone site as they related to the resolution of degraded and nonconforming conditions. NRC managers directed the inspection to be conducted in light of continuing licensee performance problems, including untimely resolution of design deficiencies, facility modification and process changes outside the licensed design basis, informal control of engineering and licensing work, and inadequate corrective actions.

The special inspection team comprised a multidisciplinary group of 20 engineers, primarily NRC staff from NRR and the Regional offices. To ensure the greatest degree of independence, the selection criteria for team members specified that they had no significant previous involvement with Northeast Utilities (NU).

The team's original scope was to inspect Millstone Units 1 and 2. The scope was revised to focus on Millstone Units 2 and 3 and Haddam Neck, in part, because of findings of a February 1996 NU internal root-cause evaluation of the problems with the Unit 1 Final Safety Analysis Report (FSAR). This internal report questioned whether the same fundamental design and licensing concerns identified at Unit 1 could exist at these other units.

The team performed onsite inspections at Millstone from March 11–29 and from May 13–22, 1996, and at Haddam Neck from March 25–28 and April 15–26, 1996. The Haddam Neck inspection report was issued on July 31, 1996; the Millstone inspection report was issued on September 20, 1996.

At Haddam Neck, the team identified programmatic weaknesses and apparent violations in the areas of design calculations and analyses; problem identification and corrective actions; licensing and design basis documentation; operations and materials classification. At Millstone, team findings included similar programmatic weaknesses and apparent violations in the areas of problem identification and corrective actions; licensing and design basis documentation; translation of design basis requirements to procedures, practices and drawings; engineering; and materials classification.

In June 1996, the NRC designated the units at Millstone as Category 3 plants on the NRC's watch list. Plants in this category have significant weaknesses that warrant maintaining them in a shutdown condition until the licensee can demonstrate to the NRC that it has both established and implemented adequate programs to ensure substantial improvement. Plants in this category require Commission authorization to resume operations.

On August 14, 1996, the NRC issued a confirmatory order directing the licensee to contract with a third party to implement an Independent Corrective Action Verification Program (ICAVP) to verify the adequacy of its efforts to establish adequate design bases and design controls. The ICAVP is intended to provide additional assurance before unit restart that the licensee has identified and corrected existing problems in the design and configuration control processes.

On October 24, 1996, the NRC issued an order directing that before the restart of any Millstone unit, the licensee develop and submit to the NRC a comprehensive plan for reviewing and dispositioning safety issues raised by its employees and ensuring that employees who raise safety concerns can do so without fear of retaliation. The order also directs the licensee to retain an independent third party to oversee implementation of its comprehensive plan.

On November 3, 1996, the NRC created the Special Projects Office (SPO) within NRR to provide a specific management focus on future NRC activities associated with the Millstone units. The SPO's responsibility for future activities at Millstone includes all licensing and inspection activities required to support an NRC decision on restart of the Millstone units.

On December 4, 1996, NU announced its decision to permanently shut down Haddam Neck before the expiration of its 40-year operating license (June 29, 2007).

Decommissioning Nuclear Power Plants

Title 10 of the *Code of Federal Regulations*, Section 50.2 (10 CFR 50.2), defines decommissioning as the safe removal of a facility from service and reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license.

Since 1988, when the Commission issued the original decommissioning regulations, several licensees have permanently ceased operations prematurely without having submitted the decommissioning plan required under the regulations. In addition, these licensees requested exemptions from some safety requirements to reflect their status of no longer having fuel present in the reactor. Because the regulations did not specifically address prematurely shutdown facilities, these situations were handled on a case-by-case basis.

STATUS OF DECOMMISSIONING REGULATIONS

Throughout FYs 1995 and 1996, the NRC staff worked on revisions to NRC regulations to clarify their applicability and to make certain changes in decommissioning policy regarding permanently shutdown reactors. On July 20, 1995, the Commission issued a "Notice of Proposed Rulemaking on Decommissioning of Nuclear Power Plants." On July 2, 1996, the Commission approved the final rule. The rule was published in the *Federal Register* on July 29 and became effective 30 days from the date of publication (on August 28, 1996). The final rule—

- redefines the decommissioning process,
- defines terminology related to decommissioning,

- requires licensees to provide the NRC with early notification of planned decommissioning activities at their facilities, and
- explicitly sets forth the applicability of certain NRC requirements to permanently shutdown reactors.

The Commission believes the amendments will improve efficiency and uniformity in the decommissioning process for nuclear power reactors. The amendments allow for public participation in the decommissioning process and furnish the licensed community and the public a better understanding of the process as the operating personnel at a nuclear power reactor facility undergo the transition from an operating organization to a decommissioning organization.

The revisions to 10 CFR Parts 2, 50, and 51 related to the final rule on decommissioning power reactors require that—

1. Within 30 days after a nuclear power plant licensee decides to cease operations permanently, the licensee shall submit a written certification to the NRC, and
2. When the licensee permanently removes nuclear fuel from the reactor vessel, the licensee shall submit another written certification to the NRC.

When NRC receives these certifications, the licensee's authority to operate the reactor or to load fuel into the reactor vessel will be removed by regulation. This measure would entitle the licensee to an annual fee reduction and would eliminate the obligation to adhere to certain requirements needed only during reactor operation. Within two years after submitting the certification of permanent cessation of operations, the licensee would have to submit a post-shutdown decommissioning activities report (PSDAR) to the NRC. This report would provide a description of the licensee's planned decommissioning activities, a schedule for accomplishing them, and an estimate of the expected costs.

In the PSDAR, the licensee would also discuss the reasons for concluding that environmental impacts associated with the site-specific decommissioning activities have already been considered in environmental reports or environmental impact statements prepared previously. If not previously considered,

the licensee would have to request a license amendment for approval of the activities and submit to the NRC an environmental report on the additional impacts.

After receiving a PSDAR, the NRC would publish a notice of receipt, make the PSDAR available for public review and comment, and hold a public meeting in the vicinity of the plant to discuss the licensee's intentions.

Ninety days after the NRC receives the PSDAR, and generally 30 days after the public meeting, the licensee could begin to perform major decommissioning activities without specific NRC approval. These activities could include permanent removal of major components such as the reactor vessel, steam generators, large piping systems, pumps, and valves.

The final regulations state that decommissioning activities conducted without specific prior NRC approval must not—

- foreclose release of the site for possible unrestricted use,
- result in there being no reasonable assurance that adequate funds will be available for decommissioning,
- cause any significant environmental impact not previously reviewed.

If any decommissioning activity could not meet these terms, the licensee would be required to submit a license amendment request, which would provide an opportunity for a public hearing.

Initially, the licensee could use up to 3 percent of the amount specified in 10 CFR 50.75 for decommissioning activities without prior NRC approval. An additional 20 percent could be expended 90 days after submittal of the PSDAR. The remaining decommissioning trust funds would be available for decommissioning activities when the licensee submits a detailed site-specific decommissioning cost estimate to the NRC.

A new rule entitled "Safeguards for Spent Nuclear Fuel or High-Level Radioactive Waste—10 CFR Parts 60, 72, 73, and 75" (SECY-95-104) addresses physical protection requirements for the

storage of spent fuel and high-level radioactive waste in a permanently shutdown reactor, independent spent fuel storage installation (ISFSI), monitored retrievable storage installation, or a geologic repository. The Commission published the proposed rule on August 18, 1995. After a period for public comment, a final rule was scheduled to be issued on April 15, 1996. However, the NRC staff is considering requesting a Commission policy review of ISFSI safeguards based on public comments and staff reviews. During this interim period, a second independent review of the proposed rulemaking is being considered. Following the Commission policy review, the proposed rule will be revised and will be submitted for public comment if significant changes occur.

Other rulemakings that are anticipated in the decommissioning area include a revision of regulations to address spent fuel cooling periods and indemnity issues, decommissioning costs, funding, and financial assurance.

SHUTDOWN PLANTS IN THE DECOMMISSIONING PROCESS

Since the original decommissioning rule was published in 1988, seven power reactor facilities have shut down prematurely:

- Fort St. Vrain Nuclear Generating Station
- Shoreham Nuclear Power Station
- Rancho Seco Nuclear Generating Station
- Yankee Rowe Nuclear Station
- San Onofre Nuclear Generating Station, Unit 1
- Trojan Nuclear Plant
- Haddam Neck Plant

Three Mile Island Nuclear Station, Unit 2, also ceased operation after the accident on March 28, 1979. In addition, Indian Point Nuclear Generating Station Unit 1, Dresden Nuclear Power Station Unit 1, Humboldt Bay Power Plant Unit 3, and LaCrosse Boiling Water Reactor, which were shut down in 1974, 1978, 1980, and 1987, respectively, are in the decommissioning process. FY

1996 decommissioning highlights for individual plants are outlined below.

Yankee Rowe. During the early component removal process at Yankee Rowe in 1993, the Citizens Awareness Network (CAN), a group in the Rowe, Massachusetts, area, filed a complaint in court claiming the NRC did not follow the National Environmental Protection Act (NEPA) in its review of the licensee's early component removal program. On July 20, 1995, the court issued its decision, which found that the NRC erred when it rejected CAN's request for a hearing on the component removal program, that CAN was entitled to a hearing under Section 189a of the Atomic Energy Act, and that the NRC had violated NEPA by permitting Yankee Atomic Electric Company (YAEC) to initiate the component removal program before the agency had prepared an environmental assessment or impact statement. The court remanded the case to the NRC for further action.

On October 27, 1995, the NRC provided public notice of the opportunity for a hearing regarding reapproval of the Yankee decommissioning plan. On November 30, 1995, CAN and the New England Coalition on Nuclear Pollution submitted a joint petition to intervene on the Yankee decommissioning plan. On January 16, 1996, the Commission turned over the petitioners' pleadings to the Atomic Safety and Licensing Board (ASLB). The hearing process was completed on October 18, 1996, when the Commission denied CAN's latest petition. On October 28, 1996, the NRC informed YAEC that decommissioning activities may be conducted at Yankee Rowe.

Trojan. In November 1994, the licensee for the Trojan Nuclear Plant, Portland General Electric, commenced its large component removal project (LCRP). The project included the removal and shipment of the Trojan steam generators and pressurizer to the U.S. Ecology low-level waste repository at Hanford, Washington. The LCRP was completed on November 1, 1995, when the final component, the pressurizer, was buried at Hanford. Subsequently, on April 15, 1996, the NRC issued an order approving the Trojan decommissioning plan; dismantlement activities are ongoing.

Big Rock Point. Although Consumers Power Company plans to continue to operate Big Rock

Point until its current license expires on May 31, 2000, the licensee submitted its proposed SAFSTOR decommissioning plan for the plant on February 27, 1995. This submittal of a decommissioning plan was made several years earlier than required by NRC regulations to allow for early NRC review of the plan as the plant continued to operate. On February 14, 1996, Consumers Power Company requested that the NRC defer its review of the Big Rock Point decommissioning plan until after issuance of the revised 10 CFR Part 50 decommissioning regulations. Following its review of the final rulemaking, Consumers Power Company detailed, by letter dated September 5, 1996, that it considers its decommissioning plan submittal the Post-Shutdown Decommissioning Activities Report in accordance with 10 CFR 50.82(a)(4)(ii). Currently, the licensee plans to utilize the SAFSTOR decommissioning alternative although it continues to review the possibility of the DECON alternative.

Haddam Neck. The licensee for the Haddam Neck plant, Northeast Utilities, announced permanent cessation of operations on December 4, 1996. The license has two years from that date to submit the PSDAR for the plant.

IMPROVING THE LICENSING PROCESS

Reactor Licensing Priorities and Process Improvements

Largely in response to concerns raised in connection with issues at Millstone and Maine Yankee, the staff developed the Associate Director for Projects Process Improvement Plan (PIP). The PIP was developed to capture process improvements identified by the staff and ensure that concerns and improvements were fully developed and implemented. The PIP is a dynamic document in that, as concerns and improvements are identified, action items are continuously added to the PIP and are tracked to implementation.

Issues captured on the PIP included improving training for the staff, ensuring existing guidance is

updated to reflect current agency and NRR priorities, and ensuring that additional guidance is developed and management expectations are disseminated to the staff as necessary. As processes and procedures are upgraded to resolve issues and clarify staff positions, information about them is disseminated to the staff.

Along with other demands on NRC resources and priorities, changes in the NRC's priorities are being reviewed as part of broader process improvements. Prior emphasis by NRR on licensing actions is being re-evaluated. NRR has been decreasing its emphasis on completing routine licensing actions, which include license amendments, reliefs, and exemptions, but increasing its emphasis on licensing activities, which include multiplant actions and task interface agreements. As part of the PIP, previously developed goals for licensing actions will be re-evaluated, and performance goals will be developed for licensing activities. Existing guidance that provides NRR priorities for the workload will be re-assessed in light of current expectations and direction.

Improved Standard Technical Specifications

The NRC continues to place high priority on license amendment applications related to full conversion to the improved Standard Technical Specifications (STS). During 1996, the NRC issued license amendments implementing the improved STS for an additional five units at three plant sites.

As of December 1996, about 75 percent of all commercial nuclear units have converted, are converting, or plan to convert to the improved STS. That estimate represents a 5-percent increase from a year ago in the number of conversions to be made to the improved STS. Entering 1997, the NRC is reviewing license amendment applications to implement the improved STS for another 23 units at 12 plant sites.

The NRC continues to work with the Nuclear Energy Institute (NEI) standing task force established to coordinate industry initiatives for

improvements to the technical specifications and related industry practices. During 1996, both the NRC and NEI issued guidance to the industry that should bring more uniformity to future license amendment applications for STS conversion. That uniformity in both format and content of the applications should achieve more efficient preparation and processing of these extensive license amendment applications.

To keep the public apprised of efforts related to the improved STS, the NRC has made the improved STS and changes to the STS available on the Internet. The NRC has also undertaken a trial program in which the improved STS for one reactor design have been converted into Standard Generalized Markup Language (SGML). With the improved STS in the SGML format, the NRC hopes to simplify TS word processing and determine whether the extensive word search and hyper-text linking capabilities of the SGML format will provide greater utility for both use and maintenance of the STS.

Looking to the future, the NRC is working on a voluntary pilot application to develop more risk-informed technical specification requirements. That effort to incorporate additional risk insights into technical specifications is a part of the overall NRC Probabilistic Risk Assessment (PRA) Implementation Plan, which will lead to specific guidance for application of PRA results to regulatory requirements.

PLANT LICENSE RENEWAL

Nuclear power provides approximately 20 percent of the electric power produced in the United States. The Atomic Energy Act and NRC regulations limit commercial power reactor licenses to 40 years, but also permits the renewal of such licenses. The 40-year term was originally selected on the basis of economic and antitrust considerations—not technical limitations—but once selected, individual plant designs may have been engineered based on an expected 40-year service life.

The first plant's 40-year operating license will expire in the year 2000 and approximately 20 percent of the rest will expire by the end of the

year 2010. The timely renewal of licenses for an additional 20 years, where appropriate to do so, may be important to ensuring an adequate energy supply for the Nation during the first half of the 21st century.

A nuclear power plant licensee may apply to the NRC to renew its license for 20 years or less. An applicant may apply as early as 20 years before the expiration of its current license. It would likely take a licensee about three to five years to prepare an application. The application would be subject to public hearings—a formal, adjudicatory process. For the first application, NRC expects to take five years to complete a detailed technical review and the hearing process.

Rulemaking and Regulatory Guidance Development

Environmental and technical requirements for renewal of operating licenses are contained in NRC's regulations, 10 CFR Parts 51 and 54, respectively. Part 54 was revised in May 1995 to simplify and clarify the renewal process. The revision emphasizes managing the *effects* of aging rather than managing aging *mechanisms*, thus allowing greater credit for existing licensee programs and maintenance rule provisions in the license renewal process.

In FY 1996, NRC revised the final generic environmental impact statement (GEIS) and Part 51 rule based on public comments. The final environmental protection rulemaking was published on December 18, 1996, with an effective date of January 17, 1997. The staff is developing a regulatory guide for the format and content of the environmental portion of a license renewal application as well as a staff environmental standard review plan. These documents are expected to be completed by March 1998 and August 1998, respectively.

The NRC developed a draft regulatory guide for the format and content of the technical portion of a license renewal application in FY 1996. The draft regulatory guide proposes to endorse an implementation guideline prepared by NEI as an acceptable method of implementing the license renewal rule. The draft regulatory guide and the

NEI guideline were published for comment in the *Federal Register* in August 1996.

In addition, the NRC staff participated in an NEI-sponsored demonstration program that is assessing the effectiveness of guidance contained in the NEI guideline. A public workshop was conducted on October 29, 1996, to discuss the staff's draft regulatory guide, NEI's guideline, and the staff's observations of the NEI-sponsored demonstration program. As a result of the public comment period and the public workshop, the NRC received comments from both the public and industry concerning the draft regulatory guide and NEI guideline. The NRC staff is reviewing the comments and expects to revise its regulatory guide and recommend changes to the NEI guideline. The final regulatory guide and NEI guideline are expected to be issued by August 1997.

Industry Activities

Currently, several industry efforts are underway implementing the license renewal process such as preparing topical reports on aging management issues and conducting initial reviews for the preparation of applications. NEI is the lead industry group interacting with the NRC on the license renewal rule implementation guidance.

The Babcock & Wilcox Owners Group (B&WOG), representing seven operating B&W plants, has formulated a generic license renewal program that will lead to the submittal of a renewal application in late 1997. To date, the B&WOG has submitted three generic license renewal reports on reactor coolant system (RCS) piping, the pressurizer, and the reactor vessel that the staff is reviewing. The NRC issued a final safety evaluation report (FSER) on March 21, 1996, on the B&WOG RCS piping report.

Baltimore Gas & Electric Company (BGE) is developing a specific approach for a license renewal application for its Calvert Cliffs plants. BGE submitted its integrated plant assessment methodology in August 1995. The methodology details how BGE intends to meet the requirements of the license renewal rule. The NRC issued an FSER on April 4, 1996. BGE has begun to submit detailed topical reports for selected plant structures and components.

Duke Power Company is also developing a plant-specific approach for a license renewal application. Duke has submitted its first in a series of license renewal technical reports in July 1996 for Oconee Nuclear Station, Units 1, 2, and 3. The first report contains the technical information to meet the license renewal requirements for the reactor building.

The Westinghouse and Boiling Water Reactor Owners Groups have also met with the NRC to discuss their programs for license renewal. The Westinghouse Owners Group has submitted topical reports on the aging management activities for the RCS piping supports, the pressurizer, Class 1 piping, and PWR containment. The NRC is currently reviewing these reports. The Boiling Water Reactor Owners Group submitted its first topical report on containment in December 1995. The NRC has reviewed the report and requested additional information.

DESIGN CERTIFICATION PROCESS FOR NEXT-GENERATION REACTORS

The Commission has long sought nuclear power plant (NPP) standardization and the enhanced safety and licensing reform that it could make possible. The Commission issued 10 CFR Part 52—a rule that sets out a more predictable and stable licensing process, including certifications of next-generation reactor designs—to improve the licensing environment for next-generation nuclear power reactors by minimizing the uncertainty in the regulatory process. The design certification process is the key for early resolution of licensing issues.

Design Review Status

Advanced Boiling Water Reactor (ABWR). The NRC issued the final design approval (FDA) for the GE ABWR and the FSER (NUREG-1503) in July 1994. The Commission issued a notice of

proposed rulemaking for the design certification of the ABWR on April 7, 1995. On the basis of comments received from the industry, public groups, and the vendors, the proposed ABWR design certification rule was revised. A final rule is expected to be issued in May 1997.

System 80+. The NRC issued its final design approval for ABB-Combustion Engineering's System 80+ on July 26, 1994, and issued its FSER (NUREG-1462) in August 1994. The Commission issued a notice of proposed rulemaking for the design certification of the CE System 80+ design on April 7, 1995. On the basis of comments received from the industry, public groups, and the vendors, the proposed System 80+ rule was revised. A final rule is expected to be issued in May 1997.

AP600. In November 1994, the NRC issued a Draft Safety Evaluation Report (DSER) for the AP600 design. The DSER identified over 1100 open issues. In support of the passive design, Westinghouse established a comprehensive test program for the AP600 that included separate-effects experiments on the passive approach and two integral systems test programs. Testing was completed in 1994. The NRC is currently evaluating the data from all of Westinghouse's design certification test programs. The staff issued a supplement to the DSER to discuss the acceptability of the test program and application of the results to verify the AP600 analysis codes on May 3, 1996. Review of the AP600 design continues.

Simplified Boiling Water Reactor (SBWR). GE Nuclear Energy submitted an application for final design approval and design certification of its SBWR design in August 1992. However, problems in resolving staff concerns about the SBWR testing program led GE to request a realignment of the SBWR design certification program and to reassess its testing and analysis program. The staff issued a DSER on the Test and Analysis Program Description (TAPD) in November 1994. GE-sponsored testing continued into 1996 and NRC continued its evaluation of test data as well as its review of the TRACG thermal-hydraulic code. However, following GE's announcement on March 4, 1996, to redirect the focus of its SBWR program to plants of 1,000 MWe or larger, NRC expects to complete all closeout actions on its review efforts for the SBWR in early 1997.

MHTGR. An NRC review of the Modular High Temperature Gas-Cooled Reactor design, sponsored by DOE, started in 1986. A draft Pre-application Safety Evaluation Report (PSER) was issued in 1989 as NUREG-1338. Important safety matters are fuel design and performance, containment design and performance, reactor cavity cooling system, accident selection and analysis, accident source terms and analysis, role of the operators, design of the control room and remote shutdown area, emergency preparedness, and quality standards for equipment. At the request of DOE in March 1996, the review was terminated after the PSER had been issued to DOE for comment.

INSPECTION PROGRAMS

NRR is responsible for developing and maintaining policy and procedures for the implementation of the reactor inspection program, which encompasses oversight of all licensee activities. In addition, NRR is responsible for assessing the effectiveness of the inspection program as carried out by NRC Headquarters and Regional Offices. The inspection program is a basic element in the NRC reactor regulation program. It provides oversight of licensed reactor facilities by assessing their ability to comply with regulatory requirements and the provisions of the license and identifying other conditions that warrant corrective action. Most inspections are dedicated to operations at the 109 plants where operating licenses were in effect (as of September 30, 1996).

Reactor Inspection Program

The NRC reactor inspection program has the following four objectives: (1) to provide one of several bases for conclusions on both individual licensee and industry-wide performance for allocating NRC resources, (2) to assess the licensee's systems and techniques for conducting internal inspections and maintaining control that result in safe operations, (3) to find and resolve plant-specific safety concerns that have generic significance, and (4) to identify declining trends in

licensee performance and perform inspections to verify that the licensee has resolved the issue before performance declines below an acceptable level.

The reactor inspection program is implemented by inspectors located in NRC Headquarters and Regional Offices, as well as at the licensees' sites. Headquarters inspectors are primarily involved with conducting team inspections. The Regional Offices conduct most of the required inspections, utilizing both region-based and resident inspectors, as appropriate. Region-based inspectors perform technically detailed inspections in such areas as engineering, system modifications, inservice inspection, fire protection, physics testing, radiation protection, physical security and safeguards, maintenance, and licensee management systems. The resident inspectors provide the most frequent onsite NRC presence for direct observation and verification of licensee activities. This involvement includes indepth inspections of control room operations; maintenance and surveillance testing carried out by the licensee; periodic "walkdown" inspections to verify the correctness of system lineups for those nuclear systems important to safe operation; and frequent plant tours to assess radiation control, physical security, equipment condition, and housekeeping.

The reactor inspection program comprises the following three elements:

1. *Core Inspections.* This program element provides a minimum examination of licensee activities to confirm the adequacy of licensee performance and identify potential problems in the early stages.
2. *Plant-Specific Regional Initiative Inspections.* This program element consists of three parts:
 - *Regional Initiative Inspections* provide followup on problems identified in licensee performance during other inspections and to address areas where the greatest safety benefit can be obtained.
 - *Reactive Inspections* are generally conducted in response to events or issues, but may also be conducted to follow up on findings from other inspections that require immediate attention.

INSPECTING THE NUCLEAR POWER PLANT

The primary safety consideration in the operation of any nuclear reactor is the control and containment of radioactive material, under both normal and accident conditions. Numerous controls and barriers are installed in reactor plants to protect workers and the public from the effects of radiation.

Both the industry and the NRC have roles in providing these protections and in ensuring that they are maintained. The NRC establishes regulations and guides for the construction and operation of nuclear reactors. Organizations licensed by the NRC must abide by these regulations and are directly responsible for designing, constructing, testing, and operating their facilities in a safe manner.

The NRC inspection program is audit-oriented to verify, through scrutiny of carefully selected samples, that relevant activities are properly conducted and equipment properly maintained to ensure safe operations. The staff determines which items to sample, as well as the sample sizes and inspection frequencies, based on the importance of the activity or system to overall safety and on available resources. The inspection process monitors the licensee's activities and gives feedback to the licensee's management for appropriate corrective action. However, the NRC inspection program does not supplant the licensee's programs or attenuate its responsibilities.

Inspections are performed on power reactors under construction, in test conditions, and in operation. The inspections are conducted primarily by region-based and resident inspectors. Resident inspectors are stationed at each reactor under construction and in operation. Region-based inspectors operate out of the four Regional Offices located in or near Philadelphia, Atlanta, Chicago, and Dallas. These programs are supplemented by personnel from NRC Headquarters. Inspections are a vital part of the NRC's review of applications for licenses, as well as the process leading to issuance of construction permits and operating licenses. Inspections continue throughout the operating life of a nuclear facility.

Before construction, the inspection program concentrates on the applicant's establishment and implementation of a quality assurance (QA) program. Inspections cover QA activities related to design, procurement, and planning for fabrication and construction of the facility. During construction, samples taken across the spectrum of licensee activities are examined to confirm that the licensee is following the requirements of the construction permit issued by the NRC, and that the plant is being built according to the approved design and applicable codes and standards. Construction inspectors look for qualified personnel, high-quality material, conformance to approved design, and a well-formulated and well-implemented QA program.

As construction nears completion, pre-operational testing begins to demonstrate the operational readiness of the plant and its staff. Inspections during this phase seek to determine

whether the licensee has developed adequate test plans—both to verify that tests are consistent with NRC requirements, and to ascertain whether the plant and its staff are thoroughly prepared for safe operation. Inspections during the pre-operational phase involve reviewing overall test procedures, examining selected test procedures for technical adequacy, and witnessing and assessing selected tests to verify that test objectives have been met and to confirm the consistency of tests that are planned and conducted. Inspectors also review the qualifications of operating personnel and verify that operating procedures and QA plans are properly developed and implemented.

About 6 months before the operating license is issued, the licensee begins a startup phase to prepare for fuel loading and "power ascension." After issuance of the operating license, fuel is loaded into the reactor, and the startup test program begins. As in pre-operational testing, NRC inspections emphasize test procedures and results. Inspectors appraise the licensee's management system for startup testing, analyze test procedures, witness tests, and review licensee evaluations of test results. Thereafter, the NRC continues its inspection program for the remainder of the operating life of the plant.

The NRC verifies that the licensee is operating safely through selective inspections. An onsite resident inspector provides a continual inspection and regulatory presence, as well as a direct contact between NRC management and the licensee. The activity of the resident inspector is supplemented by the work of engineers and specialists from the Regional Office who perform inspections in a wide variety of engineering and scientific disciplines, ranging from civil and structural engineering to health physics and reactor core physics.

The NRC Inspection Manual defines the frequency, scope, and depth of the inspection program for operating reactors, and detailed inspection procedures provide instructions and guidance for NRC inspectors. The program is structured to ensure that the resources available for inspection are used efficiently and effectively, with particular attention accorded to those plants where past performance indicates the need to improve the levels of protection and safety-consciousness.

The inspection program is designed to ensure that NPPs are constructed and operated safely and in compliance with regulatory requirements. The NRC considers the results of the inspection program when making its overall evaluation of licensee performance for the SALP program. When a safety problem or a failure to comply with requirements is discovered, the NRC requires prompt corrective action by the licensee, confirmed, if necessary, by appropriate enforcement action.

The NRC periodically assesses the inspection program to evaluate its effectiveness in achieving its regulatory objectives.

- *Team Inspections* provide a more indepth assessment of one or more aspects of licensee performance. They are often multidisciplined in both the scope of the inspection and the composition of the team.
3. *Generic Safety Issue Inspections.* This program element consists of two parts:
- *Generic Area Team Inspections* address one or more generic areas selected for specific team inspection emphasis. The selection is based on the identification of an emerging safety concern or an area requiring increased emphasis because of recurring problems.
 - *Safety Issues Inspections* address specific safety issue concerns. If a concern is of appropriate safety significance, it may be necessary to initiate a one-time inspection effort under the safety issues program element.

The inspection program allows Headquarters and Regional inspections to focus on those plant operations that contribute most to ensuring reactor safety, as well as on the identification of existing or potential safety problems.

The NRC continued to revise the inspection program during FY 1996, based on knowledge gained from experience with the current program. One such change resulted in revised guidance requiring inspectors to verify selected FSAR commitments by reviewing the applicable portions of the FSAR during inspection preparation and verifying that the commitments had been properly incorporated into plant practices, procedures, or design. In addition, the NRC issued a substantial revision to its guidance that governs the content, format, and style of inspection reports. The revision has resulted in improved effectiveness of reports as the primary vehicle for communicating inspection results to the licensees and the public.

Special Team Inspections

During FY 1996, NRC Headquarters and Regional staffs continued to perform special team inspec-

tions. Team inspections usually involve 4 to 10 individuals, representing multiple engineering disciplines, and require 1 to 2 weeks of onsite inspection. The team examines in detail various aspects of selected systems and components that are critical to safe shutdown of a plant or that are required to maintain the plant in a safe condition after shutdown. The team may inspect design, installation, testing, maintenance, and operation of the selected systems. The overall objective of such inspections is to determine whether, when called upon to do so in an emergency, plant systems and personnel will perform their safety functions as set forth in the safety analysis report.

Some types of team inspections are performed "as needed" at particular plants, while others are designated "area-of-emphasis" inspections and are performed at a designated population of plants. Established types of special team inspections cover emergency operations, maintenance, ability of systems to perform safety functions as designed, motor-operated valves, modification of safety systems during reactor outages, operational safety, operational readiness, and plant designs.

ONGOING INITIATIVES

In 1994 and 1995, the NRC developed a process to improve the periodic, long-term integration of objective information (e.g., inspection reports, licensee self-assessments, Systematic Assessments of Licensee Performance [SALPs], etc.) to arrive at conclusions regarding licensee performance and provide site-specific recommendations for future inspections. This process, known as the Integrated Performance Assessment Process (IPAP), supplements existing processes that provide ongoing integration. IPAP provides direct feedback on the effectiveness of the inspection program and its implementation. After piloting the IPAP at five plants, the staff held a public meeting on the process, obtained Commission approval to implement the process, and issued the final inspection procedure (IP 93808). During FY 1996, NRR conducted four IPAPs and the regions conducted five.

NEW INITIATIVES

During 1995 and 1996, NRC inspectors identified numerous findings where the actual plant configuration or operations were inconsistent with the design basis, the licensing basis, or the UFSAR. To

address this concern, in 1996 the NRC shifted the inspection emphasis in engineering to performing Safety System Functional Inspections (SSFIs). SSFIs were included as part of NRR inspections, such as the Crystal River IPAP, the Fermi Operational Safety Inspection, and the Waterford Engineering Inspection. The regions also performed SSFIs, specifically at LaSalle and Cooper.

In addition, NRR developed a new initiative for three design inspection teams to be led by NRR and staffed through contracts with two architect-engineers, Stone and Webster and Sargent and Lundy. The contractors will provide three teams to perform eight SSFIs each over a two-year period, for a total of 24 inspections. The architect-engineer contracts may be extended an additional two years, depending on need. Plants will be selected for these SSFIs based on their responses to the NRC's October 1996 letter to licensees requesting information pursuant to 10 CFR 50.54(f) regarding the adequacy and availability of design basis information. For plant selection, the staff will also consider factors such as SALP rating in engineering, plant age, and the results of the NRC's Senior Management Meetings.

Vendor Inspection Program

The Vendor Inspection Program centered in NRC Headquarters is principally a reactive program structured to respond to vendor and licensee reports of deviations and defects in vendor-supplied parts, components, materials, and services provided to NPPs, as well as allegations from members of the public concerning potentially defective and sometimes misrepresented parts, components, and materials. The program determines and prioritizes actions to identify and resolve issues according to their safety significance and generic applicability.

Inspections during FY 1996 addressed allegations and reports from industrial organizations. According to the provisions of 10 CFR Part 21, licensees and vendors are required to report to the NRC problems and defects in safety-related equipment, materials, and services. In FY 1996, the vendor inspection staff had the responsibility for screening, tracking, and ensuring the closeout of approximately

56 notifications required in 10 CFR Part 21. The staff determined the validity, extent, and safety significance of each reported deficiency, and determined the need for inspections. Further, as appropriate, the staff ensured that licensees were apprised of potential problems with vendor products or services so that they could take appropriate action to prevent the use of defective components in nuclear plant safety systems. The NRC vendor inspection staff also frequently communicated with vendors and licensees to explain the NRC's position on specific interpretations and applications of 10 CFR Part 21 and other Federal regulations.

In FY 1996, the NRC vendor inspection staff conducted 25 vendor inspections. Of these inspections, 8 involved allegations and 3 others resulted from findings during an allegation-related inspection. The vendor inspections covered those who provide commercial grade dedication or equipment qualification services, as well as those who manufacture or supply valves, switchgear and distribution equipment, snubbers, fasteners, fire-barrier penetration seal assemblies, power supplies, software, electrical terminals and splices, hydrogen and oxygen monitors, engineering and inspection services, and fuel-related products and services. In addition, the inspection staff continued involvement in the review and inspection of the GE and Westinghouse advance reactor QA programs. The vendor inspection staff also provided inspection assistance to the Regions and Headquarters during the inspection of seven reactor licensees, including the major team inspection of Millstone.

As a result of inspection findings and other information in the vendor program area, the NRC issued 12 information notices informing the nuclear industry of potential problems with equipment, material, and services. These information notices dealt with—

- falsification of American Society of Nondestructive Testing certificates,
- inoperability of power-operated relief valves,
- scram solenoid pilot valve diaphragms causing slow scram insertion times,
- preconditioning of molded-case circuit breakers,

- requirements from 10 CFR Part 21 concerning software errors,
- deficiencies in vendor material dedication and procurement practices,
- failure of General Electric Magne-Blast circuit breakers,
- reactor trip-breaker failure caused by cracking of phenolic material,
- zinc plating of hardened material parts and removal of protective coatings in refurbished circuit breakers, and
- problems with levering-in devices in Westinghouse circuit breaker contact assemblies.

The vendor inspection staff continued to supply information to other Government agencies. All NRC information notices and bulletins are published in the Government Industry Data Exchange Program (GIDEP) Failure Experience Database. In addition, the vendor inspection staff provided technical support to assist the NRC Office of Investigations and U.S. Attorneys in criminal cases.

PERFORMANCE EVALUATION

The NRC evaluates the performance of NPP licensees through various coordinated processes. Performance evaluation involves integrating information from various sources and NRC activities such as conducting inspections, imposing enforcement actions, tracking performance indicators, analyzing trends, evaluating events, and examining licensed operators. Ongoing evaluations of licensee performance are made by NRC inspectors during each plant inspection and documented in the associated inspection reports. Short-term assessments of performance are made at least twice each year through the plant performance review (PPR) process. Senior NRC regional managers assess licensees' long-term performance through the SALP process. Senior management meetings (SMMs) overlay these processes and give agency senior managers an opportunity to

review observations and findings and plan a coordinated course of action for those plants where past performance gives the NRC the greatest concern. These various processes rely on the results of NRC inspections and other objective information collected on plant performance. In 1996, Management Directive 8.13, "Evaluating the Safety Performance of Nuclear Power Reactor Licensees," was issued to describe the interrelationships between these processes and communicates the overall plant evaluation process to the industry and the public.

Plant Performance Reviews

The PPR is a semiannual process conducted by the Regional Offices to provide a short-term evaluation of objective information and insights to arrive at a current summary of overall plant performance. The primary source of objective information and insights is inspection reports. Additional sources include licensee event reports, enforcement history, status of allegations, the open items list, performance indicators, results of licensee self-assessments, and data from the Human Factors Information System. The goal of the PPR process is to perform an integrated assessment of licensee safety performance so that early identification of performance trends can be identified and then, based on these results, to review the current inspection plan for each plant to determine if changes are needed (i.e., to increase or reduce inspections or to change the schedule for them).

For each power reactor licensee within the region's responsibility, regional staff and managers integrate and assess objective information in the areas of plant operations, maintenance, engineering, and plant support. To allow more efficient and thorough integration of information, a historical listing of plant issues is developed into a Plant Issues Matrix (PIM). The PIM and other selected sources of information are the raw assessment data used in the PPR process. Following each PPR, the staff issues to the licensee a six-month inspection plan that reflects observed trends or changes in licensee performance. Inspections are then conducted in accordance with the plan, unless reactive events cause the staff to redirect resources. In September of 1996, a new Inspection Manual Chapter 0304, "Plant Performance Review," was issued to

provide guidance for implementing the PPR process.

Systematic Assessment of Licensee Performance

Under the SALP program, the performance of each licensee with a nuclear power facility in operation in the United States is evaluated through the periodic, comprehensive examination of available data—including inspection findings, event review results, and similar licensing and inspection-related information. The SALP program is intended to provide long-term integration of licensee safety performance.

The SALP program is designed to arrive at an overall assessment of how well licensee management at a given plant is directing and guiding operations for the requisite assurance of plant safety. The purpose of the SALP review is to focus both NRC and licensee attention on those areas that could most likely affect nuclear safety and that need improvement.

The SALP includes a review of reported events, inspection findings, enforcement history, licensing issues, and all other available performance information for the previous 1 to 2 years. SALP results are issued in a report to the licensee, and the inspection plan for the next SALP period is developed based on these results.

During FY 1996, the NRC issued 34 SALP reports. Among the 34 reports, two plant sites (with a total of three reactors) received SALP Category 1 ratings, indicating superior safety performance in all four functional areas. Because of their superior level of performance, the SALP evaluation frequency for these plants was extended to 24 months. In addition, they will receive an appropriate reduction in NRC inspections. Another three plant sites (with four reactors) received at least one SALP Category 3 rating, indicating acceptable safety performance, but still of concern to the NRC. The NRC will focus an appropriate level of increased inspection at these plant sites and on the plant functional areas that were rated SALP Category 3.

Following significant changes to the SALP program in 1993, the Commission solicited feedback from licensees and the public on the effectiveness of those changes. The results of the feedback were issued as SECY-96-005, "Systematic Assessment of Licensee Performance." The feedback concluded that, in general, SALP reports were improved, the involvement of NRC senior managers in the SALP process was significant and beneficial, changes in the SALP meeting format improved discussions between the NRC and licensee managers, and participation in the SALP monitoring program had increased.

Senior Management Meetings

The SMM process is a semiannual review and integration of the agency's observations and findings regarding nuclear reactors, culminating in a meeting of senior NRC managers during which operating NPP safety performance is reviewed. This SMM process gives senior agency managers an opportunity to review the staff's observations and findings on operating nuclear reactors and to plan a coordinated course of action for plants at which performance is of significant concern to the NRC.

The SMM is conducted under the direction of the Executive Director for Operations (EDO), with each regional administrator leading the senior managers in discussing the plants in their respective region. During these discussions, the managers determine which plants, if any, to place in one of the three categories of the NRC Watch List:

- Category 1—plants removed from the Watch List;
- Category 2—plants that are authorized to operate, but will be closely monitored by the NRC;
- Category 3—shutdown plants that require NRC authorization to restart, and that will be closely monitored by the NRC.

In addition to the three Watch List categories, senior managers identify plants that are exhibiting adverse performance trends that could cause the NRC to place the plants on the Watch List in the future. Strong evidence exists that most licensees

take robust actions to remediate poor performance if they believe their plants are close to being placed on the Watch List.

The senior managers also review the performance of plants that have received SALP Category 1 ratings in all four functional areas since the last SMM. This review enables the senior managers to identify those plants at which sustained superior performance warrants formal recognition by the EDO.

As a result of SMM discussions, the EDO issues letters to the licensees of the plants placed on the Watch List, plants exhibiting adverse performance trends (known as trending letters), and superior performers. The results of the SMM are discussed with the Commission at a public meeting twice each year.

The NRC is in the process of issuing a management directive that builds on the foundation that has already been established by providing structure to the preparations for, and conduct of, SMMs. It articulates the assumptions and criteria that are used to evaluate the safety performance of NPPs; provides greater openness to the industry and public about the overall NRC evaluation process; outlines the NRC regulatory options that are available for plants that remain on the Watch List for extended periods; and includes formal criteria for removing plants from the Watch List.

During the two SMMs that were held in 1996, three plants remained on the Watch List, three new plants were placed on the list, two were removed from the list, and one was issued a trending letter. In addition, one plant was recognized by the EDO for superior performance.

SPECIALIZED PROGRAM AREAS

Specialists in the areas of emergency preparedness, radiation protection, facility security and safeguards, and nonpower reactors complement ongoing inspection activities by providing program oversight of inspection activities in these areas as well as reviewing licensing issues and developing

regulatory policy. Specialists also monitor licensee activities with respect to indemnity, financial protection, and property insurance. Activities in these specialized program areas are summarized in the following paragraphs.

Emergency Preparedness

During FY 1996, the emergency preparedness (EP) staff focused its attention on three major areas: onsite EP inspections, EP licensing policy activities, and coordination with the Federal Emergency Management Agency (FEMA). Onsite EP inspections continued to be a major activity in the regions. The regional staff observed and evaluated full and partial participation exercises at more than 42 nuclear power plant sites around the country, and performed routine EP inspections at more than 43 sites.

Major EP licensing policy activities during FY 1996 included a re-consideration of criteria used by the NRC staff to evaluate acceptable locations of, and activation times for, near-site emergency operations facilities. In response to a staff requirements memorandum, the staff assessed the nature of exemptions granted to licensees in these areas for emergency operations facilities and concluded that the existing guidance was appropriate. The staff requested and received authority from the Commission to review, evaluate, and, if appropriate, approve minor deviations from staff-generated guidance. Major deviations would continue to require Commission approval.

The staff continued to work closely with FEMA to address issues related to offsite emergency preparedness at and around NPPs in the United States. For this cooperative activity, the NRC has statutory responsibility for the radiological health and safety of the public, while FEMA has been designated as the Federal agency for offsite planning and response. As such, FEMA assesses the adequacy of State and local emergency preparedness and provides its findings and determinations to the NRC for use in licensing decisions. The NRC and FEMA staffs worked closely together in FY 1996 to develop two important documents and issue them for public comments. The first of these was Draft Supplement 2 to NUREG-0654, "Criteria for Emergency Planning in an Early Site

Permit Application." This report provides guidance to applicants for early site permits (10 CFR Part 52) in the development of emergency plans. The second of these documents was Draft Supplement 3 to NUREG-0654, "Criteria for Protective Action Recommendations for Severe Accidents." This document clarifies existing NRC practice related to recommendations for protective actions for members of the public following a major accident (involving significant damage to the fuel in the reactor core).

The NRC and FEMA staffs also coordinated closely the development of interim guidance for the restart of NPPs following a severe natural event (such as a hurricane, tornado, or flood) where there has been some damage to the 10-mile emergency planning zone infrastructure but only minor damage to the plant itself. The interim guidance was tested during the 1996 hurricane season for Bertha (July) and Fran (September). These two experiences demonstrated the ability of NRC and FEMA to work cooperatively to address offsite emergency planning issues to allow nuclear plant restart in a timely manner while ensuring protection of the public health and safety. The guidance is currently being put in final form.

Radiation Protection at Nuclear Power Plants

Daily monitoring of licensee and regional reports to the NRC Operations Center alerts the staff to potential problems developing in radiation safety, ranging from major repair problems involving highly radioactive components inside the facility to contamination from small leaks of liquid and gaseous materials. These initial reports are evaluated and discussed with regional NRC inspection staff. Significant health physics problems could result in subsequent reactive regional inspections or a generic communication to the industry. During FY 1996, an information notice was issued to warn licensees of the sudden creation of a high radiation area inside the reactor building, caused by equipment failure of nuclear instrumentation.

The regions completed the inspection activities governed by Temporary Instruction (TI) 2512/123, "Implementation of the Revised 10 CFR Part 20." Based on the inspection feedback, all power plant licensees have effectively implemented the revised rule.

During FY 1996, the NRC staff provided radiation protection support in licensing activities at most of the operating nuclear power reactors. Two significant areas, steam generators and implementation of revised source term in operating reactors, are discussed in the regulatory/safety issues portion of this chapter.

With respect to occupational exposure data, since 1969, the NRC staff has been collating the annual occupational doses at light-water reactors (LWRs). Although the annual dose averages for both PWRs and BWRs have fluctuated over the years, the overall trend between the early 1970s and 1980s was increasing, and annual plant dose averages peaked in the early 1980s. These high doses primarily resulted from NRC-mandated plant upgrades imposed on all LWRs shortly after the 1979 accident at Three Mile Island (Pennsylvania). Since 1983, the annual average doses for both PWRs and BWRs have declined.

In 1995, the last year for which complete data are compiled, the average dose per unit for all LWRs was 199 person-rem. This is one rem higher than the 1994 average of 198 person-rem per unit. In 1995, the average dose per unit for PWRs was 170 person-rem. This figure is nearly 30-percent higher than the 1994 average dose per unit of 131 person-rem (although it is still the second lowest recorded average dose per unit for PWRs). The activities that most frequently contributed to PWR doses in 1995 were related to steam generators, valve maintenance and repair work, refueling activities, scaffolding and insulation, inservice inspections, health physics coverage, and reactor coolant pump maintenance. In 1995, the average dose per unit for BWRs was 256 person-rem. This average dose is nearly 22 percent lower than the 1994 average BWR dose per unit of 327 person-rem. Major contributors to BWR doses in 1995 included inservice inspections, valve maintenance work, refueling activities, shielding installation and

removal, and area and system decontamination work.

Monitoring Environmental Impacts of Nuclear Power Plants

The discharge of radioactive effluents from routine plant operations can result in environmental impacts. These impacts can be on man, animals, plants, and sea life. During the licensing of a plant, NRC issues a Final Environmental Impact Statement (FEIS), which identifies these potential impacts. As part of NRC's requirements licensees must—

1. Keep releases of radioactive material to unrestricted areas during normal operation as low as reasonably achievable (10 CFR 50.36a) and
2. Comply with radiation dose limits for the public (10 CFR Part 20).

In addition, NRC regulations require licensees to have various effluent and environmental monitoring programs to ensure that the impacts are minimized.

The NRC requires licensees to report plant discharges and results of environmental monitoring around their plants to ensure that potential impacts are detected and reviewed. Licensees must also participate in an Interlaboratory Comparison Program, which provides an independent check of the accuracy and precision of environmental measurements.

The NRC conducts periodic aerial surveillance of NPPs to determine if there is any accumulation of radioactive materials associated with radioactive effluent releases during routine operation of plants. In addition, the NRC maintains a network of thermoluminescence dosimeters (TLDs) around each nuclear power plant's site. The TLDs are processed quarterly and measured radiation levels are reported in a public document, NUREG-0837, "NRC TLD Direct Radiation Monitoring Network."

During FY 1996, the NRC documented licensee's effluent releases and the results of the NRC's independent monitoring and assessment effort in plant-specific inspection reports available to the public. In addition to licensee requirements, NRC contracts with 35 states to independently measure radiation levels around NPPs and to establish background radiation levels to assess the radiological impact of an unusual condition or an accident.

Reactor Safeguards

SAFEGUARDS INSPECTION AND LICENSING ACTIVITIES FOR POWER REACTORS

In FY 1996, NRC's four Regional Offices continued to conduct core inspections of security programs at operating nuclear power reactors, decommissioned reactor sites, and independent spent fuel storage installations in owner-controlled areas of operating reactor sites. A core inspection is a minimum examination to confirm licensee performance and to identify problems in their early stages.

In addition to core inspections, regional safeguards inspectors conducted reactive inspections and region-initiated inspections arising from allegations or other events at sites. The allegations themselves also require extensive investigation by Regional and Headquarters personnel.

During FY 1996, licensees submitted approximately 150 revisions to site physical security plans, safeguards contingency plans, and guard training and qualification plans. Most of the revisions were submitted under 10 CFR 50.54(p), which allows a licensee to make changes without NRC approval when the licensee determines that the changes do not decrease the overall effectiveness of its plan commitments. When a revision involves a decrease in the overall effectiveness of a licensee's plan commitments, the licensee must submit a request under 10 CFR 50.90 for review and approval by the NRC Headquarters staff. The Headquarters staff also continued to process requests from licensees for modifying their site access controls to use technology advances, such as biometric identification devices, as cost-saving measures.

OPERATIONAL SAFEGUARDS RESPONSE EVALUATIONS AT POWER REACTORS

In addition to the inspections of licensee security programs done by NRC's Regional offices, an NRC Headquarters team conducts Operational Safeguards Response Evaluations (OSREs) at power reactors. The OSRE team consists of a nuclear engineer, physical security specialists, and contractors skilled in terrorist methods and tactics. The team evaluates the effectiveness of the licensee's response to realistic intrusions conducted by an "aggressor" team of trained licensee security personnel. Some of the more significant parameters evaluated include the interactions between operations and security personnel in establishing priorities for protecting plant equipment important to safety, the selection and effectiveness of defensive strategies, and the interface between safety and security to ensure that safeguard measures do not adversely affect the safe operation of the plant. Ten OSREs were conducted during FY 1996, for a total of 46 OSREs completed to date. These 46 OSREs have resulted in a total of 41 significant improvements at 20 power reactor sites.

PROTECTION AGAINST MALEVOLENT USE OF VEHICLES AT POWER REACTORS

In August 1994, the NRC amended the design basis threat statement in 10 CFR 73.1 to explicitly address malevolent use of vehicles, including four-wheel-drive vehicles, by adversaries to gain unauthorized proximity to vital equipment and to transport personnel, tools, and explosives. Power reactor licensees were required to implement vehicle control measures, including vehicle barriers, by February 29, 1996. Licensee compliance with the new requirements is determined by an inspection program conducted by NRC regional safeguards inspectors, assisted by security specialists from NRC Headquarters and the U.S. Army Corps of Engineers.

FITNESS-FOR-DUTY PROGRAMS AT POWER REACTORS

Power reactor licensees are required to implement fitness-for-duty programs under 10 CFR Part 26. These programs are to ensure that workers at NPPs will perform their tasks in a reliable and

trustworthy manner, and that they are not under the influence of any substance or are not so mentally or physically impaired as to adversely affect their ability to safely and competently perform their duties. The Commission is currently considering changes to the rule to address lessons learned during the first six years of the program. The changes, published in the *Federal Register* on May 9, 1996, are intended to ensure compatibility with policies and guidelines used by the Department of Health and Human Services, the Office of National Drug Control Policy, the Department of Transportation, and several other Federal Government agencies. The proposed changes would substantially reduce licensee burdens, clarify the Commission's original intent, and enhance the overall program's integrity, effectiveness, and efficiency.

Program performance data provided by licensees were summarized in "Fitness for Duty in the Nuclear Power Industry; Annual Summary of Program Performance Reports, CY 1995" (NUREG/CR-5758, Volume 6), dated July 1996. Most of the "positive" tests were from pre-access testing. The positive rates for random testing varied by worker category, with short-term contractors having the highest rate, followed by long-term contractors, and then by licensee employees. Since the program's January 1990 inception, the positive rates have generally decreased. A notable exception, however, is the increase in positive rates for pre-access tests during the past two years—in contrast to a general decline in positive rates over the first four years after the program was implemented. The changing trend may be attributable to increased emphasis by several licensees on detecting attempts to subvert the testing process.

ACCESS AUTHORIZATION PROGRAMS AT POWER REACTORS

Power reactor licensees are required to implement access authorization programs under 10 CFR 73.56 to ensure that workers granted unescorted access to protected and vital areas at nuclear power plants are trustworthy and reliable and do not constitute an unreasonable risk to the health and safety of the public—including the potential to commit radiological sabotage. The access authorization programs use background investigations, psychological assessments, and continual behavioral

observation programs as the principal methods of satisfying these requirements. Initial NRC inspections were made to determine that the licensee programs were effective. Subsequent, continuing evaluations of the programs are done under NRC's Core Inspection Program. Core inspections are also used to determine if further program changes are needed.

SAFEGUARDS INSPECTIONS AND LICENSING ACTIVITIES AT NONPOWER REACTORS

During FY 1996, the NRC conducted safeguards inspections of nonpower reactors (NPRs) and continued the program to convert 25 NPRs from highly enriched uranium (HEU) fuel to low-enriched uranium (LEU) fuel. The conversion program's progress depends on the availability of DOE funding, the availability of a suitable replacement fuel, and whether a reactor has some "unique purpose" requiring HEU fuel. Through the end of FY 1996, 13 of the 25 NPRs with HEU will have been resolved as follows: eight converted to LEU fuel, one license terminated, one given a conversion order to convert to LEU fuel, and three given decommissioning orders. Of the 12 NPRs still operating with HEU fuel, one has submitted an SAR that is currently being evaluated by the NRC staff. DOE has funded six of the 12 NPRs to evaluate the operational effects of an HEU-to-LEU fuel conversion and to prepare an SAR. One university NPR has not been funded by DOE for conversion because no suitable replacement fuel is available. Two of the 12 NPRs still operating with HEU fuel are commercial NPRs that will not be funded by DOE for conversion, and another two are "unique purpose" applications being reviewed by the Commission.

Nonpower Reactors

The NRC also ensures the safe operation of test and research reactors not used to generate power on a commercial basis and referred to as nonpower reactors (NPR). These smaller reactors are designed and used for research and testing in areas such as physics, chemistry, biology, medicine, and materials sciences; and for training of individuals

for nuclear-related careers in the power industry, national defense research, and education. The NRC's staff conducts all agency activities associated with the licensing, inspection, oversight, and decommissioning of these reactors, and with the examination and requalification of nonpower reactor operators.

The NPR staff reviews new and renewal license applications and license amendments for nonpower reactors to evaluate the safety, environmental, and safeguards aspects of their operation. The NRC also conducts inspections at approximately 40 nonpower reactors each year to ensure their safe operation. It also ensures that the approximately 300 nonpower reactor operators are qualified to perform their duties.

Major NPR activities in FY 1996 include—

- A document entitled "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," NUREG-1537, Parts 1 and 2, was issued. Part 1 gives guidance to nonpower reactor licensees and applicants on the format and content of applications to the NRC for licensing actions. Part 2 gives guidance on the conduct of licensing action reviews to NRC staff who evaluate nonpower reactor licensing applications. These licensing actions include construction permits and initial operating licenses, license renewals, amendments, conversions from HEU to LEU, decommissioning, and license termination.
- Ten license amendments and one license termination were processed in FY 1996. Review of a new nonpower reactor application was initiated. Also, the staff participated in a hearing on the pending application to renew an existing license.
- Operator licensing examinations were given to 67 prospective new nonpower reactor operator applicants at 25 facilities.
- Nonpower reactor staff conducted a one-day NRC seminar at the Test Research and Training Reactor annual meeting. Breakout sessions were held to provide a forum for the exchange of information.

Indemnity, Financial Protection, and Property Issuance

The two private nuclear energy liability insurance pools—American Nuclear Insurers and the Mutual Atomic Energy Liability Underwriters—paid policyholders a 30th annual refund of premium reserves, under their Industry Credit Rating Plan. Under the plan, a portion of the annual premiums is set aside as a reserve available for refund to policyholders. The amount of the reserve available for refund is determined on the basis of the loss experience of all policyholders over the preceding 10-year period. Refunds paid in 1996 (for the period from 1986 through 1996) totaled \$26,073,500, which is approximately 47 percent of all premiums paid on the nuclear liability insurance policies issued in 1986. The refunds represent about 63 percent of the premiums placed in reserve in 1986.

The 14th annual property insurance reports submitted by power reactor licensees indicated that, of the 71 sites insured, 56 are covered for at least the \$1.06 billion required in the revised property/accident recovery insurance rule, published on April 2, 1990, and 28 of those sites carry the maximum \$3.35 billion currently available. The remaining 16 sites have sought or been granted exemptions from the full amount of required coverage because of their small size or their operating status.

Human Factors

Human performance is a crucial element of NPP safety. More than half of the incidents reported by commercial NPP licensees have human performance as a root cause. Humans perform multiple functions, and while accomplishing these functions, they can cause, prevent, mitigate, recover from, or be affected by events. During FY 1996, the Human Factors Assessment Branch (HHFB) staff participated in one augmented inspection team (AIT) inspection, one operational readiness assessment team (ORAT) inspection, and 17 special inspections at operating plants. The objectives in each of these 19 inspections were to help determine the root causes and contributing factors of events involving

human performance and to identify and analyze those conditions that contribute to human errors. The human performance investigation process (HPIP) is used in such inspections. The NRC developed the HPIP specifically to consider issues related to human performance; the design of human-systems interface, plant procedures, training, and communications, as well as the effects of supervision, management, and organization.

In FY 1996, the HHFB staff began the design and development of a Windows-based relational database to replace the existing DOS-based Human Factors Information System (HFIS). HFIS is used currently to manage, evaluate, and track human performance information contained in inspection reports and licensee event reports (LERs). The HFIS system conversion was undertaken to provide easier access to HFIS data by other agency offices as well as by the public.

One of the most important ways the NRC staff evaluates the effectiveness of licensee training efforts is by monitoring the Institute of Nuclear Power Operations (INPO) training program accreditation process. During FY 1996, NRC personnel observed National Nuclear Accrediting Board meetings, during which utility training programs are evaluated for initial accreditation or accreditation renewal. Also during FY 1996, the NRC staff observed one INPO accreditation team site visit. The staff concluded that the industry continues to conduct effective training in accordance with NRC requirements. The Commission continues to endorse the INPO accreditation program as an effective means of ensuring proper nuclear plant personnel training.

When a significant training program weakness is identified at a specific plant through, for example, an event investigation or operator requalification inspection, the staff may conduct a training inspection. During FY 1996, the staff conducted inspections of accredited training programs at three sites.

In July 1994, the staff published NUREG-0711, "Human Factors Engineering Program Review Model," which describes review criteria for the human factors engineering program elements necessary to develop an acceptable advanced control room design specification and an acceptable implemented design. During FY 1996, the staff completed one supplement to NUREG-0711,

which supports the program review model in the area of integrated system validation.

The HHFB staff cooperates both nationally and internationally in human factors activities. In FY 1996, HHFB staff members participated in several regional workshops on training and procedures development, and on an Institute for Electrical and Electronics Engineers standards committee to revise and upgrade several human factors standards. HHFB personnel participate in the studies and semiannual meetings of the Organization for Economic Cooperation and Development, Nuclear Energy Agency, Principal Working Group 1 on Operating Experience and Human Factors, and the Expanded Task Force on Human Factors. This task force conducts studies on human factors issues and subjects of general interest to the world nuclear community. This year's efforts included studies of human factors related to common-cause failures and the role of simulators in operator training. A new task was initiated to improve reporting and coding of human factors information in the international Advanced Incident Reporting System.

HUMAN PERFORMANCE PROGRAM PLAN

Representatives of the human factors organizations within NRR and the Offices of Nuclear Regulatory Research (RES), for Analysis and Evaluation of Operational Data (AEOD), and Nuclear Material Safety and Safeguards (NMSS) issued Revision 1 of the Human Performance Program Plan (HPPP) in July 1996. The HPPP reflects the goals, objectives, and activities associated with the agency's human factors programs. The HPPP serves as a focal point for coordinating the agency's human factors activities and assures that each of the organization's missions are accomplished with minimal duplication and overlap.

Maintenance

On July 10, 1991, the Commission published in the *Federal Register* (56 FR 31306) a new maintenance rule 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." This rule took effect on July 10,

1996, and requires commercial NPP licensees to monitor the effectiveness of maintenance activities for safety-significant plant equipment in order to minimize the likelihood of failure and of events caused by the lack of effective maintenance.

On August 31, 1995, the staff issued the final version of Inspection Procedure (IP) 62706, which is used to verify implementation of the rule. The final version incorporated appropriate comments and suggestions received from the public and industry representatives. Numerous other IPs were changed to incorporate the maintenance rule, most notably, the resident core IP. Revision 2 to Regulatory Guide 1.160, which endorses Revision 2 of NUMARC 93-01, the industry guidance document, was issued for public comment on August 31, 1996, and contains additional clarifying information. Revision 1 is adequate for implementation of the rule and is the basis for the staff's inspections.

An intensive training program was carried out by the Quality Assurance and Maintenance Branch (HQMB) of NRR. Training sessions were provided to the NRC staff involved with the rule. The courses conducted ranged from a one-hour overview for the technical review staff and project managers, to a one-day course for resident inspectors, and a three-day course for region-based inspectors. All inspectors performing baseline inspections were thoroughly trained by Headquarters staff.

In July 1996, the staff began performing baseline inspections of each licensee's implementation of the maintenance rule. These inspections are being conducted by resident and region-based inspectors and are expected to be completed by July 1998. To ensure uniform implementation, HQMB staff has participated in these inspections and will provide continuing training to the resident and region-based inspectors. In addition, a special enforcement panel was established to review all enforcement actions for consistency.

Operator Licensing

The NRC is continuing to administer initial examinations to applicants for reactor operator (RO) and senior reactor operator (SRO) licenses at power and nonpower reactor facilities. The responsibility for administering the examinations

at power reactors rests with the four NRC Regional Offices, while the NRC's Headquarters has responsibility for managing the program and administering the examinations at nonpower reactors.

The operator licensing process at power reactors includes a Generic Fundamentals Examination (GFE), which covers the theoretical knowledge required to operate a NPP, and a site-specific examination, which consists of a written examination and an operating test that includes a plant walk-through and a dynamic performance demonstration on a simulation facility. License applicants must pass the GFE before they can take the site-specific examination. The licensing examinations at nonpower reactors are similar to those at power reactors, with two major exceptions: the theoretical knowledge is included on the site-specific written examination and the dynamic performance demonstration is conducted on the actual reactor instead of a simulation facility. During FY 1996, the NRC administered approximately 525 site-specific initial licensing examinations to RO and SRO applicants at power and nonpower reactor facilities and approximately 340 GFEs to prospective license applicants at power reactor facilities.

During FY 1996, the NRC evaluated the licensed operator requalification programs at approximately 40 power reactor facilities to verify the programs' capacity to ensure the continued competence of their individual licensed operators. All of the programs were evaluated using the process described in IP 71001, "Licensed Operator Requalification Program Evaluation." The NRC uses the IP to periodically evaluate each licensed operator requalification program at each power reactor facility. The NRC also conducts requalification examinations, as needed, when the staff loses confidence in a facility licensee's ability to conduct its own examinations or believes that the inspection process will not provide the needed insight; the staff did not conduct any requalification examinations during FY 1996.

On August 14, 1991, the NRC amended 10 CFR Part 55 to make the facility licensee's fitness-for-duty requirements a condition of each operator's license. During FY 1996, the NRC received nine reports of licensed individuals exceeding their facility licensee's cutoff levels for drugs or alcohol. The NRC reviews these reports and the implementation of the facility's fitness-for-duty program.

The NRC is continuing to monitor the performance of the utilities' certified and approved simulation facilities to ensure that they remain acceptable for the conduct of operating tests in accordance with 10 CFR Part 55. As of September 1996, the staff's observations during the conduct of NRC licensing examinations and requalification inspections and its evaluations of the facility licensees' quadrennial simulator performance test reports have not resulted in the loss of certification for a facility.

The NRC is continuing its efforts to revise the operator licensing program in response to resource reductions and industry input. The following actions were either accomplished during FY 1996 or are in progress:

1. The NRC is considering a possible change to 10 CFR Part 55 that will require power reactor facility licensees to prepare the initial operator licensing written examinations and operating tests in accordance with the guidance in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors." The facility licensees will also administer and grade the written examinations in accordance with this same report. The NRC will remain actively engaged in the examination process to ensure that acceptable levels of effectiveness, objectivity, and independence are maintained. NRC examiners will review the proposed examinations in detail to verify that they conform with the applicable guidelines; they will ensure that changes are made as necessary to bring the examinations into conformance; they will continue to administer and grade the operating tests; and they will review the written examination results after they are graded by the facility licensee. The NRC will continue to issue or deny operator licenses based upon the qualifications and competence of the license applicants. The proposed change is part of NRC's continuing efforts to streamline the functions of the Federal Government consistent with Administration initiatives and to accommodate anticipated resource reductions, including the elimination of contractor support in the operator licensing area.

From October 1995 through April 1996, the NRC confirmed the effectiveness of the revised examination process by reviewing, approving, and administering 22 pilot examinations; a total of 146 license applicants were

tested. The facility licensees prepared the examinations in accordance with the existing procedures in NUREG-1021, using supplemental instructions provided by NRR. The pilot examinations prepared by facility licensees in accordance with NRC guidelines, and subject to review, revision where appropriate, and approval by NRC staff examiners, were generally consistent with examinations prepared by NRC or contract examiners. The examinations also appeared to be equally effective at identifying applicants who had not mastered the job requirements well enough to become licensed ROs or SROs. Although some of the pilot examinations required significant rework to bring them up to NRC standards, the NRC expects that the quality of the draft examinations will improve as facility licensees gain experience and become more familiar with the NRC's requirements and expectations.

Since completing the pilot examinations, the NRC has revised the guidance in NUREG-1021 to integrate the supplemental pilot examination criteria, to incorporate lessons learned during the pilot examinations, and to assimilate public and industry comments submitted in response to a *Federal Register* notice. The NRC plans to implement the revised examination process on a voluntary basis until 10 CFR Part 55 can be revised to require all power reactor facility licensees to prepare the initial operator licensing examinations.

2. In April 1996, the NRC issued Revision 2 to Regulatory Guide (RG) 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations." The RG endorses ANSI/ANS-3.5-1993, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," subject to a number of clarifications and exceptions.

SAFETY AND REGULATORY ISSUES

The NRC's policy is to have an effective, coordinated program to systematically review operating

experience of the nuclear power industry in accordance with regulations and to communicate the lessons learned. The NRC operational safety data review program ensures that program and regional offices maintain a coordinated and efficient capability to collect, review, and analyze operational and occupational data as related to radiation safety, including identification of potential generic issues, and establishes responsibilities for tracking and resolving potential generic safety issues, as they relate to the functional responsibilities of each office.

Operational safety data are reported to or identified by NRC in the conduct of authorized activities. Sources of data include LERs; inspection reports; component failure reports; preliminary notification of significant operating events; 10 CFR Part 21 reports; industry reports; reports on operational, safeguards, and security events; and reports of operational experience at foreign facilities. Operational safety data do not include economics or data associated with routine operations such as normal occupational radiation exposure or effluent releases. Annually, approximately 8,000 to 10,000 reports are reviewed in the reactor program area.

Operational safety data are screened for safety significance and generic implications. The screening is performed principally by the events assessment staff in NRR with support from the Regional Offices, AEOD, and NRR technical branches. Issues identified as potentially generic are evaluated by a review panel of members possessing expertise in event evaluation, risk assessment, and human factors. Technical experts on the particular subjects contribute to the panel's deliberations. Based on these reviews, a regulatory response is adopted that might include further analysis, preparation of a generic communication (either for information or requiring some action), or closeout with no further action. In 1996, about 400 issues were identified for followup efforts.

Feedback of operational and occupational experience consists of implementing the actions that are identified through analysis to maintain or improve licensees' safety and safeguards activities and NRC regulatory programs. Followon measures may include collection of additional relevant information and recommendations for immediate or long-term changes. Specific followon action may involve changes in facility operations or procedures; modifications to the facility components, systems, or

structures; improvements in operator or staff training; changes in regulations or regulatory guides; changes in licensing review procedures or criteria; changes in the inspection program; changes in research and risk assessment activities; or the issuance of a generic communication. These actions are subject to and consistent with NRC controls on imposition of regulatory requirements. In addition, for those generic communications in which the staff states a new position or through which the staff seeks additional licensee commitments (excluding rulemaking, orders, or urgent matters), the public is provided an opportunity to comment on the proposed generic communication.

The number and types of generic communications issued by the NRC in 1996 are shown in Figure 1.

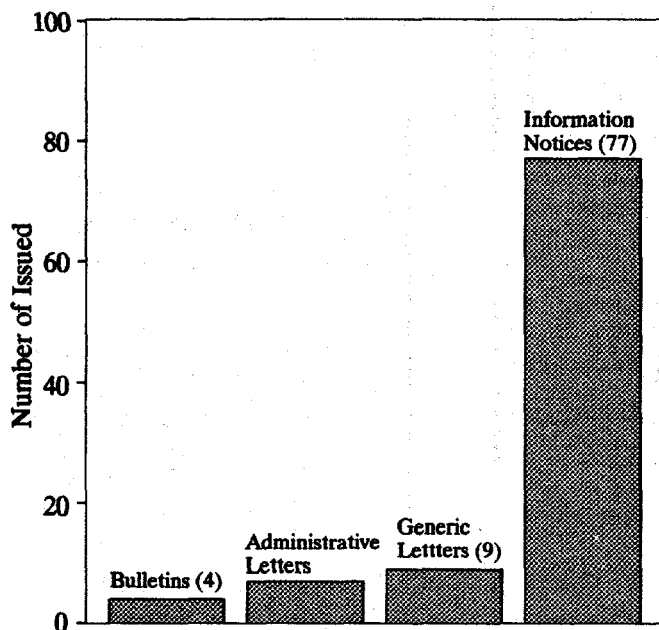


Figure 3.1 Generic Communications Issued in 1996

A detailed status of significant safety and regulatory issues for 1996 is given in the following paragraph.

Implementation Status of Safety Issues

The NRC tracks the status of the implementation and verification of actions involving major safety issues that affect multiple facilities, including the Three Mile Island (TMI) Action Plan requirements,

unresolved safety issues (USIs), generic safety issues (GSIs), and all other multiplant actions (MPAs). More than 99 percent of the TMI Action Plan Requirements, about 96 percent of the USIs, about 99 percent of the GSIs, and about 89 percent of the other MPAs had been implemented at the 110 operating plants as of January 31, 1997. The addition of 10 new MPAs since September 1995 has reduced the implementation completion percentage from 92% in 1995 to 89% in 1996. In addition, in 1996 Watts Bar 1 received its operating license and Browns Ferry 3 was restarted after a long-term shutdown. Although Browns Ferry 1 remains in a long-term shutdown, it has an operating license and the status of its safety issues is now included in the implementation status.

Effects of Electric Industry Deregulation on Nuclear Power Plants

The Public Utility Regulatory Policies Act of 1978 and the Energy Policy Act of 1992 opened the way for a number of State Public Utility Commissions (PUCs) and the Federal Energy Regulatory Commission (FERC) to initiate actions leading to the deregulation of the electric utility industry. The industry is moving away from traditional rate-based regulation toward increased competition. This move could potentially have profound impacts on the long-term ability of NRC's power reactor licensees to obtain adequate funds to operate and to decommission their plants safely. Although the NRC is not normally involved in economic or rate regulation, we have recognized over the years a possible relationship between access to capital and safety of operations. While there is much evidence that an efficiently operated facility is a safe facility, the NRC must be increasingly vigilant to ensure that economic pressures do not result in a degradation in safety at operating plants.

The NRC needs to ensure that adequate provision is made for decommissioning funding whether nuclear plants operate to the end of their license terms or are shut down prematurely. In addition, given the potential for significant early recapture of capital investment and reduced access to rate-payers that deregulation may engender for nuclear

power reactor licensees, some increase in financial qualifications monitoring may be appropriate as electric utilities are deregulated. The NRC needs to be apprised in a timely manner of any potential changes to ownership or control of licensed facilities that could affect safety or NRC safety oversight and whether significant changes in the organizational and financial support for each plant are contemplated.

During FY 1996, the NRC initiated a re-evaluation of its policies for decommissioning funding and other financial issues affecting NPPs. The staff developed a comprehensive action plan to provide a framework for this re-evaluation. One element of the action plan was to issue an advance notice of proposed rulemaking (ANPR) in April 1996, seeking additional information on electric utility restructuring and comments on additional measures to ensure adequate decommissioning funding. Forty-two parties submitted comments on the ANPR. The NRC is developing a proposed rule to address issues raised in the ANPR.

The NRC also issued a draft policy statement for public comment in September 1996 on specific actions planned in response to deregulation initiatives. This guidance included (1) a discussion of safety concerns with respect to electric utility deregulation; (2) a discussion of the current regulatory framework with respect to the conduct of financial qualifications, antitrust, and decommissioning funding assurance reviews for the mergers, holding companies, and other restructurings seen so far; and (3) a discussion of the planned approach to future reviews as rate deregulation accelerates. These actions will include possible rule changes to NRC regulations covering evaluation of transfers of control, which are perceived to include asset transfers and restructurings. As another part of this second issue, the NRC is evaluating its responsibilities vis-a-vis State and Federal rate regulators and the NRC view of the responsibilities of co-owners of nuclear plants. The NRC also developed draft standard review plans on financial qualifications, decommissioning funding assurance, and antitrust review processes.

The NRC recognizes the role of PUCs and FERC in rate matters, but also recognizes that the NRC must meet its statutory mandate to protect public health and safety. The agency has actively pursued

increased contacts with the PUCs through the National Association of Regulatory Utility Commissioners, with FERC, and with the Securities and Exchange Commission to broaden areas of cooperation where our interests and responsibilities overlap.

Because of the complexity of new business arrangements that have been proposed or discussed and because of NRC's concern about the timing of asset divestiture in relation to rate deregulation, the NRC took a more proactive role in informing licensees of their obligation to report new ownership arrangements, issuing an administrative letter to utility chief executive officers on June 21, 1996. Where appropriate, the NRC will seek additional information to determine whether licensees remain electric utilities as the NRC defines that term, or conversely, whether some mechanism is needed to ensure decommissioning fund collection.

Application of Revised Source Term for Operating Reactors

Regulatory guidance on accident source terms was originally published in 1962 by the U.S. Atomic Energy Commission in Technical Information Document (TID) 14844, "Calculation of Distance Factors for Power and Test Reactors." The source term is used to characterize the postulated release of fission products from the core of a light-water reactor into the containment atmosphere during an accident. This source term is used in conjunction with containment performance characteristics and other engineered safety features to evaluate the radiological consequences of design basis accidents (DBAs) to determine compliance with various requirements in 10 CFR Parts 50 and 100.

The staff's methods for calculating accident doses (RGs 1.3 and 1.4 and NUREG-0800) were developed to be consistent with the TID-14844 source term (TID source term) and the whole-body and thyroid dose acceptance criteria (10 CFR Parts 50 and 100 and NUREG-0800). Doses are calculated at the exclusion area boundary (EAB) for the first 2 hours and at the low population zone (LPZ) for the course of the accident, which is assumed to continue for 30 days. This regulatory framework

provided a consistent analytical approach for evaluating the potential consequences from DBAs.

During the past three decades, significant advances were made in understanding the timing, magnitude, and chemical form of fission-product releases from NPP accidents. NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," presents a representative accident source term for a BWR and for a PWR. For DBAs, the revised source term is comparable to the TID source term; however, it contains a more realistic description of release timing and radionuclide composition. The revised source term describes different release fractions of core inventory, chemical and physical forms of important species, and natural removal processes that reduce the quantity of radioactive material that may be released to the environment.

The revision to 10 CFR Parts 50 and 100 for the consideration of new plant designs and new sites was developed to accommodate updated source term and radiobiological insights (issued as a final rule on December 11, 1996; 10 CFR Parts 21, 50, 52, 54, and 100; *Federal Register*, Vol. 61, No. 239). The staff developed a new regulatory framework to apply the revised source term to the advanced plant Westinghouse AP600 standard design.

The new regulatory framework accounts for the change in fission product behavior of the revised source term by assessing all of the radionuclides in the dose calculation and identifying the 2-hour period that produces the highest dose at the EAB. The dose at the LPZ is still calculated from plume passage over the course of the accident. Also, radiological doses are calculated using the total effective dose equivalent (TEDE) methodology from 10 CFR Part 20, which considers the effects of doses to all body organs. The calculated doses are compared to a dose acceptance criterion of 25-rem TEDE for offsite doses. This approach provides a coherent regulatory framework for evaluating the radiological consequences of DBAs using the revised source term.

The existing analytical approach based on the TID source term continues to be adequate to protect public health and safety. Therefore, the staff will not require that operating plants reanalyze DBAs using the revised source term. However, many licensees are interested in using the revised source

term in analyses to support operational flexibility and cost-saving measures. The staff continued to discuss the proposed implementation plan with industry in a series of public meetings. Several licensees have submitted pilot plant applications proposing to use updated source term insights.

Review of Department of Energy's Proposal for Tritium Production in Commercial Light-Water Reactors

In May 1996, the Chairman and the Secretary of Energy signed a joint MOU between the DOE and the NRC establishing the basis for NRC review and consultation of DOE's possible use of commercial LWRs for the production of tritium. Tritium is an essential material in U.S. nuclear weapons that decays at a rate of approximately 5 percent a year (a 12.3-year half-life).

The MOU recognized that the use of commercial reactors to produce tritium is subject to an additional set of issues concerning the use of civilian commercial reactors for purposes that support military requirements. The MOU states that "The manner in which these concerns are resolved and a final determination on the mode of tritium production chosen will not involve NRC technical or policy review and is not [the] subject of this memorandum."

DOE is responsible for establishing the capability to produce tritium by the end of 2005 in accordance with a Presidential decision directive. DOE has selected a dual-path strategy to meet the schedule. One path is the accelerator production of tritium. If DOE adopts an accelerator design utilizing a tungsten target (as is currently contemplated), the Commission does not have statutory authority to regulate this option. The NRC is responsible for regulating production and utilization facilities (as defined by the Atomic Energy Act, as amended) and possession and use of byproduct and special nuclear material.

The other path is one that would require NRC oversight. DOE proposed to produce tritium in commercial LWRs, either through acquisition of reactors under Government ownership or by

contracting for target irradiation services under private ownership. DOE is preparing topical reports for both a lead-test assembly (LTA) phase and a production phase. The staff will review the topical reports, prepare safety evaluations, and consult with the Commission before safety evaluation issuance. A series of public meetings is planned to provide for public comment regarding the technical issues associated with LTA radiation and to ensure that the public is aware of the staff's review activities early in the evaluation process. Additional public meetings are planned in the vicinity of the host facility before loading LTAs into the core and inserting the target assemblies in any particular NRC-licensed facility. Should DOE choose to purchase (acquire) a reactor outright, additional license transfer issues may be involved in the staff's review. The staff will consult with the Commission and provide additional information regarding any licensing and staff resource implications if DOE chooses this option.

Regardless of whether the commercial reactor option or the accelerator operation is selected as the primary approach for tritium production, DOE intends to complete confirmatory testing and fabricate the first core load of targets during the years 2002 and 2003. Irradiation, cooling, and shipment of the irradiated targets is scheduled during the years 2004 and 2005 to support the Presidential decision directive that calls for extraction operations to begin (probably at Savannah River) by the end of 2005. Extraction would take place at Savannah River and would not involve oversight by NRC.

Under the terms of the MOU, NRC will provide review and consultation to assist DOE in assessing and resolving technical and licensing issues associated with commercial LWR production of tritium (including reactor safety, physical security, security clearance, and environmental issues) to support a Secretarial decision on the primary and backup tritium production approaches in late 1998.

Action Plan for 10 CFR 50.59

Section 59 in Part 50 of Title 10 of NRC regulations was promulgated in 1962 to describe the circumstances under which licensees may make

changes to their facility (or make changes to procedures or conduct tests and experiments) without prior NRC approval when the change does not involve the Technical Specifications or an unreviewed safety question. Licensees are required to periodically submit information related to changes made in accordance with 10 CFR 50.59. The NRC monitors each licensee's processes for implementing the requirements in this section. In an October 1995 memorandum, Chairman Jackson raised a number of questions concerning implementation of 10 CFR 50.59 and NRC oversight and proposed a systematic reconsideration and reevaluation of the process. During FY 1996, the staff developed short-term guidance and developed a long-term action plan to identify actions to be undertaken to improve both the licensee's implementation and the NRC staff's oversight of this process. Implementation of the plan will continue in FY 1997.

Adequacy and Availability of Design Bases Information

During FY 1996, NRC's findings during inspections and reviews identified broad programmatic weaknesses that resulted in design and configuration deficiencies at a few plants that could impact the operability of required equipment. These inspections and reviews also highlighted numerous instances in which timely and complete implementation of corrective action for known degraded and nonconforming conditions and for past violations of NRC requirements had not been evident. As a consequence of this information, the NRC believed that the industry's voluntary efforts to improve and maintain design bases information for their plants have not been effective in all cases.

The magnitude and scope of the problems that the NRC staff has identified raised concerns about the presence of similar design, configuration, and operability problems and the effectiveness of QA programs at other plants. Of particular concern was whether licensee programs to maintain configuration control at plants licensed to operate were sufficient to demonstrate that plant physical and functional characteristics were consistent with, and were being maintained in accordance with, their design bases. The extent of the licensees' failures to maintain control and to

identify and correct the failures in a timely manner was of concern because of the potential impact on public health and safety should safety systems not respond to challenges from off-normal and accident conditions.

The NRC's position has been, and continues to be, that it is the responsibility of individual licensees to know their licensing basis, to have appropriate documentation that defines their design bases, and to have procedures for performing the necessary assessments of plant or procedural changes required by NRC regulations. Therefore, in October 1996, the NRC issued a letter to each utility with power reactors licensed to operate that required information that would provide the NRC added confidence and assurance that its plants are operated and maintained within the design bases and that any deviations are reconciled in a timely manner. The following information was required for each unit.

1. Description of engineering design and configuration control processes, including those that implement 10 CFR 50.59, 10 CFR 50.71(e), and Appendix B to 10 CFR Part 50;
2. Rationale for concluding that design bases requirements are translated into operation, maintenance, and testing procedures;
3. Rationale for concluding that system, structure, and component configuration and performance are consistent with the design bases;
4. Process for identification of problems and implementation of corrective actions, including actions to determine the extent of problems, action to prevent recurrence, and reporting to NRC; and
5. The overall effectiveness of current processes and programs in concluding that the configuration of each plant is consistent with the design bases.

The NRC expects to receive this information and start its review in early 1997. Inspection resources will also be directed toward the engineering and design areas.

Nuclear Safety Assistance to Russia and Ukraine

Under the Lisbon Accord discussed broadly under the Office of International Programs, NRR initiated a program of assistance to the regulatory agencies of Russia (Gosatomnadzor [GAN]) and Ukraine (Ministry of Environmental Protection and Nuclear Safety [MEPNS]) to develop and implement regulatory tools. The program encompassed the areas of Licensing Basis and Safety Analysis, Inspection Programs, and Fire Protection.

The 1996 Licensing Basis and Safety Analysis activities covered both consultation and classroom training on licensing documents and regulatory processes, safety analysis, quality assurance, beyond design basis accident analytical methodologies, and the development of inspection procedures. Classroom training was also provided in onsite inspection for core calculations, radiation safety, operational modes, engineering safety, and research reactors.

The 1996 inspection program included onsite activities such as inservice and engineering inspection and Systematic Assessment of Licensee Performance (SALP) activities at Headquarters, in the Region, and at the reactor site.

The fire protection activities are scheduled to begin in 1997 and will include a workshop and seminar to develop GAN fire protection requirements and regulations and a review of MEPNS post-fire safe-shutdown inspection procedures and regulations, and post-fire safe-shutdown inspection observation in the United States.

Core Performance

On the basis of current generic fuel and core performance issues and related evaluations of fuel failures, the staff developed an action plan for a proactive approach to monitor and improve core performance in operating reactors. The resulting core performance action plan involves staff reviews of fuel fabrication, core design, and reload analysis issues. The staff evaluates generic fuel and core performance issues, performs evaluations of fuel

and control rod performance problems, plans and leads inspections of fuel and core component vendors, and participates in licensee and reactive inspections.

The staff assesses the impact of reload core design activities on plant safety through inspections of fuel vendor reload design analyses and manufacturing, evaluation of licensee reload analysis capabilities, and independent evaluation of core performance indicators, in coordination with regional inspections. The evaluation of individual vendors occurs through performance-based inspections of reload core design, safety analysis, and licensing processes and of fuel assembly mechanical design and fuel fabrication activities. The performance of licensees that conduct reload core analysis functions or oversee the vendor reload core design process is evaluated through inspection of the vendor-licensee interface. Generic issues are identified, documented, and categorized as core performance problems by root-cause evaluations. The staff issues generic communications, revisions of regulatory guidance, and enhanced guidance for regional inspectors to improve awareness of these issues. Emergent issues, including the failure of control rods to fully insert and extended cycle/burnup concerns, have resulted in the staff's expanding the scope of the action plan to include adequacy of vendor lead testing and surveillance programs for new fuel designs.

Eight vendor inspections have been completed since 1994, with multi-disciplined NRC staff teams and contracted technical assistance. The staff completed inspections at the GE Nuclear Engineering Plant and Framatome Cogema Fuels in FY 1996. An evaluation of a distinctive crud pattern with associated fuel cladding failures, observed at Three Mile Island Unit 1, was also performed at General Public Utilities and Framatome.

In October 1996, the staff conducted a workshop on current core performance issues in which industry participated. Staff activities are continuing to capture and address early warning of emerging issues, with 10 licensee/plants and 5 vendor LTA program inspections planned, in addition to region-led licensee inspections. The staff plans to complete two remaining issue-driven vendor inspections involving the ABB-Combustion Engineering Nuclear Operations supply of a trans-

ition core reload for Washington Nuclear Power Unit 2 and a comprehensive re-inspection of Siemens Power Corporation to help resolve open and emergent issues.

Risk-Informed Regulatory Approaches

The staff continued to implement the Commission's Final Policy Statement on the Use of Probabilistic Risk Assessment in Nuclear Regulatory Activities (60 FR 42622; August 16, 1995). Background on the PRA Policy Statement and the PRA Implementation Plan were provided in the 1995 Annual Report. During 1996, the staff continued to work on and complete activities described in the PRA Implementation Plan, including the review of several ongoing PRA pilot programs in the areas of graded QA, risk-informed inservice testing, risk-informed inservice inspection, and risk-informed technical specification improvements. These PRA pilot programs are scheduled to be completed by FY 1998.

The purposes of the PRA pilot programs are to develop, test, and validate risk-informed methodologies and to develop guidance documents for risk-informed regulatory applications. The Commission has assigned a high priority to developing risk-informed regulatory guidance. The staff completed working drafts of the guidance documents for most of the pilot applications and held initial meetings with the Advisory Committee on Reactor Safeguards and the Committee To Review Generic Requirements. Revised draft guidance documents are scheduled to be published for public comment in early 1997.

In March 1996, the staff identified several emerging policy issues related to implementing risk-informed regulation. In September 1996, the staff developed options and recommendations for resolving the policy issues (SECY-96-218). The Commission is expected to provide guidance on these policy issues in January 1997.

The staff completed its review of Individual Plant Examinations (IPEs) and developed a report summarizing the results of the IPE program and providing staff perspectives on reactor safety and plant performance. The staff is evaluating the IPE

insights to determine necessary followup activities, including the identification of possible safety enhancements.

Shutdown and Fuel Storage Pool Operation

Following the publication in the *Federal Register* (59 FR 53707-52714) on October 19, 1994, of a proposed rule regarding shutdown and low-power operations, the NRC staff analyzed 1,023 comments on the proposed rule. The comments identified significant operational and cost implications associated with the rule, which was intended to address risk-significant issues associated with a series of events that occurred at nuclear plants during shutdown operation. As a result of the public comments, the NRC staff decided to revise the rule and again publish the rule for public comment in a form that was both more risk-informed and more performance-oriented.

During 1995 and 1996, the staff held a series of public meetings to ensure that a subsequent proposed rulemaking would more completely reflect the insights available from the public and the industry. On June 11, 1996, the staff placed a copy of a work-in-progress version of the rule in the NRC Public Document Room, which contained language extending coverage to include the fuel storage pool. The fuel storage pool was considered for addition to the rule because of the parallel functions that must be satisfied to protect irradiated fuel whether it is located in the reactor vessel or an adjacent storage pool.

Currently, the staff is preparing a rulemaking package that will include a revised rule, a corresponding regulatory guide, and an improved regulatory analysis. The revised rule will have a structure that establishes safety requirements and requires licensees to set performance criteria that satisfy those safety requirements. The rule will also require licensees to have a backup capability for responding to events that interrupt or degrade shutdown cooling and to make reports to the NRC for more serious events. Within the context of the licensee-established performance criteria, a wide range of operational latitude is permitted with little regulatory burden. The portion of the rule

under consideration for the fuel storage pool provides licensees with the option of maintaining existing procedures or adopting a performance-based alternative with a structure similar to the shutdown operations rule. The NRC plans to publish this revised rule in the *Federal Register*, along with a statement of consideration in 1997.

Loss of Spent Fuel Pool Cooling Function

The NRC staff has been evaluating concerns related to sustained losses of spent fuel pool cooling and reassessing the potential for substantial losses of coolant inventory from spent fuel pools. These activities have been managed through the staff's action plan for spent fuel storage pool safety. The 1993, 1994, and 1995 NRC Annual Reports provide background regarding the development of these issues and past NRC review activities related to these issues.

The NRC staff has identified particular design features and administrative controls important to the prevention and mitigation of loss of spent fuel pool cooling and loss of spent fuel pool coolant inventory events. To address concerns that an evaluation of any subset of operating reactor sites may miss risk-significant variations in design features and operating practices, the staff conducted a technical review of spent fuel pool design and operational and licensing basis information for all operating reactor sites.

The results of the licensing basis review indicated that the spent fuel pool operating practices of some licensees had been inconsistent with the licensing basis. However, during the course of the review, these licensees committed to complete or took specific actions to ensure that subsequent spent fuel pool operations would be consistent with the licensing basis of their facilities. The NRC staff has been considering the addition of fuel storage pool operation to the rulemaking for shutdown operation, which will propose a risk-informed rule with performance elements.

The results of the design review indicated that existing structures, systems, and components related to storage of irradiated fuel in spent fuel pools, combined with existing broad-scope regula-

tory controls, provide adequate protection for public health and safety. However, the staff identified several specific design features at operating reactors that warrant further evaluation. The staff intends to perform site-specific evaluations at the small number of operating reactors possessing each design feature to determine whether regulatory action to modify the design or operation of these facilities is justified. The results of these evaluations will be considered in the planned revision to NRC guidance for licensing reviews of spent fuel pool cooling systems.

Emergency Core Cooling System Strainer Blockage in Boiling-Water Reactors

The NRC staff continues to address concerns regarding clogging of ECCS suction strainers. The 1995 Annual Report provides background regarding the development of these issues and past NRC activities related to this issue.

In September 1995, the licensee at Limerick Unit 1 experienced flow oscillations occurring in the residual heat removal system that were subsequently determined to be caused by flow blockage and reduction in net positive suction head as a result of fibrous foreign material and corrosion product buildup on the surface of the suction strainers. In response to the event, the NRC issued NRC Bulletin 95-02 on October 17, 1995. This bulletin requested that licensees determine the operability of their ECCS and other pumps that draw suction from the suppression pool while performing their safety function. The bulletin requested that licensees evaluate suppression pool and suction strainer cleanliness and the effectiveness of foreign material exclusion practices. The staff has reviewed the responses from every addressee and is currently discussing the responses with these licensees.

On May 6, 1996, the staff issued NRC Bulletin 96-03, which requested that addressees implement appropriate procedural measures and plant modifications to minimize the potential for clogging of ECCS suppression pool suction strainers by debris generated during a loss-of-coolant accident

(LOCA). The bulletin discussed three options to resolve the issue by ensuring the capability of the ECCS to perform its safety function following a LOCA. These options include the installation of a large-capacity passive strainer, installation of a self-cleaning strainer, or installation of a safety-related backflush system. The latter two options would rely on an active system to remove debris from the surface of the strainer. The licensees were requested to complete the actions requested by the bulletin by the end of the first refueling outage starting after January 1, 1997.

Since 1994, the staff has discussed the resolution of this issue on a continuing basis with the BWR Owners Group (BWROG). Both the staff and the BWROG have performed tests and analyses to provide insight into this issue. The staff has issued two reports on the results of experiments conducted at Alden Research Laboratory, Inc. These reports are NUREG/CR-6368, "Experimental Investigation of Sedimentation of LOCA-Generated Debris and Sludge in BWR Suppression Pools," published in December 1995, and NUREG/CR-6367, "Experimental Study of Head Loss and Filtration for LOCA Debris," published in February 1996.

The BWROG has published the results of its work, along with proposed methods for resolving this issue, in NEDO-32686, Rev. 0, "Utility Resolution Guidance for ECCS Suction Strainer Blockage," which will be submitted for NRC review. NEDO-32686, Rev. 0, is intended to establish design criteria for strainer debris loadings to satisfy the requested actions of NRC Bulletin 96-03. The staff expects that NRC Bulletin 96-03, together with the NRC and industry research and development work, will resolve the issue of BWR strainer blockage caused by LOCA-generated debris.

Recent events indicate an ongoing need to ensure that foreign material capable of clogging or damaging BWR ECCS strainers or PWR ECCS sumps is adequately controlled.

Fire Protection

Following extensive investigation of a fire at the Browns Ferry (Alabama) NPP in 1975, the Commission, in 1981, issued a fire protection rule (10 CFR 50.48) which licensees could satisfy by,

among other acceptable means, installing fire barriers. In 1981, licensees began installing Thermo-Lag 330-1 fire barriers and, by 1991, Thermo-Lag fire barriers were installed in most plants.

In 1991, the NRC received information that raised questions as to the adequacy of Thermo-Lag as an effective fire barrier. In 1992, the staff concluded that the fire-resistance ratings and ampacity derating factors (lowering the current-carrying capacity of cables, taking into account the insulating effects of the fire barrier) for Thermo-Lag were indeterminate. The staff also found that some evaluations of test results and some procedures for installing Thermo-Lag were inadequate. Later, beginning in 1992, tests of Thermo-Lag fire barriers conducted by the nuclear industry and the NRC staff demonstrated that certain Thermo-Lag fire barrier configurations did not provide the level of fire resistance needed to satisfy NRC fire protection requirements. The staff incorporated these and other issues into an action plan to ensure that the issues are tracked, evaluated, and resolved. The staff has completed the action plan and has shifted its focus from the generic issues to plant-specific corrective action programs. For the short term, licensees have addressed the fire endurance problem by implementing compensatory measures, such as fire watches, where the Thermo-Lag is installed. Long-term actions may range from barrier upgrades and repairs to complete replacement of some barriers. Additional plant-specific analyses may also be required to resolve the ampacity derating problem. Regulatory action and coordination with the industry will continue until the technical and programmatic issues in the staff's action plan have been resolved.

In 1992, the staff also informed the Commission that it would reassess the NRC reactor fire protection program to (1) determine if the program had appropriately addressed the safety issues, (2) determine if licensees are maintaining compliance with the NRC fire protection requirements, (3) identify the strengths and weaknesses of the program, and (4) recommend improvements. The staff issued its "Report on the Reassessment of the NRC Fire Protection Program" on February 27, 1993. In response to this report, the staff has developed the framework for future direction of the NRC fire protection program with emphasis on a new fire protection functional inspection (FPFI) program.

The FPFI program will provide a strong, broad-based, and coherent inspection program that is commensurate with the safety significance of the subject and that will help ensure licensee compliance with NRC fire protection regulations and commitments. Benefits of the FPFI program include focusing NRC fire protection and support staff resources on the fire protection issues of most importance (such as licensee control of the fire protection design and licensing bases), providing clear guidance to the staff and the nuclear industry about NRC oversight of licensee reactor fire protection programs, and improving the consistency of internal NRC oversight of the program. The program will also provide an immediate safety benefit arising from renewed industry attention to NPP fire safety.

The FPFI program consists of a pilot program followed by a permanent program. The pilot program, which will begin during the first quarter of calendar year 1997, will consist of four pilot inspections (one per region) conducted in series over a 1-year period. The permanent program, as currently envisioned, will consist of four to eight NRC team inspections (one or two per region) per year. The FPFIs will be led by NRR with regional support.

Age-Related Degradation of BWR Internals

Many BWR vessel internals are made of materials susceptible to intergranular stress-corrosion cracking (IGSCC), including stainless steel, Alloy 600, Alloy X750, and Alloy 182 weld metal. Background on IGSCC, the construction and functions of the core shroud, and staff activities regarding BWR vessel internals were provided in the 1993, 1994, and 1995 Annual Reports. Since 1988, the NRC staff has been meeting every year with the BWROG and GE, and later, with the Boiling Water Reactor Vessel and Internals Project (BWRVIP) to review the generic safety implications of reactor internals that are considered to be susceptible to IGSCC.

Significant circumferential cracking of the core shroud was discovered at the Brunswick Unit 1 (North Carolina), Dresden Unit 3 (Illinois), Quad Cities Unit 1 (Illinois), Oyster Creek (New Jersey) and Vermont Yankee (Vermont) nuclear stations.

In light of the extent of cracking observed at these plants, the staff evaluated potential safety concerns associated with the possibility of a 360-degree circumferential separation of the shroud following a postulated LOCA. The staff's evaluation considered the potential for separation of the shroud during postulated accidents either to prevent full insertion of the control rods or to open a gap large enough to preclude the ECCS from fulfilling the intended safety functions. The staff concluded that core shroud cracking did not pose a high degree of risk for the short term and that immediate plant shutdowns were not warranted for inspections. However, the staff concluded that in the long term, appropriate inspections and repairs should be implemented.

On July 25, 1994, the NRC issued GL 94-03, which requested BWR licensees to inspect their core shrouds by the next outage and to justify continued safe operation until inspections could be completed. To date, all BWR licensees with shrouds that are highly or moderately susceptible to IGSCC have performed comprehensive inspections or have implemented repairs of their core shrouds. These repairs are designed to ensure the structural integrity of the core shrouds based on an assumption that the shroud circumferential welds are completely cracked. The repairs are being reviewed by the NRC staff on a case-by-case basis.

In the spring of 1994, the industry formed the BWRVIP to address the issue of age-related degradation of BWR internals. The BWRVIP is headed by several high-level utility executives to ensure that top executives in the industry are aware of its function, purpose, and efforts. Since its founding, the BWRVIP has submitted to the NRC a series of generic documents addressing technical issues related to the resolution of IGSCC in BWR internals. These documents include an integrated safety assessment of the issue, guidelines on performing nondestructive examinations (NDEs) of core shroud welds, guidelines on inspection scopes for reactor internals, and generic guidelines and acceptance criteria in regard to performing flaw evaluations and repairs of BWR core shrouds. The NRC staff has approved the BWRVIP generic repair criteria document, the latest revision to the BWRVIP guidelines regarding core shroud inspection scopes and flaw evaluations, and the BWRVIP guidelines regarding core shroud NDE

methods. The staff is currently reviewing the other BWRVIP submittals.

In March 1996, the NRC staff issued NUREG-1544, "Status Report: Intergranular Stress Corrosion Cracking of BWR Core Shrouds and Other Internal Components." The report provides a historical perspective of the BWR core shroud cracking issue and summarizes the actions taken by the staff and the BWR licensees to address the core shroud cracking issue.

Environmental Qualification of Electric Equipment

A review of environmental qualification (EQ) requirements for license renewal and failures of qualified cables during research tests led to the development of the EQ Task Action Plan (TAP), which was issued in July 1993. The EQ TAP was developed to address—

1. Staff concerns relative to the differences in EQ requirements for older and newer plants,
2. Concerns raised by research tests indicating that qualification of some electric cables may have been non-conservative, and
3. Concerns that programmatic problems might exist in the NRC EQ Program.

The EQ TAP is intended to resolve these concerns through meetings with industry, EQ program review, data collection and analysis, risk assessment, and research on aging and condition monitoring. Additional background information regarding the TAP was provided in the 1993, 1994, and 1995 Annual Reports.

Since the development of the EQ TAP, the staff has met several times with the public, including NEI, the Nuclear Utility Group on Equipment Qualification, the Electric Power Research Institute (EPRI), and licensees to discuss activities under the EQ TAP. In August 1996, RES sponsored a public meeting to discuss the results of NUREG/CR-6384, "Literature Review of Environmental Qualification of Safety-Related Electric Cables," Vols. 1 and 2, which was published in April 1996. Publishing NUREG/CR-6384 completed the data collection and analysis portion of the EQ TAP.

The literature review evaluated existing documentation to determine which specific EQ TAP concerns could be resolved by existing research. The results of this review were used to modify the scope of research being performed under this action plan.

The staff is currently reviewing the results of all information gathered to date under the EQ TAP and is preparing a paper to the Commission to address the differences that exist in EQ requirements between older and newer plants. The paper is expected to be issued in early FY 1997.

Research to evaluate uncertainties associated with accelerated aging methodologies and to investigate certain promising cable condition monitoring techniques began in May 1996. Baseline measurements of certain cable properties have been taken, and accelerated aging of the samples is scheduled to begin in November 1996 and continue throughout FY 1997.

Performance of Motor-Operated Valves

On June 28, 1989, the NRC staff issued GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," as a result of poor experience with the performance of motor-operated valves (MOVs) in nuclear power plants. In GL 89-10, the staff requested that licensees ensure the capability of MOVs in safety-related systems by reviewing MOV design bases, verifying MOV switch settings initially and periodically, testing MOVs under design basis conditions where practicable, improving evaluations of MOV failures and necessary corrective action, and developing trends from MOV data. The staff requested that licensees complete the GL 89-10 program within approximately three refueling outages or five years from the issuance of the generic letter. Since 1989, Supplements 1 through 7 to GL 89-10 were issued to provide supplemental information and clarify GL 89-10 recommendations.

Most NPP licensees have notified the staff of the completion of their programs to verify the design basis capability of safety-related MOVs as requested in GL 89-10. The staff has completed

its review for over half the reactor units and will complete its review for most reactor units by the end of 1997.

On September 18, 1996, the staff issued GL 96-05, "Periodic Verification of the Design Basis Capability of Safety-Related Motor-Operated Valves," to request that NPP licensees have and use programs to periodically verify the capability of their safety-related MOVs to perform their safety functions in accordance with their licensing bases. While GL 96-05 was under development, the staff worked with the American Society of Mechanical Engineers (ASME) to develop and issue a code case (OMN-1) to provide improved guidance for periodic testing of MOVs included in the Inservice Testing Programs of the ASME Boiler and Pressure Vessel Code. On March 15, 1996, the staff completed a safety evaluation of the MOV Performance Prediction Program developed by EPRI to predict thrust and torque requirements to operate gate, globe, and butterfly valves. On February 27, 1996, the staff issued a safety evaluation of a methodology developed by BWROG for the use of PRA for prioritizing MOVs in the GL 89-10 program. In GL 96-05, the staff discussed the application of the ASME Code case, EPRI MOV program methodology, and BWROG ranking methodology in the development of long-term MOV programs. The staff also discussed several attributes of an effective MOV periodic verification program.

All licensees have submitted the responses indicating that they will ensure the periodic verification of the design basis capability of their safety-related MOVs. Licensees will be submitting a description of their MOV periodic verification programs in response to GL 96-05 in early 1997. The staff will review the licensee responses and conduct selected inspection activities at some facilities. The staff anticipates completion of its review of the descriptions of the GL 96-05 programs in 1997.

In response to continuing problems with potential pressure locking and thermal binding of gate valves, the NRC issued GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," on August 17, 1995, to request that licensees take actions as necessary to ensure that safety-related power-operated gate valves susceptible to pressure locking or thermal binding are capable of performing their safety functions within the current licensing bases of the facility. All

licensees have submitted responses to GL 95-07 describing their actions to address this issue. The staff is reviewing these submittals and preparing a safety evaluation for each facility. The staff is conducting followup inspections to address specific aspects of the licensee's responses to GL 95-07 at selected facilities. The staff anticipates completion of this review activity in 1997.

The staff continues to monitor the industry's efforts toward resolving the concerns about the performance of MOVs at nuclear plants. The staff is conducting inspections of the implementation of GL 89-10 programs at nuclear plants. The staff provides information to licensees on MOV issues through NRC-sponsored public meetings, participation at industry meetings, and issuance of NRC information notices. In July 1996, the NRC and ASME sponsored a major symposium on valve and pump testing.

Primary Water Stress-Corrosion Cracking

In 1989, primary water stress-corrosion cracking (PWSCC) was identified to the Commission as an emerging issue after leakage was reported from an Alloy 600 pressurizer heater sleeve penetration at Calvert Cliffs Unit 2 (Maryland). Since 1986, other leaks have occurred in several Alloy 600 pressurizer instrument nozzles at both domestic and foreign reactors from several different nuclear steam supplier vendors. In 1991, a leak was discovered in a control rod drive mechanism (CRDM) penetration at the Bugey-3 plant in France. Since the discovery at Bugey-3, many European plants have conducted inspections and identified more cracked penetrations.

In 1992, the NRC staff conducted meetings with the owners groups to discuss the significance of the CRDM leak at Bugey-3 to domestic plants. Evaluations of CRDM nozzles in U.S. reactor vessels showed that they are also susceptible to PWSCC. However, the NRC concluded that the cracking was not safety significant in the short term. The basis for this conclusion was that the cracks are generally short and axially oriented, leakage is expected to occur before catastrophic failure, and visual examination would find leaks.

Degradation of the vessel head by borated water in a crevice area was predicted to occur very slowly; consequently, an event such as ejection of a CRDM would be unlikely. On this basis, the staff concluded that the industry had time to develop automated inspection techniques that would decrease personnel exposure and reliably detect PWSCC in CRDM nozzles.

Inspections had been performed in 1994 and 1995 with cracking found at two plants, Oconee and D. C. Cook (see 1995 Annual Report). Virginia Electric Power Company inspected North Anna Unit 1 during its spring 1996 refueling outage. Some high-stress areas were examined on each outer-ring CRDM penetration, and no indications were observed using eddy current testing.

By letter dated March 5, 1996, NEI submitted a white paper entitled "Alloy 600 RPV Head Penetration Primary Stress Corrosion Cracking," which reviews the significance of PWSCC in PWR vessel head penetrations (VHPs) and describes how the industry is managing the issue. The program outlined by NEI describes a decision tool to be used by PWR licensees to evaluate the probability of a VHP developing a crack or a through-wall leak during a plant's lifetime. This information would then be used by a PWR licensee to evaluate the need to conduct a VHP inspection at its plant.

The NRC staff issued, for comment, a GL to all PWR licensees requesting information regarding inspection activities and a description of the evaluation methods and results used to assess the susceptibility of the CRDM and other vessel head penetrations to PWSCC, including the susceptibility ranking of the plant and the factors used to determine this ranking. Also, the GL requests information related to the potential for resin intrusions that could increase the potential for cracking. Public comments received by the staff are being reviewed.

Reactor Vessel Materials

RPV integrity is essential to ensuring reactor safety. During operation, a reactor vessel is subject to neutron irradiation and, as a result, the fracture resistance of its materials is reduced. The decrease in fracture resistance is measured by an increase in the brittle-to-ductile transition

temperature and a reduction in the Charpy upper-shelf energy (USE).

In 10 CFR 50.60 (a), the NRC requires that licensees for all light-water NPPs meet fracture toughness requirements and have a material surveillance program for the RPV materials that are subject to neutron irradiation. In addition, 10 CFR 50.61 sets limits on the reference temperature for pressurized thermal shock, RT_{PTS} , which is related to an increase in brittle-to-ductile transition temperature.

On the basis of the currently docketed information, the staff has previously concluded that Beaver Valley Unit 1 (Pennsylvania) and Palisades (Michigan) were the only two plants likely to exceed PTS screening limits before their current operating licenses expire, unless mitigative actions are taken. As a result of information obtained by testing material from Palisades' retired steam generators in 1995, the NRC determined that the Palisades RPV would exceed the PTS screening criteria in late 1999, before the end of its operating license in 2007. Similarly, Beaver Valley Unit 1 was projected to exceed the PTS screening limits in 2012, before the end of its operating license in 2016.

In 1996, the licensees for both Palisades and Beaver Valley Unit 1 submitted additional information regarding the neutron fluence of their reactor vessels. The staff was reviewing this information at the end of 1996.

The NRC expects that additional information and analyses and licensee programs to reduce neutron flux will result in changes to the currently predicted RT_{PTS} and USE values. The NRC staff will continue to assess new information as it becomes available. A supplement to NUREG-1511, "Reactor Pressure Vessel Status Report," was issued in 1996, and additional supplements will be issued as new information and evaluations become available. This effort will be facilitated through the use of a computerized reactor vessel integrity database (RVID) developed by the NRC. This database includes summary tables containing necessary input for evaluating RPV structural integrity in accordance with the requirements of 10 CFR Part 50, Appendix G, and 10 CFR 50.61. The RVID was issued in 1995 to all licensees and to all individuals requesting a copy. The RVID

was issued on the World Wide Web (WWW) in 1996. The RVID will be updated periodically on the basis of NRC assessments of new information from the industry and licensees.

The staff issued GL 92-01, Revision 1, Supplement 1, in 1995. This GL required licensees to provide all data relevant to the determination of RPV integrity and to assess the impact of the data on previously submitted RPV integrity evaluations. Licensees provided additional data and indicated that previous assessments remain applicable. In addition, some licensees indicated that they had initiated plans to acquire new data. Data and analyses provided by licensees will be reviewed by the staff and incorporated into the RVID.

In order to continue operation of the Palisades RPV beyond 1999, the licensee has proposed to thermal anneal the reactor vessel. The licensee originally scheduled the Palisades thermal anneal for its refueling outage in 1998. However, based on the revised fluence analysis, the thermal anneal could be delayed.

Annealing is a thermal treatment to mitigate the effects of neutron irradiation by increasing the fracture resistance of the RPV materials. To demonstrate the feasibility of annealing, the licensee will rely on the results of the Marble Hill Demonstration Anneal. The Marble Hill Demonstration Anneal was completed in 1996. Preliminary evaluation of the Marble Hill anneal indicates that temperatures, stresses, and displacements were maintained within the expected ranges and that there was no measurable permanent deformation to the RPV or damage to key components and structures from the anneal.

The staff published an annealing rule in December 1995 and a regulatory guide for annealing in February 1996. In accordance with the requirements in the thermal annealing rule, the licensee for Palisades has submitted a thermal annealing report that the staff is reviewing.

Steam Generator Issues

A significant portion of the reactor coolant system pressure boundary for a PWR is composed of steam generator tubes. Consequently, the NRC requires PWR utilities to complete periodic inspections to

identify degraded tubes. Tubes with indications of degradation in excess of the plant repair limits are required to be removed from service before the affected steam generator can be declared operable for continued operation. Stress corrosion cracking of tubes fabricated from Alloy 600 is the dominant age-related tube degradation mechanism. As the age of the PWR fleet increases, known modes of tube degradation are anticipated to affect an increasing number of tubes. In addition, new damage modes may also become evident. Therefore, the nuclear industry is devoting significant resources toward improving methods to inspect and assess steam generator tube degradation.

Although no new modes of steam generator tube degradation have appeared over the past year, several utilities have reported tube cracking in areas that have typically not experienced corrosive degradation. To summarize some of the recent findings, the NRC issued IN 96-38, "Results of Steam Generator Tube Examinations," on June 21, 1996. This IN highlighted some plant-specific experiences with steam generator tube degradation and emphasized that areas historically unaffected by tube degradation may become affected in the future owing to the complexity of the causal factors that drive damage mechanisms such as stress-corrosion cracking. IN 96-38 also informed licensees of the importance of improving and updating steam generator tube inspection programs to optimize the ability to identify degraded tubing and discussed the importance of assessing potentially significant tube degradation identified during inspections to ensure that all tubes can maintain their intended safety function for the planned operating interval. At one plant, several thousand tubes with indications of circumferentially oriented flaws were identified after only several months of operation. The results from in-situ pressure testing of several tubes containing the largest apparent flaws indicated that these tubes had adequate margins for structural and leakage integrity. After an assessment of the inspection results, the licensee and the NRC staff concluded that much of the tube degradation that was identified during the inspection was attributed to improvements in the licensee's steam generator tube inspection program. Another plant identified indications of tube degradation in an area historically considered to be of low susceptibility to

corrosion-induced damage. These indications were primarily evident only through the use of improved inspection technology. Many of the issues that the NRC addressed over the previous year regarding steam generator tube condition were, in part, a consequence of increased sensitivity by both the NRC and the nuclear industry to these issues and improvements in licensees' programs to inspect and assess tube integrity. These improvements will help to ensure that defective tubes are removed from service, thus minimizing the potential for events resulting from inadequate structural or leakage integrity of degraded steam generator tubing.

Changes in types of steam generator tube degradation being experienced and improvements in inspection and tube repair technology have made the existing regulatory requirements and guidance that apply to steam generator tube integrity, in many cases, out of date. Additionally, the current regulatory approach, as embodied in the plant's technical specifications and in the ASME Boiler and Pressure Vessel Code, is highly prescriptive and inflexible. To date, the staff has dealt with the current regulatory framework problems on a plant-specific basis. However, this plant-specific approach has proven to be resource intensive for both the staff and the industry. As a result, the NRC is currently in the process of revising the regulatory framework to implement a performance-based, risk-informed rule for maintaining steam generator tube integrity. The proposed steam generator rule would require licensees to monitor and maintain the condition of the steam generator tubes against performance criteria that provide reasonable assurance that the steam generator tubes remain capable of performing their intended safety functions and that risk remains at an acceptable level. Under the proposed rule, licensees would have greater flexibility to develop and implement new inservice inspection techniques, new methods for assessing tube condition, and new repair criteria to the extent that such new approaches ensure compliance with the proposed rule and its performance criteria. An ANPRM was issued in September 1994, and the public comments received in response to the ANPRM were supportive of this rulemaking. The NRC is planning to issue the proposed steam generator rule for public comment in 1997.

Instrumentation and Control Issues

SYSTEM UPGRADES

The NRC staff and the nuclear power industry recognize the continuing need to upgrade and replace existing obsolete analog electronic instrumentation and control (I&C) systems with digital computer-based systems. Since the early 1980s, the staff has reviewed and approved digital I&C system upgrades to operating plants. The basis for acceptance of these modifications was continued compliance with the basic requirements for safety-related I&C systems as identified in 10 CFR 50.55a (h). Section 50.55a(h), in turn, refers to Institute for Electrical and Electronics Engineers (IEEE) Standard 279-1971, and the additional guidance contained in industry standards specific to digital (software-based) systems, primarily IEEE Standard 7-4.3.2 as endorsed in RG 1.152. The staff recognized that the primary review guidance document, NUREG-0800, "Standard Review Plan" (SRP), had not been updated since 1981 and did not contain the guidance and criteria necessary for the reviews of digital I&C system modifications. Thus, the staff began in 1995 to codify the digital I&C system review criteria and guidance in an update to Standard Review Plan (SRP) Chapter 7, "Instrumentation and Control." This update was completed in September 1996 and the draft of SRP Chapter 7 was noticed for public comment in the *Federal Register* on December 3, 1996. The SRP Chapter 7 update includes new SRP sections and branch technical positions containing acceptance criteria for digital I&C systems derived from past staff reviews of digital I&C system upgrades to operating plants, reviews of the advanced LWR standardized designs under 10 CFR Part 52, and operating experience with digital I&C systems. In addition, the SRP Chapter 7 update references six new regulatory guides endorsing various IEEE standards on the quality of software and the software development process. The staff will review public comments on the SRP Chapter 7 update in early 1997, revise the document as appropriate, and issue the completed SRP Chapter 7 update by about the middle of 1997.

At the request of the Commission, an independent study of the staff's review approach and guidance

for digital I&C systems was undertaken by the National Academy of Sciences. This study was performed by a panel of experts in software-based systems and nuclear industry regulatory requirements from academia, Government, and the nuclear power industry. Their report with recommendations as a result of their study is expected in early 1997. The recommendations will be incorporated into the SRP Chapter 7 update as appropriate.

In 1996, the staff continued its interactions with representatives from the nuclear industry on several generic programs intended to streamline the implementation of digital I&C system upgrades in operating plants. These programs are sponsored by the Electric Power Research Institute (EPRI); DOE and a number of NPP licensees participated. The programs are as follows:

- Electromagnetic/Radio Frequency Interference (EMI/RFI) Qualification:

Because of the potentially greater vulnerability of digital I&C systems to the adverse effects from EMI/RFI and the high cost of conducting plant-specific surveys to measure EMI/RFI environments in plants, the nuclear power industry developed topical report EPRI TR-102323, "Guidelines for Electromagnetic Interference Testing in Power Plants." This document provides guidance on methods for qualifying digital I&C system upgrades to bounding EMI/RFI environments without the need to conduct site-specific surveys. In addition, it provides guidance on means for excluding unacceptable sources of EMI/RFI in areas containing digital I&C systems. This topical report was approved by the staff in April 1996.

- Use of Commercial-Off-the-Shelf (COTS) Digital Systems:

Because of the cost involved in developing custom digital I&C systems, the nuclear industry recognized the need to use commercially available digital systems in safety-related applications. To this end, the industry developed topical report EPRI TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications." This document provides guidance on the actions and information required by licensees planning upgrades to safety-related I&C systems, using COTS

digital systems. This topical report is under staff review; endorsement is planned for early 1997.

- **Generic Digital I&C System Upgrade Platforms:**

In an effort to share the cost of digital I&C system upgrade development and improve the licensing process, the nuclear power industry is developing three generic digital I&C upgrade platforms for application in various safety-related I&C systems. These platforms are (1) application-specific integrated circuits (ASICs), (2) programmable logic controllers (PLCs), and (3) dynamic safety systems (DSSs). Each platform has advantages and features appropriate for different I&C systems upgrade applications. Topical reports on these designs are planned for submittal for staff review at various times in 1997.

The staff and the nuclear industry will continue their interactions on the remaining generic activities regarding digital I&C system upgrades through 1997 and beyond. In addition, as the generic digital I&C system upgrade programs come to completion, reviews and inspections of plant-specific digital I&C system upgrades will be undertaken as these designs are implemented in operating plants.

OPERATING PLANTS

On January 10, 1996, the staff issued GL 96-01, "Testing of Safety-Related Logic Circuits," based on concerns identified over a number of years with the adequacy of periodic surveillance testing of logic circuitry for reactor protection systems (RPSs) and essential safety feature actuation systems (ESFASs) as required by NPP technical specifications. Licensees were requested to compare the RPS and ESFAS logic diagrams with the surveillance test procedures to ensure that all portions of the circuitry requiring testing per the technical specifications were being correctly tested. Surveillance procedures were to be revised as necessary to ensure completeness of the testing. Licensees were given until startup from the first refueling outage commencing one year after the date of issuance of GL 96-01 to complete the requested actions. They are to report to the staff when the requested actions have been completed. On March 19, 1996, the staff participated in a

workshop in Atlanta, Georgia, sponsored by the Nuclear Energy Institute (NEI) that was attended by most NPP licensees. The staff provided clarifications on the content of GL 96-01 and answered licensee questions on the scope, schedule, and other issues arising from the requested actions. The staff is continuing to follow licensee implementation of GL 96-01 through LERs and specific interactions as events warrant.

Graded Quality Assurance

One activity associated with the PRA implementation plan is the development of a graded QA methodology. The purpose of graded QA is to adjust the application of licensee QA controls (such as reviews, inspections, audits, and other verifications) so that they are conducted with an intensity proportional to the relative safety significance of plant equipment. Thus, graded QA allows both licensee and staff resources to be focused on more safety-significant plant equipment. Similarly, graded QA reduces the resources that must be allocated for QA activities involving equipment of less safety significance. The staff envisions a process, similar to the maintenance rule implementation, whereby a licensee evaluation of both PRA input and deterministic consideration by an expert panel would result in categorization of plant equipment by safety significance.

Initially, the staff focused on interacting with the NEI during the development of a document that could provide generic industry guidance on how to adjust quality practices commensurate with equipment safety significance. A Commission Paper, SECY-95-059, described the initial stages of the project. During FY 1995, three volunteer licensees indicated a desire to work with the staff to develop graded QA implementation practices. During FY 1996, the staff has continued to interact with the three volunteer licensees and has worked on the development of a draft regulatory guide for graded QA. In general, the current licensee QA controls would continue to apply to safety-significant equipment, while less rigorous licensee QA controls would apply to equipment of less safety significance. The program would be subject to periodic assessments of plant and industry information to adjust both QA controls and safety-significant categorization.

Allegation Program

The Allegation Program is managed by the Agency Allegation Advisor, organizationally located in NRR, but administered by the Allegation Coordinators and agency staff in NRR, NMSS, OSP, and each region. The allegation program is a reactive program structured to respond to safety and regulatory concerns submitted to the NRC by industry employees and members of the public. The allegation program determines and prioritizes actions to review and resolve safety and regulatory concerns according to their safety or regulatory significance and communicates the results of NRC's review to the individual who raised the concerns.

In FY 1996, the NRC received 1239 allegations, comprising 2827 individual concerns. Of the 1239 allegations received, 243 were purported to involve wrongdoing, and 178 stated that someone had been discriminated against for raising safety or regulatory concerns. In the same time frame the NRC completed action on 1252 allegations, comprising 3328 individual concerns. In 35 percent of the allegations on which action was completed, the NRC was able to substantiate the validity of at least part of the concerns raised.

In addition to handling a significant number of allegations, the NRC also significantly improved the allegation program by—

- installing a toll-free number for industry workers and members of the public to report safety and regulatory concerns;
- raising the priority for investigating claims of discrimination;
- issuing a new policy statement, "Freedom of Employees in the Nuclear Industry to Raise Safety and Compliance Concerns Without Fear of Retaliation," and providing the Commission's expectations on this topic;
- revising internal guidance on handling allegations, Management Directive 8.8, "Management of Allegations;"
- including a requirement to send letters to allegers acknowledging receipt of allegations

within 30 days of receipt and providing status letters at least every 6 months; and

- revising the Commission policy statement on protecting the identity of confidential sources to cover all allegers and clarify the limits on NRC's ability to protect the identity of allegers.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The Advisory Committee on Reactor Safeguards (ACRS), established by statute in 1957 by revision of the Atomic Energy Act of 1954, provides advice to the NRC on potential hazards of proposed or existing reactor facilities and the adequacy of proposed safety standards. The Atomic Energy Act also requires that the ACRS advise the Commission with respect to the safety of operating reactors and perform such other duties as the Commission may request. Consistent with the Energy Reorganization Act of 1974, the committee will review any matter related to the safety of nuclear facilities and activities of the DOE specifically requested by the DOE. Upon request, the ACRS also provides advice to the Defense Nuclear Facilities Safety Board and the U.S. Navy. In addition, the ACRS, on its own initiative, performs reviews of specific generic matters on nuclear facility safety-related items. Also, in accordance with Public Law 95-209, the ACRS is required to prepare an annual report to the U.S. Congress on the Reactor Safety Research Program.

The ACRS reviews requests for pre-application site and standard plant design approvals, as well as applications for construction permits, operating licenses for power reactors, 10 CFR Part 52 licenses, and certain test reactor facility licenses for construction and operation. With respect to reactors that are already licensed to operate, the ACRS is involved in the review and evaluation of any substantive licensing changes, corrective actions resulting from operating events and incidents, and the resolution of GSIs.

Activities of the ACRS are conducted in accordance with the Federal Advisory Committee Act (FACA),

which provides for public attendance at and participation in ACRS meetings. Consistent with the charter of the ACRS and FACA requirements, unclassified ACRS reports are made part of the public record. The ACRS Web address is <http://www.nrc.gov/acrsacnw>.

The ACRS membership is drawn from various scientific and engineering disciplines. Its current membership includes those experienced in the areas of NPP operations; PRA; analysis of severe reactor accident phenomena; design of NPP structures, systems, and components; material sciences; mechanical, civil, and electrical engineering; and digital I&C systems.

During FY 1996, the ACRS completed its annual report to Congress on the NRC Safety Research Program and other closely related matters. It also reported to the Commission on the continued need for United States membership in the Nuclear Energy Agency and issued the following reports on matters related to evolutionary and passive plant designs:

- NRC Staff Program on the Adequacy Assessment of the RELAP5/MOD3 Code for Simulation of AP600 Passive Plant Behavior
- Design Changes Proposed by ASEA Brown Boveri-Combustion Engineering Relating to the Certification of the System 80+ Design
- SECY-96-128, "Policy and Key Technical Issues Pertaining to the Westinghouse AP 600 Standardized Passive Reactor Design"
- Design Changes Proposed by General Electric Nuclear Energy Relating to the Certification of the U.S. Advanced Boiling-Water Reactor Design

The committee also provided these reports on topics related to the safety of operating reactors:

- Proposed Modifications to the Boiling Water Reactor Owners Group Emergency Procedure Guidelines to Address Reactor Core Instabilities
- National Academy of Sciences/National Research Council Study on "Digital Instrumentation and Control Systems in Nuclear Power Plants, Safety and Reliability Issues"—Phase 1

- Fatigue Action Plan
- Application for Operating License for Watts Bar Nuclear Plant Unit 1
- Proposed Final Generic Letter, "Testing of Safety-Related Logic Circuits"
- Use of Individual Plant Examinations in the Regulatory Process
- Review of Recent Fire Probabilistic Risk Assessment Reports by Brookhaven National Laboratory and Certain Fire Barrier Issues
- Westinghouse Best-Estimate Loss-of-Coolant Accident Analysis Methodology
- Probabilistic Risk Assessment Framework, Pilot Applications, and Next Steps to Expand the Use of PRA in the Regulatory Decision-Making Process
- Resolution of the Multiple System Responses Program Issues
- Potential Use of IPE/IPEEE Results to Compare the Risk of the Current Population of Plants with the Safety Goals
- Implementation of the Regulatory Review Group Recommendations
- Severe Accident Research
- Risk-Informed, Performance-Based Regulation and Related Matters

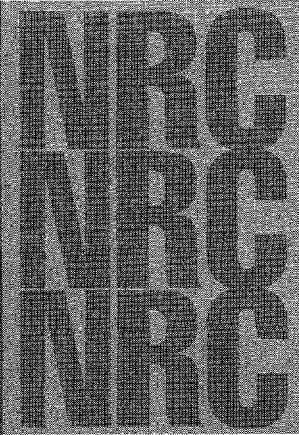
In addition, the committee provided these reports to the NRC on proposed rules, policy matters, and regulatory guidance:

- Proposed Final Rev. 1 to Regulatory Guide 1.152, "Criteria for Digital Computers in Safety Systems of Nuclear Power Plants"
- NUREG-0700, Revision 1, "Human-System Interface Design Review Guideline"
- Proposed Final Regulatory Guide 1.164, "Time Response Design Criteria for Safety-Related Operator Actions," to Resolve Generic Safety Issue B-17
- Revision 2 to Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations"

- Proposed Revisions to 10 CFR Parts 50 and 100 and Proposed Regulatory Guides Relating to Reactor Site Criteria
- Regulatory Guidance Documents Related to Digital Instrumentation and Control Systems
- Revision 2 to Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"
- Draft Regulatory Guide DG-1047, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses"
- Resolution of Generic Safety Issue 78, "Monitoring of Fatigue Transient Limits for the Reactor Coolant System"
- Proposed Revision 3 to Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants"
- Proposed Revision 3 to the Regulatory Guide 1.105, "Instrument Setpoints for Safety Systems" (Draft Regulatory Guide DG-1045)
- Proposed Rule on Shutdown Operations

In performing the reviews and preparing the reports cited, the ACRS holds subcommittee meetings as needed, and 10 full committee meetings throughout the year.

Chapter 4



Operational Information and Investigations and Enforcement Actions

This chapter deals with activities of NRC offices concerned with (1) gaining the fullest possible understanding of every aspect of operations at facilities licensed by the NRC, in particular of unplanned and unforeseen occurrences from which safety lessons may be drawn; (2) investigating alleged wrongdoing by licensees, applicants for licenses or vendors to licensees, or their contractors; and (3) taking appropriate enforcement action against licensees for violations of NRC regulations, through the issuance of notices of violation, assessment of civil penalties, and orders for the modification, suspension, or revocation of licenses. The three offices dedicated to these tasks are the Office for Analysis and Evaluation of Operational Data (AEOD), the Office of Investigations (OI), and the Office of Enforcement (OE), respectively.

ANALYSIS AND EVALUATION OF OPERATIONAL DATA

AEOD was created in 1979 to provide a strong, independent capability to analyze and evaluate operational safety data associated with activities licensed by the NRC. The office serves as the focal point for the assessment of operational safety through the collection, review, analysis, and evaluation of information related to the safety performance of both reactor and nuclear materials facilities. To accomplish this mission, AEOD—

1. Collects, analyzes, and disseminates operational data;
2. Identifies important events and their associated safety concerns and root causes;
3. Assesses trends in performance;
4. Evaluates operating experience to provide insights into, and to improve the understanding of, the risk-significance of events;
5. Conducts reliability studies of risk-important systems;
6. Analyzes human performance in operating events; and
7. Produces periodic Performance Indicator, Abnormal Occurrence, and Accident Sequence Precursor Reports.

AEOD is also responsible for the NRC's Incident Response Program, Incident Investigation Program, and Technical Training Program. The Incident Response Program provides a coordinated NRC emergency response to ongoing events through the NRC Operations Center. The Incident Investigation Program provides a structured NRC investigative response to significant operational events according to their safety significance. The Technical Training Program provides initial and continuing technical training for NRC staff and contractors. In addition, AEOD provides management direction and oversight of independent safety inspections, as well as administrative and technical support to the NRC's Committee to Review Generic Requirements.

The AEOD programs, taken as a whole, constitute the essential independent review and assessment of power reactor and nuclear materials safety performance and complement the regional, the Office of Nuclear Reactor Regulation (NRR), and the Office of Nuclear Material Safety and Safeguards reviews of operating events. They perform a quality verification function that provides assurance of feedback of important operational safety lessons. AEOD findings and recommendations continue to be addressed through generic correspondence in the resolution of generic issues and in initiatives taken by industry.

AEOD publishes annual reports of its activities in NUREG-1272, which consists of three volumes. Part 1 addresses power reactors, Part 2 covers nuclear materials, and Part 3 presents the NRC's technical training activities. These volumes provide greater detail on all the AEOD programs described in this AEOD section.

Power Reactor Operational Experience

ANALYSIS OF REACTOR OPERATIONAL EXPERIENCE

Nuclear Reactor Safety Performance. Through the many activities of AEOD, trends in overall safety performance of power reactors may be inferred. The Performance Indicator (PI) and Accident Sequence Precursor (ASP) Programs of AEOD have been applied to analyze data and information in a consistent manner over a number of years. These programs show a substantial reduction in safety-significant operational events since 1985 (see Figures 4.1 and 4.2).

The PI program includes eight indicators: automatic scrams while critical, safety system actuations, significant events, safety system failures, forced outage rate, equipment-forced outages per 1000 critical hours, collective radiation exposure, and cause codes. PI reports are issued annually and distributed widely within

the NRC and to all operators of commercial nuclear power plants (NPPs). They are used in various NRC programs, such as the Senior Management Meeting process and plant-specific analyses of safety performance. Industry average PIs have been used for the past 10 years to monitor trends in the safety performance of the commercial nuclear power industry.

The number of initiating events resulting in scrams has declined significantly over the past 10 years, and this is reflected in fewer and less complicated plant transients (safety system actuations and significant events). In 1996, the industry average number of scrams, safety system actuations, and significant events continued to decline slightly. However, equipment problems persist, as evidenced by the percentage of scrams caused by equipment failure (the leading cause of all scrams), and the lack of sustained improvement in safety system failures, forced outage rate, and equipment forced outages per 1000 critical hours. In 1996, safety system failures, forced outage rate, equipment forced outage rate, and collective radiation exposure leveled off or worsened. Although average unit availability has improved considerably over the past 10 years, this has not resulted from fewer forced outage hours but to greatly reduced scheduled outage hours. This is a consequence of longer fuel cycles, which result in greater intervals between refueling outages and shorter refueling outages. These changes are part of the industry's response to the need to become more competitive. Implementation of the maintenance rule, and the collection and use of equipment reliability and availability data associated with it, will provide a means to reduce the number of safety system failures as well as both the number and duration of forced shutdowns.

Accident Sequence Precursor Program. The Accident Sequence Precursor Program is a formal program in which NPP events are analyzed using probabilistic risk assessment techniques to evaluate the conditional core damage probabilities associated with the events. The ASP Program quantitatively evaluates operational experience and serves as one of several tools to ensure that important operating lessons are not overlooked. The ASP Program uses a rigorous method that integrates actual initiating events, plant

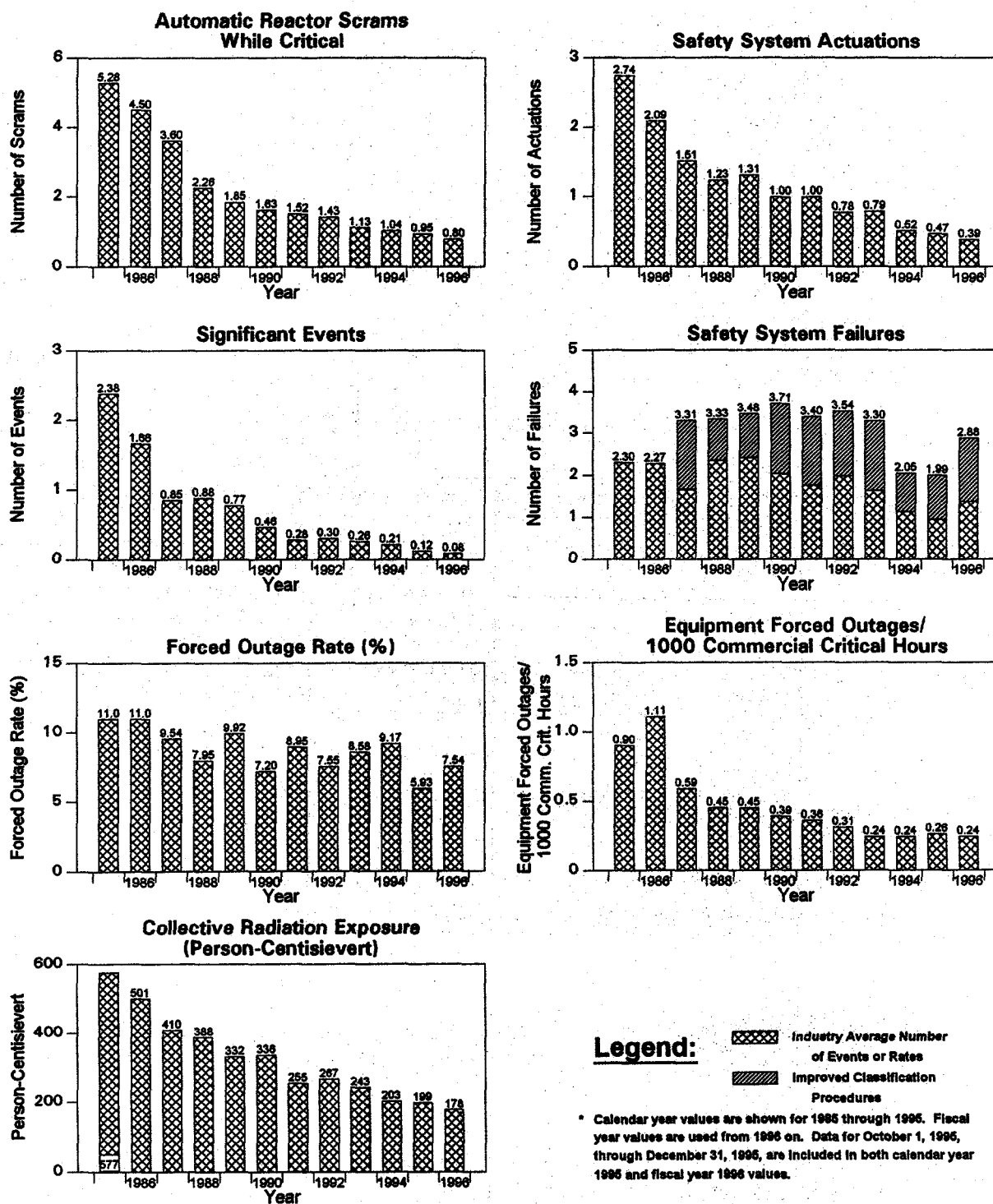
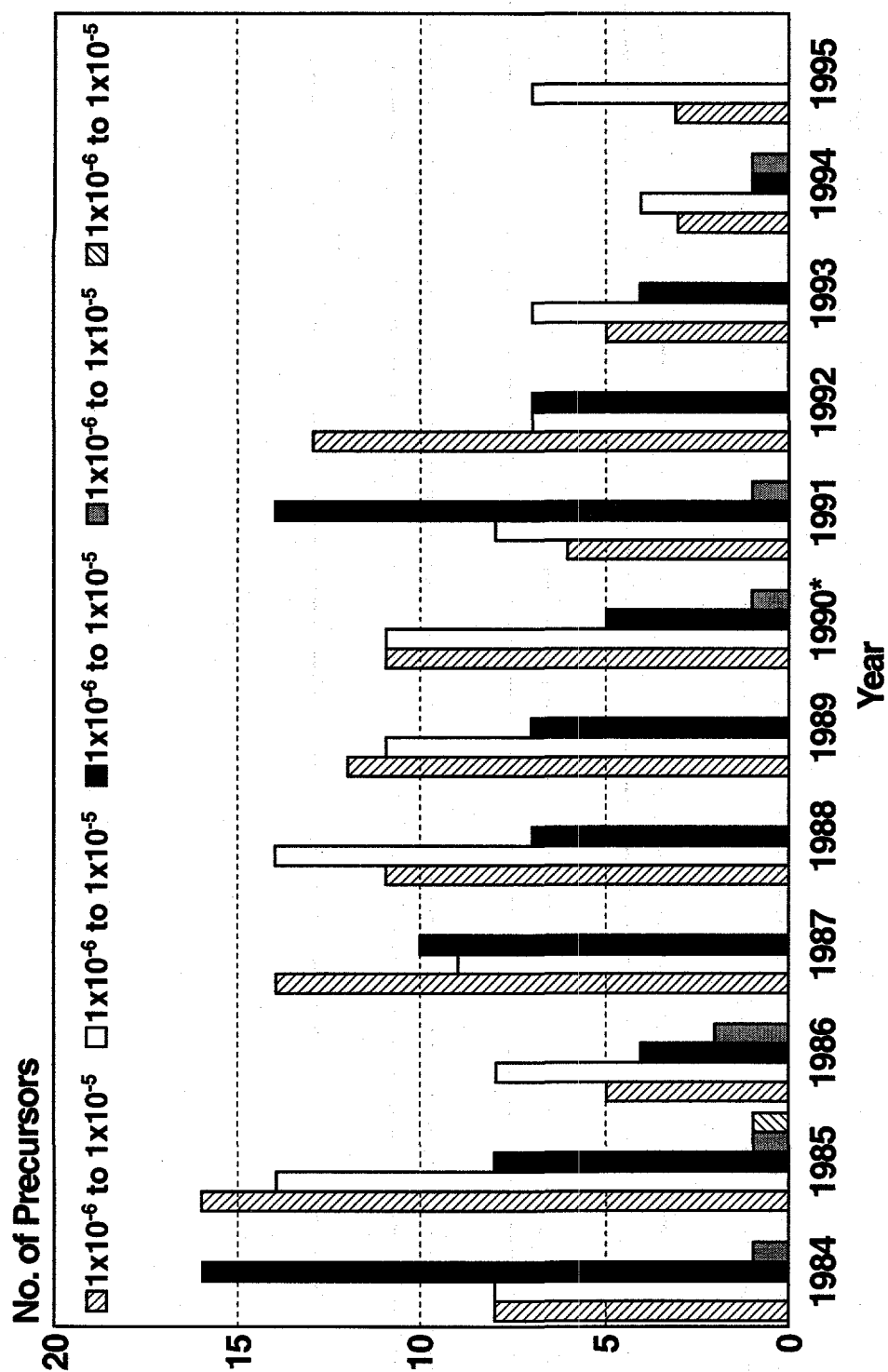


Figure 4.1 Annual Industry Averages



*The 3/20/90 Vogtle Event has been rounded up from 9.7×10^{-4} and plotted as 1×10^{-3} .

Figure 4.2 ASP Program Conditional Core Damage Probabilities for Calendar Years 1984 Through 1995

conditions, and the reliability of standby safety equipment into an overall quantitative assessment, which is expressed as a conditional core damage probability. Results of the ASP Program are peer-reviewed by outside consultants, other NRC offices, and the affected licensees. They are used in NRC initiatives such as the Senior Management Meeting process. There were 10 precursors with conditional core damage probabilities greater than 10^{-6} in calendar year 1995. These events are listed in Table 4.1; details may be found in NUREG-4674, Volume 23, "Precursors to Potential Severe Core Damage Accidents: 1995, A Status Report."

System Reliability Studies. AEOD uses operational data to determine the reliability of risk-significant systems in U.S. commercial reactors. The data are obtained from licensee event reports (LERs), special reports, and monthly operating experience reports. Each of the studies covers the period from 1987 through 1993. Three of them have been completed. Reports on the reliability of the high-pressure coolant injection (HPCI) system in the 23 boiling-water reactors (BWRs) with dedicated HPCI systems, and the emergency diesel generator (EDG) trains in all plants with EDGs, were completed in prior years. The third study, on the reliability of the isolation condenser (IC) system at the five BWRs with that system, was completed in 1996.

Abnormal Occurrences. AEOD administers the Commission's program for reporting abnormal occurrences (AOs) to Congress. AOs are incidents or events that the Commission determines are significant from the standpoint of public health and safety. In its 1996 report to Congress, AEOD described two AOs that occurred at NPPs. Brief summaries of these events are provided in Table 4.2; detailed descriptions may be found in NUREG-0090, "Report to Congress on Abnormal Occurrences, Fiscal Year 1996," Vol. 19. The number of AOs at NPPs since 1988 has remained low, averaging about two per year.

Allegations. The NRC receives allegations from individuals or organizations that assert some

impropriety or inadequacy in activities regulated by the NRC. Allegations received from NPP sites are entered into the Allegation Management System managed by NRR; NRR and the regions validate and track their resolution. AEOD analyzes trends in the numbers of allegations received and publishes the data without revealing the identity of the allegor. Each allegation may contain one or more individual concern, and no differentiation is made in the data for the varying levels of safety significance of the allegations. Allegation data for calendar years 1991 through 1995 are shown in Table 4.3.

Radiation Exposures. The NRC regulates both reactor and nonreactor applications of nuclear materials. All NRC licensees are required to monitor employee exposure to radiation and radioactive materials at levels sufficient to demonstrate compliance with the occupational dose limits specified in 10 CFR Part 20. Licensees of power reactors are required by 10 CFR 20.2206 to provide to the NRC annual reports of exposure data for individuals for whom personnel monitoring is required. These data are summarized in Table 4.4 by calendar year.

Almost all radiation doses from NPPs are occupational doses, that is, doses to NPP employees and contractors who work at the plant. The economics of operating a plant creates a strong impetus to reduce exposures and achieve ALARA (as low as reasonably achievable) objectives. As a result, utility violations of NRC limits on personnel exposure are rare, and the vast majority of NPP personnel have annual exposures far below NRC regulatory limits specified in 10 CFR Part 20. These low annual exposures are believed to result primarily from the licensees' extensive dose-reduction efforts. Some measures that reduce collective exposure are an effective maintenance program, experienced and well-trained personnel, a good water chemistry control program, effective decontamination and cleanup practices, good fuel cladding integrity, effective radiation exposure control programs, good housekeeping, and an alert health physics staff.

Table 4.1 Accident Sequence Precursors for CY 95

<i>Precursors Involving an Initiator</i>				
<i>Plant</i>	<i>LER No.</i>	<i>Date</i>	<i>CCDP</i>	<i>Description</i>
Comanche Peak 1	445/95-003, -004	10/11/95	2.9×10^{-5}	Reactor trip, auxiliary feed-water (AFW) pump trip, second AFW pump unavailable
Arkansas Nuclear One, Unit 1	313/95-005	04/20/95	2.0×10^{-5}	Reactor trip with emergency feedwater (EFW) problems
<i>Precursors Involving Equipment Unavailabilities</i>				
<i>Plant</i>	<i>LER No.</i>	<i>Date</i>	<i>Increase in CDP</i>	<i>Description</i>
St. Lucie 1	335/95-004, -005, -006	08/02/95	9.3×10^{-5}	Failed power-operated relief valves, multiple reactor coolant pump seal stage failures, relief valve failure, shutdown cooling unavailable and other problems
Millstone 2	336/95-002,	01/25/95	3.1×10^{-5}	Containment sump isolation valves susceptible to pressure locking
Waterford 3	382/95-002	06/10/95	1.7×10^{-5}	Reactor trip and fire in turbine-generator building
St. Lucie 2	389/95-005	11/20/95	1.3×10^{-5}	Failure of one emergency diesel generator (EDG) with common-cause failure implications
Arkansas Nuclear One, Unit 2	368/95-005	07/19/95	1.1×10^{-5}	Loss of dc bus could fail both EFW trains
D. C. Cook 1	315/95-011,	09/12/95	7.7×10^{-6}	One safety injection pump unavailable for six months
Limerick 1	352/95-008	09/11/95	9.0×10^{-6}	Safety-relief valve fails open, scram, suppression pool strainer fails
Haddam Neck	213/95-010	03/09/95	4.7×10^{-6}	Multiple safety injection valves susceptible to pressure locking during a large break loss-of-coolant accident

Table 4.2 Abnormal Occurrences Reported by Reactor Licensees During 1996

<i>Report No.</i>	<i>Date</i>	<i>Licensee</i>	<i>Description</i>
96-1	01/30/96	Wolf Creek Nuclear Station	Manual reactor trip with multiple complications
96-2	02/15/96	Braidwood Unit 2	Leakage path that bypassed containment existed for over 3 months

Table 4.3 Allegations at Power Plant Sites by Calendar Year (cont.)

Site	1992 ^c					1993 ^c					1994 ^c					1995 ^c					1996 ^c				
	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	H&I ^d
Indian Point 2	3	0	0	0	0	8	0	1	0	0	1	0	1	0	0	3	0	2	2	6	4	0	1	1	1
Indian Point 3	9	0	5	0	14	0	0	3	1	25	0	0	10	5	11	1	1	3	5	5	3	2	1	1	1
Kewaunee	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Lasalle	7	0	0	2	6	0	5	0	0	14	0	0	4	2	10	0	0	5	0	10	4	4	3	3	3
Limerick	7	0	1	1	17	0	1	1	0	16	0	0	10	2	5	0	0	3	0	5	3	2	0	0	0
Maine Yankee	4	0	0	0	1	0	1	1	0	9	1	1	1	0	6	0	0	1	2	18	9	0	2	2	2
McGuire	3	0	0	0	0	0	0	0	0	8	0	0	0	4	2	0	0	0	0	5	1	2	0	0	0
Millstone	51	1	59	17	35	1	8	7	42	3	22	13	22	13	48	4	22	15	76	50	10	27	10	27	27
Monticello	1	0	0	0	3	0	1	1	0	1	0	1	0	0	0	0	0	0	0	6	2	0	0	0	0
Nine Mile Point	18	0	0	0	11	0	6	2	8	1	3	2	9	1	0	9	1	0	4	16	5	3	1	1	1
North Anna	6	0	0	2	12	0	3	1	2	0	1	0	1	0	7	0	0	0	6	2	3	1	1	1	1
Oconee	1	0	1	0	1	0	0	0	4	0	1	0	1	0	1	0	0	0	1	7	3	2	1	1	1
Oyster Creek	3	0	0	0	9	0	2	1	2	0	0	0	0	0	5	0	2	1	5	3	3	2	2	2	2
Palisades	1	0	0	0	7	0	2	1	4	0	3	0	3	0	10	0	2	1	8	1	1	0	1	0	0
Palo Verde	58	1	10	19	52	0	5	21	23	0	11	11	11	11	22	3	15	5	20	9	10	4	4	4	4
Peach Bottom	7	0	1	0	7	0	2	1	7	0	3	2	3	2	3	0	2	0	4	3	1	0	0	0	0
Perry	6	0	1	0	8	0	3	0	9	0	2	4	2	4	2	0	2	0	9	5	3	4	4	4	4
Pilgrim	22	0	5	0	16	0	4	2	14	0	1	2	9	2	9	2	2	3	4	1	0	0	0	0	0
Point Beach	2	0	0	0	3	0	0	1	1	0	2	0	2	0	4	0	2	0	3	0	2	1	1	1	1
Prairie Island	7	0	3	0	4	0	2	1	5	0	3	0	3	0	3	0	1	1	5	1	0	0	0	0	0
Quad Cities	11	0	1	1	6	0	2	1	10	0	6	1	6	1	6	0	2	0	12	7	6	2	2	2	2
River Bend	19	0	5	3	21	0	14	6	17	0	11	1	13	2	13	2	6	10	22	4	11	7	7	7	7
Robinson	5	0	1	0	4	0	2	3	1	0	0	0	5	1	1	1	1	1	1	0	3	0	0	0	0
Salem	5	0	2	2	11	0	4	2	20	3	1	5	13	2	13	2	5	5	38	20	7	7	7	7	7
San Onofre	6	0	1	2	12	0	0	3	14	1	2	6	28	2	14	3	14	3	32	14	10	6	6	6	6
Seabrook	16	0	2	0	6	0	0	0	4	0	4	1	4	0	0	0	0	0	2	1	0	0	0	0	0
Sequoyah	30	0	15	6	24	1	6	7	16	1	4	6	20	2	5	3	27	11	7	12	11	7	7	7	7
South Texas	14	0	9	8	43	0	16	13	24	1	13	9	16	2	5	7	20	5	8	5	8	6	6	6	6
St. Lucie	7	0	2	1	3	0	0	0	7	0	0	1	14	0	5	2	48	14	22	5	22	5	5	5	5

Table 4.3 Allegations at Power Plant Sites by Calendar Year (cont.)

Site	1992 ^c				1993 ^c				1994 ^c				1995 ^c				1996 ^c			
	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d	Rc'd ^a	Open ^b	Sub ^c	H&I ^d
Summer	3	0	1	0	2	0	1	0	2	0	0	0	3	0	1	0	8	1	6	1
Surry	7	0	2	2	3	0	2	1	6	0	2	0	3	0	1	0	4	1	3	0
Susquehanna	9	0	2	1	8	0	5	2	7	0	0	0	5	0	4	1	34	17	9	1
Three Mile Isl.	6	0	0	0	7	0	2	0	3	0	2	0	2	0	1	0	2	2	0	1
Turkey Point	14	0	4	1	14	0	5	5	7	0	4	0	9	0	2	0	19	5	11	2
Vermont Yankee	8	0	1	1	6	0	3	0	1	0	5	0	5	0	2	1	10	8	1	1
Vogtle	10	0	2	2	7	0	3	5	11	3	1	0	8	0	4	0	7	0	5	0
Wash. Nuclear	5	0	2	0	12	0	1	6	0	0	2	0	18	3	5	3	13	6	7	4
Waterford	4	0	2	2	5	0	3	2	3	0	2	0	9	0	2	3	25	9	15	8
Watts Bar	65	0	38	27	67	0	50	19	73	0	29	19	47	4	42	16	38	10	27	7
Wolf Creek	5	0	3	1	6	0	3	0	10	0	5	0	5	0	5	1	12	5	2	0
Zion	11	0	4	4	3	0	3	0	17	0	2	3	10	0	4	2	12	5	5	0

Notes: a. Rc'd – The total number of allegations received during the year. Each allegation may contain more than one concern.

b. Open – The number of allegations that were received that year and one or more concerns remain open.

c. Sub – The number of allegations fully or partially substantiated for that year. Partially substantiated means that not all the concerns were substantiated.

d. H&I – The number of allegations that include harassment and intimidation issues without regard to whether they are substantiated.

e. The data are current as of September 30, 1996.

Table 4.4 Summary of Annual Occupational Exposure Information Reported by Commercial Reactors, Calendar Years 1973 and 1990 to 1995

Year	No. of Reactors*	Collective TEDE** (person-cSv[rem])	No. of Workers with Measurable TEDE	Average Measurable TEDE per Worker (cSv[rem])
1973	24	13,962	14,780	0.94
1990	116	36,607	98,802	0.37
1991	115	28,528	91,085	0.31
1992	114	29,298	94,317	0.31
1993	114	26,365	86,187	0.31
1994	109	21,695	73,780	0.29
1995	109	21,674	70,986	0.31

Source: Radiation Exposure Information Report System, funded by the Office of Nuclear Regulatory Research. Data are subject to change as additional information is received.

*Includes all light-water reactors in commercial operation, although some of them may not have been in operation for a full year. All reactor data are adjusted to account for multiple counting of transient reactor workers.

**TEDE is the total effective dose equivalent as defined in 10 CFR 20.1003.

Data Sources. The primary source of information about an operational event is the LER submitted in accordance with 10 CFR 50.73, "Licensee event report system." Safety performance is only one of several factors that affect the number of LERs submitted by a licensee. Therefore the NRC staff does not base its assessment of the safety performance of a plant on the number of LERS that the plant has submitted. For completeness, however, the total number of LERS submitted each year are compiled. These data are shown in Table 4.5.

Other data AEOD uses in its activities include—

- immediate notifications to the NRC Operations Center in compliance with 10 CFR 50.72, "Immediate notification requirements for operating nuclear power reactors";
- monthly operating reports submitted in accordance with plant Technical Specifications; and
- the data base of component failures in the Nuclear Plant Reliability Data System, a

system managed by the Institute of Nuclear Power Operations (INPO).

Other operational data include 10 CFR Part 21 reports, "Reporting of Defects and Non-compliance," NRC regional inspection reports, preliminary notifications of events or unusual occurrences issued by the NRC, and allegations.

AEOD employs foreign event data in its studies of reactor operational experience. Reports of operational events received from the following sources supplement the domestic data:

- the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development,
- the International Atomic Energy Agency, and
- bilateral exchange programs with over 20 countries.

AEOD continues to review and assess foreign operational experience for applicability to NPPs in the United States.

Table 4.5 LERs Submitted by Year*

Year	No. of LERs	No. of Units	LERs per Unit
1987	2895	111	26
1988	2479	110	23
1989	2356	112	21
1990	2128	111	19
1991	1858	111	17
1992	1774	111	16
1993	1400	109	13
1994	1279	109	12
1995	1178	109	11
1996	1293	110	12

*Counts do not include the Dresden Unit 1, Humboldt Bay Unit 3, and Three Mile Island Unit 2 plants. Counts also do not include the Fort St. Vrain plant after August 29, 1989; the LaCrosse plant after April 30, 1987; the Rancho Seco Plant after June 7, 1989; the Shoreham plant after June 6, 1987; the Yankee Rowe plant after February 26, 1992; the San Onofre Unit 1 plant after November 30, 1992; and the Trojan plant after January 4, 1993. Canceled, proprietary, voluntary, and safeguards LERs were excluded from all counts. Calendar year values are shown for 1985 through 1995. Fiscal year values are used from 1996 on. Data for October 1, 1995, through December 31, 1995, are included in both calendar year 1995 and fiscal year 1996 values. Data are subject to change as additional information is received.

Feedback of Reactor Operational Experience

AEOD Operational Experience Studies. Reports of AEOD studies of operational experience are broadly disseminated throughout the nuclear community and to the public. They provide a basis for decision-making based on actual operational experience. In 1996, the AEOD staff continued to analyze and evaluate operational experience and to publish reports of equipment problems, events, and operating experience reliability analyses. The

staff placed increased emphasis on the quantitative analysis of risk associated with operational events and conditions. Probabilistic risk assessment (PRA) and reliability analyses continued to be applied to a greater range of event studies.

AEOD uses a systematic process to nominate, prioritize, and select safety issues to be studied, placing emphasis on broad-based, programmatic issues and the industry's followup to previously resolved issues. The process includes an evaluation methodology to assess each topic using the following six attributes:

1. Risk significance,
2. Issue complexity,
3. Requirement factors,
4. Review factors,
5. Industry initiatives, and
6. Other considerations.

The view of operational data includes allegations, vendor test data, plant test data, vendor inspection reports, and regional inspection reports. AEOD solicits identification of potential safety issues from other program offices, regions, and interested parties. This approach strengthens AEOD's independent means of identifying and studying generic lessons learned from operational experience.

AEOD staff also continued efforts to more effectively communicate the lessons of operational experience through various forums, including participation in industry code committees, presentation of papers at professional meetings, and attendance at owners groups meetings and international meetings.

In 1996, AEOD issued 12 reports and one supplement (in addition to the AEOD Annual Report and the annual ASP and PI reports, and excluding revisions) based on its review and analysis of operational data. These reports, listed in Table 4.6, were broadly distributed within both the NRC and the regulated industry and are publicly available.

Table 4.6 AEOD Reports Issued in 1996

Date	Title	No.	Author
Special Studies			
12/95	Precursors to Potential Severe Core Damage Accidents: 1994 A Status Report	NUREG/CR-4674 Vols. 21 and 22	
01/96	Performance Indicators for Operating Commercial Nuclear Power Reactors Data Through September 1995		
01/96	Evidence of Aging Effects on Certain Safety-Related Components	NUREG/CR-6442	
08/96	Office for Analysis and Evaluation of Operational Data—Annual Report, 1994–FY 95	NUREG-1272, Vol. 9, No. 1	
08/96	Isolation Condenser System Reliability, 1987–1993	S96-01 (INEL-95/0478)	
09/96	Assessment of Spent Fuel Cooling	S96-02	J. Ibarra W. Jones G. Lanik H. Ornstein S. Pullani
02/96	Emergency Diesel Generator Power System Reliability 1987–1993	S96-03 (INEL-95/0035)	
Engineering Evaluations			
03/96	Motor-Operated Valve Key Failures	E96-01	C. Hsu
04/96	Analysis of Allegation Data	E96-02	S. Israel
06/96	Analysis of Allegation Data	E96-02 Supplement 1	S. Israel
04/96	Steam Generator Tube Failures	NUREG/CR-6365 (E96-03)	
Technical Review Reports			
10/95	Potential Damage to Low-Pressure Injection Valves During Surveillance Testing	T95-02	E. Brown
10/95	Review of the National Transportation Safety Board's Safety Study NTSB/SS-94/01, "A Review of Flightcrew-Involved, Major Accidents of U.S. Carriers, 1978 Through 1990"	T95-03	J. Kauffman
03/96	Technical Review Report—AEOD Technical Reports by Category	T96-01	S. Israel
03/96	Technical Review Report—AEOD Technical Reports by Category	T96-01 Revision 1	S. Israel
04/96	Technical Review Report—Target Rock Two-Stage SRV Performance Update	T96-02	M. Wegner
08/96	Technical Review Report—Response of Babcock & Wilcox Company Plants Following a Loss of Nonemergency AC Power	T96-03	W. Raughley

Nuclear Materials Operational Experience

The NRC licenses the use of reactor-produced isotopes, the milling of uranium, and the subsequent processing of both natural and enriched uranium, as well as other special nuclear material. The NRC directly regulates licensees in 21 States, the District of Columbia, and the U.S. territories. The remaining 29 states, known as Agreement States, have entered into agreements with the NRC under Section 274 of the Atomic Energy Act, as amended, whereby the NRC relinquishes and the States assume regulatory authority over the use of byproduct materials, source materials, and other special nuclear material in quantities not capable of sustaining a chain reaction (see Chapter 5).

ANALYSIS OF NUCLEAR MATERIALS OPERATIONAL EXPERIENCE

Nuclear materials licensees are required by Title 10 of the *Code of Federal Regulations*, comparable Agreement State regulations, or license conditions to submit reports of events that meet established criteria. Reportable nuclear materials events include—

1. Medical misadministrations of radiation or radiopharmaceuticals to patients,
2. Radiation overexposures,
3. Loss of control of licensed material,
4. Problems with equipment that uses licensed material or is otherwise associated with the use of licensed material,
5. Releases of material or contamination,
6. Leaking radioactive sources,
7. Problems during the transportation of licensed material,
8. Problems in fuel cycle facilities, and

9. Problems in nonpower reactors.

AEOD collects, reviews, and codes nuclear materials event information reported by NRC licensees and Agreement States. Approximately 7000 NRC licensees and 15,000 Agreement State licensees submit reports of events. NRC licensees submit reports directly to the NRC Regional or Headquarters Offices. Agreement State licensees submit reports to the States, which in turn voluntarily transmit summary reports to the NRC under an informal information sharing agreement. AEOD maintains this information in the Nuclear Material Events Database (NMED). In 1996 there were 441 reports of events involving nuclear materials licensees that were required to be reported to the NRC, as shown in Table 4.7.

Radiation Exposures. The NRC regulates both reactor and nonreactor applications of nuclear materials. All NRC licensees are required to monitor employee exposure to radiation and radioactive materials at levels sufficient to demonstrate compliance with the occupational dose limits specified in 10 CFR Part 20. Licensees of power reactors, and those involved in industrial radiography, the manufacture and distribution of radioactive materials, fuel fabrication and processing, low-level radioactive waste disposal, and independent spent fuel storage, are required by 10 CFR 20.2206 to provide to the NRC annual reports of exposure data for individuals for whom personnel monitoring is required. These data for calendar year 1995 are summarized in Table 4.8.

Overexposures. Although commercial nuclear power reactor exposures have been maintained at a low level, a few overexposures continue to occur. However, the number of individuals overexposed in nonreactor applications typically exceeds the number overexposed at reactor sites. The non-reactor licensees of most concern for over-exposures are radiographers. Table 4.9 provides a comparison of overexposures at reactor facilities with those of radiography licensees. The special radiological problems of industrial radiography have been known for some time, and AEOD has provided guidance, a training document, and a videotape to address those problems.

Table 4.7 Reportable Events by Event Type for NRC and Agreement State Nuclear Materials Licensees During 1996

Type of Event	NRC	Agreement States	Total
Misadministrations	25	14	39
Overexposures	5	8	13
Loss of Control of Material	90	78	168
Leaking Sources	11	11	22
Release of Material	22	14	36
Transportation	17	16	33
Equipment Problems	76	29	105
Fuel Cycle Operations	22	N/A	22
Research and Training Reactors	3	N/A	3
Total	271	170	441
Data are subject to change as additional information is received.			

Table 4.8 Annual Exposure Data for Certain Categories of NRC Licensees for Calendar Year 1995

Category	No. of Licensees Reporting	Collective TEDE* [person-cSv(rem)]	No. of Workers with Measurable TEDE	Average Measurable TEDE per Worker-[cSv(rem)]
Reactors	109	21,674	70,986	0.31
Industrial Radiography	139	1338	2465	0.54
Manufacture and Distribution	36	595	1222	0.49
Fuel Fabrication and Processing	8	1217	2959	0.41
Low-Level Waste Disposal	2	8	56	0.15
Independent Spent Fuel Storage	1	51	49	1.04
Source: Radiation Exposure Information Report System, funded by the Office of Nuclear Regulatory Research. Data are subject to change as additional information is received.				
* TEDE is the total effective dose equivalent as defined in 10 CFR 20.1003				

Table 4.9 Occupational Overexposure Rate at Reactor and NRC Radiography Licensees, 1990 - 1995

Year	Reactors			Radiography		
	No. of Workers with Measurable TEDE*	No. of Workers Overexposed	Over-exposures per 1,000 Workers	No. of Workers with Measurable TEDE	No. of Workers Overexposed	Over-exposures per 1,000 Workers
1990	98,802	1	0.01	4458	7	1.57
1991	91,085	0	0.00	4649	2	0.43
1992	94,317	5	0.05	4265	1	0.23
1993	86,187	0	0.00	3007	1	0.33
1994	73,780	1	0.01	2351	2	0.85
1995	70,986	0	0.00	2465	1	0.41

Source: Radiation Exposure Information Report System, funded by the Office of Nuclear Regulatory Research. Data are subject to change as additional information is received.

* TEDE is the total effective dose equivalent as defined in 10 CFR 20.1003

Abnormal Occurrences. In its 1996 report to Congress, AEOD described 24 AOs that were reported by nuclear materials licensees (see NUREG-0090, "Report to Congress on Abnormal Occurrences, Fiscal Year 1996," Vol.19). Two of these AOs were particularly significant:

1. The use of an incorrect dose rate for a

strontium-90 source resulted in the overexposure of more than 100 people (report no. 96-3), and

2. A cobalt-60 source became separated from a stolen radiography camera in a scrap yard and overexposed more than a dozen people (report no. AS 96-1).

Table 4.10 summarizes the nuclear materials AOs.

Table 4.10 Abnormal Occurrences Reported by NRC and Agreement State Licensees During 1996

Type of Event	NRC Licensees	Agreement State Licensees
Brachytherapy Misadministration	11	2
Radiopharmaceutical Misadministration	5	2
Lost Source	0	2
Release of Material	0	2
Totals	16	8

Incident Response

OPERATIONS CENTER

The NRC Operations Center provides the focal point for NRC communications with licensees, State agencies, and other Federal agencies regarding operating events. The center is continuously staffed and contains a state-of-the-art Operations Center Information Management System that integrates voice, video, and data systems to provide timely and effective information flow during the NRC's response to an incident.

The Operations Center receives notifications of events classified under licensee emergency plans

as well as events that do not meet the threshold for emergency classification. There were 1677 events reported in 1996, including 67 Unusual Events, 10 Alerts, and 1 Site Area Emergency. These events are summarized in Tables 4.11 and 4.12.

EMERGENCY EXERCISES

Emergency exercises are held periodically to ensure that NRC, licensee, local, State, and other Federal response organizations are proficient in dealing with emergencies. The NRC Headquarters and Regional Offices participated in four full-scale and six limited-participation emergency exercises in 1996. AEOD also conducted a tabletop emergency planning exercise with a uranium fuel fabrication facility.

Table 4.11 Events Reported to the NRC Operations Center During 1996

Event Type	Power Reactor	Fuel Facility	Non-Power Reactor	Hospital	Transport/Materials	Well/Other	Total
Non-Emergency	1345	10	2	60	100	82	1599
Unusual Event	65	1	0	0	1	0	67
Alert	5	5	0	0	0	0	10
Site Area Emergency	0	1	0	0	0	0	1
General Emergency	0	0	0	0	0	0	0
Totals	1415	17	2	60	101	82	1677

Table 4.12 Classification of Events Under Licensee Emergency Plans from 1989 to 1996*

	1989	1990	1991	1992	1993	1994	1995	1996
Unusual Event	197	151	170	135	103	97	66	67
Alert	13	10	9	20	8	4	8	10
Site Area Emergency	0	1	2	1	1	0	0	1
General Emergency	0	0	0	0	0	0	0	0

*Calendar year values are shown for 1989 through 1995. Fiscal year values are used from 1996 on. Data for October 1, 1995, through December 31, 1995, are included in both calendar year 1995 and fiscal year 1996 values.

Figures 4.3 through 4.6 show participants in a typical exercise as they receive and evaluate information to determine the appropriate NRC response and the appropriate guidance to offer State and local governments.

OTHER INCIDENT RESPONSE ACTIVITIES

During 1996, AEOD continued an aggressive State Outreach Program designed to increase and improve the NRC's interaction with States during events and exercises. Outreach sessions were conducted with 15 States and numerous licensees. AEOD also participated in an intensive activity to evaluate the adequacy of Federal plans in response to nuclear, biological, and chemical terrorist events. The office staff also provided training to selected congressional staff members on our role during a radiological emergency.

The Energy Policy Act of 1992 established a new Government corporation, the United States Enrichment Corporation, to manage and operate the Portsmouth and Paducah Gaseous Diffusion Plants (GDPs—uranium enrichment facilities) previously operated by the Department of Energy (DOE). The Act further directed the NRC to establish the process by which the GDPs will be annually certified by the NRC for compliance with NRC standards. These standards require site-specific emergency response plans for these plants to be submitted for review and approval prior to certification. NRC regulatory authority over GDP operations is currently scheduled to be transferred from DOE to the NRC on March 3, 1997.

INCIDENT INVESTIGATION PROGRAM

The Incident Investigation Program (IIP) is a formal program to ensure that NRC investigations of significant operational events are timely, thorough, and well coordinated. The scope of the program includes investigations of events involving both reactor and nuclear materials activities licensed by the NRC. Under the IIP, the NRC responds to an operational event according to its safety significance. For an event of potentially major safety significance, the Executive Director for Operations establishes an Incident Investigation Team (IIT) to investigate the event; for an event of less safety significance, the cognizant NRC Regional Administrator may establish an Augmented

Inspection Team (AIT) to investigate the event. Both IITs and AITs are assigned to determine the circumstances and causes of an operational event and to assess the safety significance of the event so that appropriate followup actions can be taken. For events of extraordinary safety significance, the Commission may establish an Accident Review Group (ARG) led by an individual from outside the NRC and composed of experts from within and outside the NRC. The ARG reports directly to the Commission and is independent of NRC management. AEOD has responsibility for overall administration of the IIP, while NRR is responsible for maintaining the procedures for an AIT response.

No events occurred in 1996 that were judged to have a level of significance sufficiently high to warrant an IIT investigation. However, nine events resulted in AIT inspections—seven at power reactors and two at nuclear materials licensees. These events are described in Table 4.13.

INDEPENDENT ASSESSMENTS

AEOD performs independent assessments of licensee performance as required at selected reactor facilities to augment information provided by other NRC programs, including the Systematic Assessment of Licensee Performance (SALP), Performance Indicator (PI), and Headquarters and Regional inspection programs. AEOD oversight and administration of the Diagnostic Evaluation Program ended in 1996. The procedures for Diagnostic Evaluation Team inspections continue to be utilized, with appropriate modifications, in other performance assessments under Headquarters and Regional oversight and administration. In 1996, AEOD led such a modified inspection of the Maine Yankee Atomic Power Station in response to anonymous allegations. The Maine Yankee Independent Safety Assessment Team found that, while overall performance at Maine Yankee was adequate for operation, a number of deficiencies existed in each of the areas assessed. The root causes of these deficiencies were determined to be the economic pressure to reduce costs, which limited the available resources, and the lack of a questioning attitude. A number of NRC staff action items have been assigned as a result of this inspection, and AEOD is tracking those items to completion.

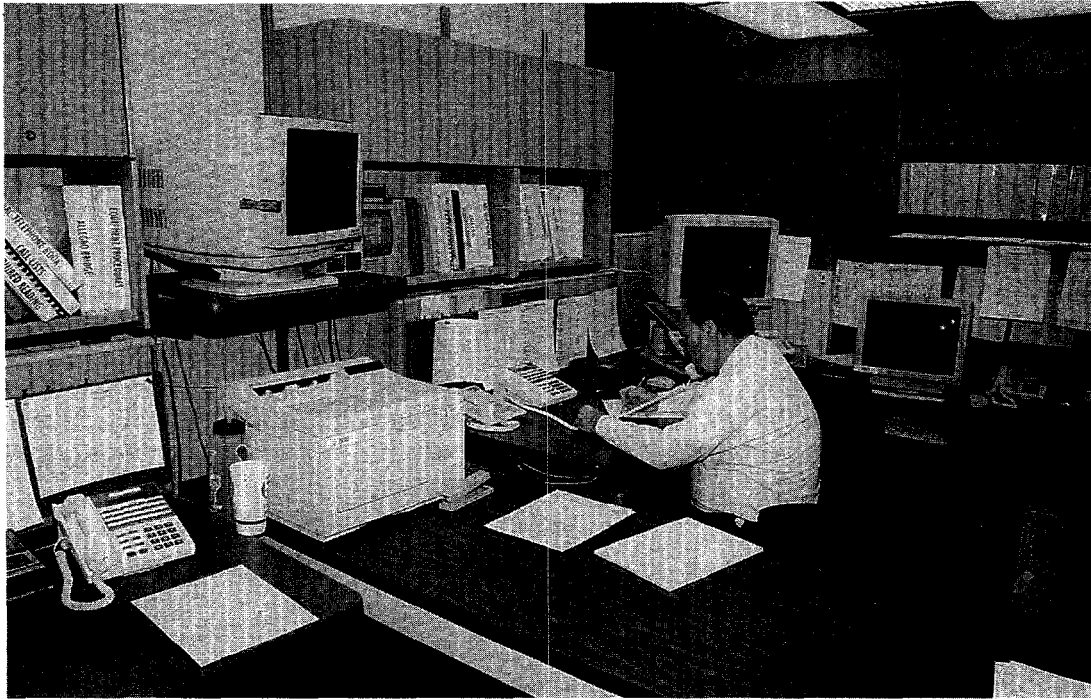


Figure 4.3 A Headquarters Operations Officer Receives an Event Notification Report from a Licensee

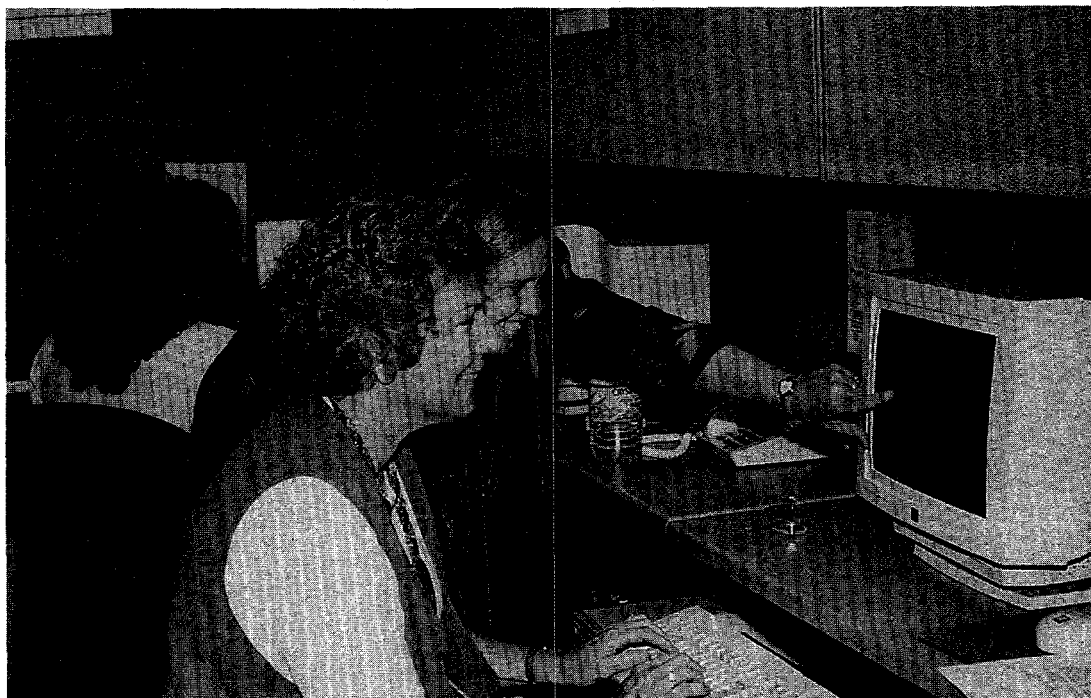


Figure 4.4 Operations Support Team Members Distribute Information Electronically

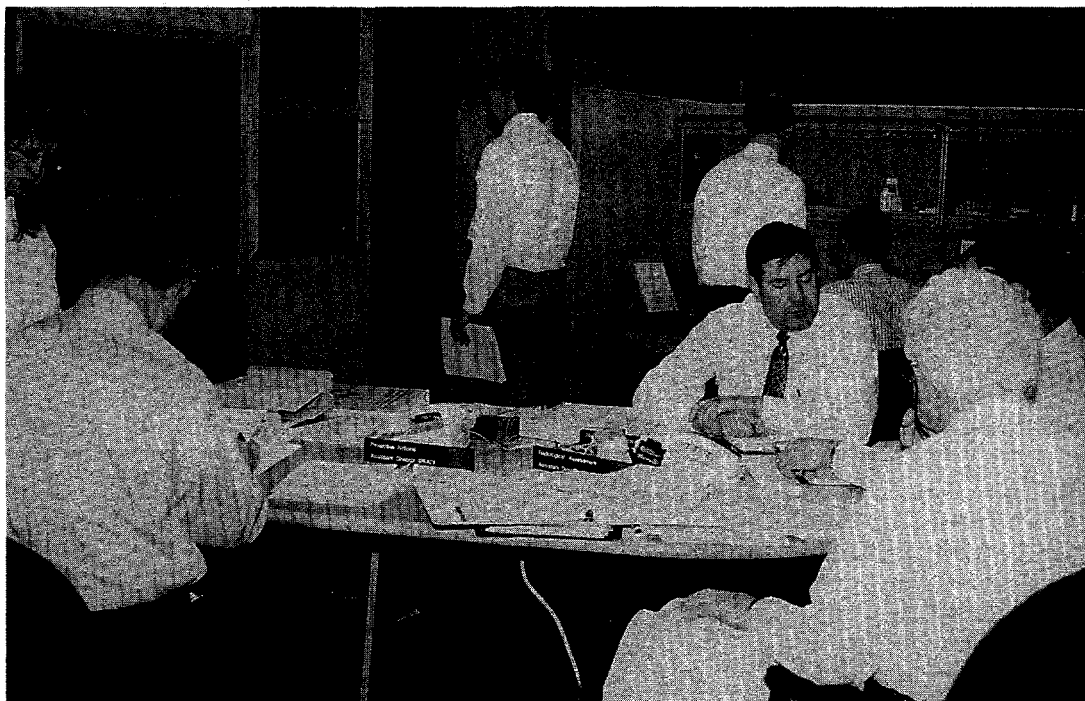


Figure 4.5 Protective Measures Team Members Independently Evaluate the Need for Sheltering and Evacuation

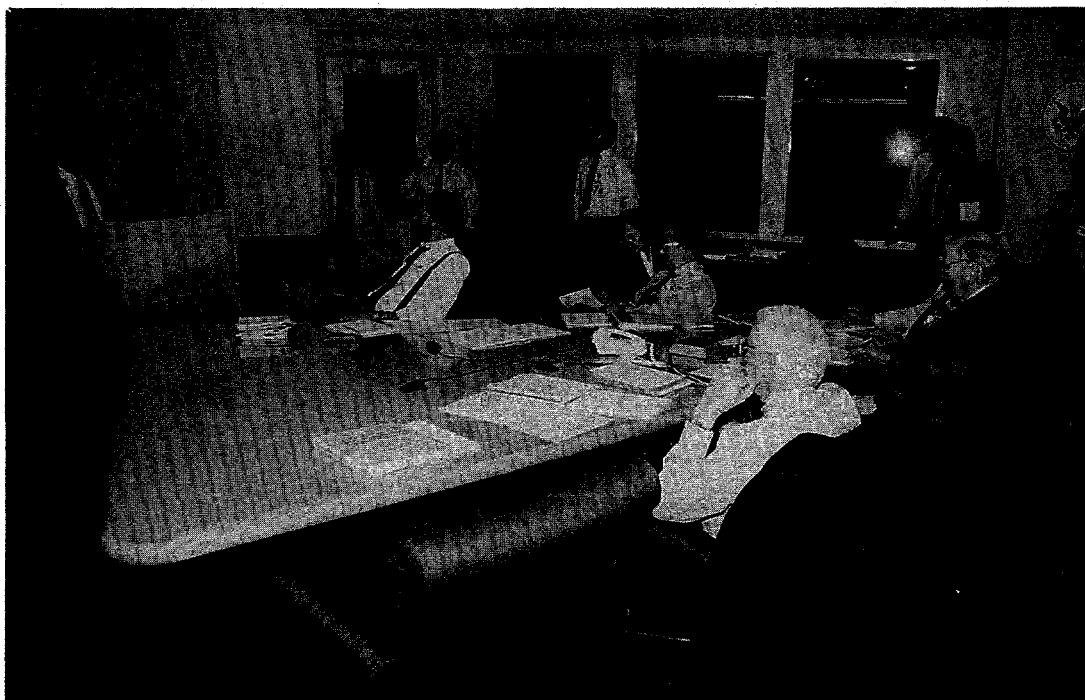


Figure 4.6 The Executive Team Receives a Briefing During an Emergency Exercise

Table 4.13 Events for Which AITs Were Established in 1996

Event Date	Facility	Event
Reactor Licensees		
01/30/96	Wolf Creek 1	Manual reactor trip with multiple complications
05/15/96	Dresden	Loss of feedwater flow
05/19/96	Arkansas Nuclear 1	Reactor trip with steam generator dry-out
05/29/96	Point Beach 1,2	Unanticipated hydrogen gas ignition
06/24/96	LaSalle 1,2	Foreign material in the intake structure
09/01/96	Haddam Neck	Inadvertent introduction of nitrogen gas into the RCS during shutdown
09/24/96	Oconee	Scram with complications: rupture of main steamline, 7 people injured
Nuclear Materials Licensees		
04/02/1996	Nuclear Fuel Services, Inc.	Fire exceeding 15 minutes, breach of containment, potential for radioactive release, Site Area Emergency
08/22/1996	ABB Combustion Engineering – Hematite	Unanticipated chemical reaction ejected hot material and plume; plume blown offsite

Technical Training

AEOD manages and conducts the NRC technical training program at the Technical Training Center in Chattanooga, Tennessee. AEOD coordinates with NRC Headquarters Offices and the Regions policy development and implementation of formal staff qualification and training programs. New courses are developed and existing courses are modified to meet new or changing needs identified by the NRC line organization. AEOD staff provide technical assistance in areas of expertise and provide advice and limited technical training assistance to foreign regulatory counterparts.

Reactor technology courses are offered for each of the reactor vendor designs: General Electric, Westinghouse, Combustion Engineering, and Babcock and Wilcox. These courses include both classroom instruction and training on full-scope simulators for each vendor design.

Specialized technical training courses are provided in probabilistic risk assessment, engineering support, radiation protection, fuel cycle technology, security and safeguards, and regulatory skills. Specialized technical training is provided through customized courses, coordination of training opportunities in courses presented by other Government agencies,

and identification of appropriate commercially available courses for NRC personnel.

During 1996, AEOD taught 62 courses in reactor technology and 97 specialized technical training courses requiring 204 course-weeks and 79,853 instructional hours. Most of this technical training was provided in support of qualification programs for NRC technical staff, although the reactor technology courses included a significant number of foreign regulatory personnel.

International Exchange of Information

INCIDENT REPORTING SYSTEM

The Incident Reporting System is a cooperative program of the Organization for Economic Cooperation and Development's Nuclear Energy Agency and the International Atomic Energy Agency of the United Nations. Member countries submit reports of operational experience that may be applicable to other NPPs. This broadens the operational experience database to include all nuclear power programs except that of Taiwan. AEOD prepares and submits reports of U.S.

operational experience and also reviews and disseminates within the NRC reports of selected foreign reactor events that could be applicable to U.S. plants. In 1996, AEOD continued to participate in the Incident Reporting System by submitting 67 reports of U.S. operational experience and reviewing approximately 110 reports of foreign events.

INTERNATIONAL SUPPORT ACTIVITIES

AEOD exchanges information and ideas on a variety of topics of international interest, such as emergency response, operating experience feedback, common-cause failures, and plant aging. AEOD is also the principal U.S. technical representative on reactor operating experience to the NEA's Committee on the Safety of Nuclear Installations Principal Working Group 1, "Operating Experience and Human Factors." In addition, AEOD is a participant in the Expert Group on Nuclear Emergency Matters, established to improve the quality of national and international nuclear emergency arrangements.

LISBON INITIATIVE ACTIVITIES

AEOD is continuing to assist the regulatory authorities of Russia and Ukraine in the improvement of their own capabilities to respond to NPP emergencies. The AEOD staff, working with counterparts in the Federal Nuclear and Radiation Safety Authority of Russia and the Ministry for Environmental Protection and Nuclear Safety of Ukraine, is helping to establish reliable emergency communications with NPP sites (1) to prepare response plans and procedures and (2) to provide equipment for basic but functional emergency response centers in each country. The AEOD staff is also helping them prepare, conduct, and evaluate exercises so that they will be able to improve their response capabilities after the assistance program ends.

In addition, AEOD is assisting Ukraine in establishing an incident reporting and operating experience feedback system. This system includes strategies for data collection, events analysis and evaluation, regulatory response to events, and experience feedback to nuclear plants as well as

information exchange between countries of the former Soviet Union with similar reactors.

LIMITED PARTICIPATION IN THE INTERNATIONAL NUCLEAR EVENT SCALE

Since December 1992, the NRC has participated in a limited manner in the International Nuclear Event Scale (INES). The INES is a ranking system that is used to promptly and consistently communicate to the public the safety significance of reported events at nuclear installations worldwide. It was designed by an international group of experts convened jointly by the International Atomic Energy Agency and the Nuclear Energy Agency. The international scale is currently in use in 54 countries throughout the world.

The NRC usually limits its participation in the INES to rating only events at NPPs that are classified as Alerts or higher on the emergency response scale used in the United States. However, additional events can be rated, based upon management discretion. After a trial period of more than two years, the NRC decided to continue indefinitely its limited participation in the INES. In 1996, AEOD submitted six INES reports, as shown in Table 4.14.

COMMITTEE TO REVIEW GENERIC REQUIREMENTS

The Committee To Review Generic Requirements (CRGR) reviews all generic requirements proposed by the NRC staff that involve one or more classes of power reactors. The CRGR consists of senior managers from various Headquarters program offices and, on a rotational basis, from one of the NRC Regional Offices. The AEOD Director serves as the CRGR Chairman, and the AEOD staff provides support for all of the Committee's activities. The AEOD Director also oversees plant-specific backfit activities of the NRC staff in the Headquarters program offices and the Regional Offices. The membership of the CRGR as of September 30, 1996, was as follows:

Table 4.14 U.S. Events Reported on the International Scale During 1996

Plant Name (Type)	Event Date	INES Level*	U.S. Emergency Classification	Event Description
Salem 1 (W/PWR)	10/04/95	Below Scale	Alert	Loss of control room annunciators for more than 15 minutes; Alert declared on 10/05/96
LaSalle 1 (GE/BWR)	10/31/95	1	Alert	High radiation levels in containment due to withdrawal of a traversing incore probe to an unshielded location in the reactor building
Wolf Creek 1 (W/PWR)	01/30/96	2	Unusual Event	Manual reactor trip with multiple complications
Catawba 2 (W/PWR)	02/15/96	1	Unusual Event	Loss of offsite power, reactor trip, and safety injection due to an electrical fault in isophase ducting
Palo Verde 2 (CE/PWR)	04/04/96	Below Scale	Alert	Fire in a lighting panel in the control room
Clinton 1 (GE/BWR)	08/19/96	1	Alert	Fire on reactor core isolation cooling pump turbine insulation
<p>*Events are classified on a scale of seven levels. The lower levels (1-3) are termed as incidents, and the upper levels (4-7) as accidents. Events that have no safety significance are classified as below scale/level 0 and are termed as deviations. Events that have no safety relevance are termed as "out of scale."</p> <p>Abbreviations: <u>W</u> - Westinghouse Electric Company GE - General Electric Company CE - Combustion Engineering Company</p>				

Edward L. Jordan, Director, AEOD (Chairman)

Frank J. Miraglia, Deputy Director, NRR

Malcolm Knapp, Deputy Director, NMSS

Joseph Murphy, Executive Assistant to Director,
RES

Charles W. Hehl, Director, Division of Nuclear
Materials Safety, RI

Dennis Dambly, Assistant General Counsel for
Materials, Antitrust and Special Proceedings,
OGC

While performing the CRGR review function, a CRGR member expresses an individual professional opinion about each item considered, rather than representing the view of his or her respective

office. The members of the CRGR determine whether proposed new generic requirements have sufficient merit in terms of safety and are justified in terms of cost (where appropriate) before reaching a consensus recommendation about each issue considered. Each independent CRGR recommendation is given to the EDO for consideration.

On March 22, 1996, the Commission approved a revision to the CRGR Charter which expanded the scope of CRGR reviews, on a 1-year trial basis, to include selected nuclear materials issues that are requested by the NMSS Director or the EDO.

In 1996, the CRGR held 15 meetings during which it discussed 23 issues, all related to power reactors. The Committee, in its reviews of proposed new generic requirements, continued to emphasize less

prescriptive, more performance-based and risk-informed regulations. The CRGR supported the expedited review of seven items requested by the staff. Of these, four were proposed urgent bulletins and three were generic letters.

OFFICE OF INVESTIGATIONS

OI conducts investigations of alleged wrongdoing by individuals or organizations other than employees of the NRC or contractors for the NRC. (Allegations involving NRC employees or NRC contractors come under the purview of the NRC Office of the Inspector General). Thus, OI is concerned with the activities of NRC licensees, applicants for licenses, licensee contractors, and vendors.

OI opened 227 investigations in FY 1996 and carried over 141 investigations from FY 1995, giving OI a total inventory during FY 1996 of 368 cases, many of which contained multiple suspected wrongdoing violations. During the same period, OI completed 240 of these investigations, representing 65 percent of the total case inventory.

Of the 173 escalated enforcement actions taken by the NRC in FY 1996, 43 (25%) were based upon findings provided by OI investigations. The civil penalties proposed in FY 1996 as a result of OI investigations totalled \$811,500.

In FY 1996, continued support was provided to the Department of Justice (DOJ) and other Federal agencies in prosecuting criminal violations that were substantiated during OI investigations. Of the 240 investigations closed in FY 1996, 66 cases were referred to the DOJ for prosecutorial review. During FY 1996, OI supported seven Federal grand juries. OI investigations resulted in two indictments, two convictions, and one guilty plea in Federal courts.

The following sections contain examples of significant OI investigations on which actions were taken by the Office of Enforcement or DOJ during FY 1996.

NRC Enforcement Actions

BALTIMORE GAS & ELECTRIC COMPANY

An investigation disclosed that Baltimore Gas & Electric Company (BG&E) knowingly awarded a contractor employee unescorted site access at its Calvert Cliffs NPP even though it was aware that the employee had a criminal record and had presented security screening documents containing material false statements. The investigation further disclosed that the contractor employee was an illegal alien, had intentionally made false statements to screening personnel in his application, and had deliberately submitted fraudulent identification documents. Based on the results of the investigation, BG&E paid a \$50,000 civil penalty on January 30, 1996. On April 19, 1996, the NRC issued an order prohibiting the involved individual from engaging in NRC-licensed activities for a period of 5 years.

EASTERN TESTING AND INSPECTION, INC.

An investigation disclosed that Eastern Testing and Inspection, Inc. (ETI), had deliberately directed at least one unqualified and untrained employee to perform radiography and that the ETI president and the radiation safety officer had generated inaccurate documents indicating that the employee had been properly trained, tested, and certified to perform radiography. The investigation staff also found that ETI did not complete the required source utilization records on 97 occasions. They determined that the president of ETI threatened a former employee on two occasions because he believed that the employee may have cooperated with the NRC. On the basis of the investigation, on March 29, 1996, the NRC issued an immediately effective order suspending ETI's licenses.

NDT SERVICES, INC.

An investigation determined that NDT deliberately used a radiographer untrained in NDT's emergency and operating procedures, which resulted in a disconnect event requiring the evacuation of a Sun Oil Refinery in Puerto Rico. Additionally, the radiation safety officer (RSO) and the president of NDT provided false documents regarding the

training program. NDT was fined \$15,000 on July 16, 1996, by the NRC, and the president and the RSO of NDT were given orders prohibiting their participation in NRC-licensed activities.

CRYSTAL RIVER NUCLEAR PLANT

From an investigation and extensive regional inspection, the staff discovered serious management errors and inadequate procedures that contributed to a pattern of unauthorized tests by control room operators. Several operators received letters of reprimand, and Florida Power Corporation, the licensee, was assessed a \$500,000 civil penalty, which was paid on September 9, 1996.

ARIZONA PUBLIC SERVICE COMPANY

From an investigation, the staff determined that a former contract instrumentation and control (I&C) employee at Palo Verde Nuclear Generating Station (PVNGS) was discriminated against by not being rehired for a second outage because he reported safety concerns to the NRC. In FY 1995, in Federal District Court, the former I&C supervisor at PVNGS pleaded guilty and was sentenced to 1 year probation, 75 hours of community service, a \$50 fine, and court costs for "discrimination against an employee of a NPP." On March 7, 1996, on the basis of the OI investigation, the NRC issued an order imposing a fine of \$100,000 on Arizona Public Service Company.

MADIGAN ARMY MEDICAL CENTER

From an investigation, the staff determined that a physicist directed a dosimetrist to include a constant value for iridium-192 in a computer program. This constant was incorrect and resulted in patient test plans and final treatment plans being incorrectly calculated from February 1994 until May 1995. The use of this inappropriate data resulted in five separate misadministrations to four different patients. The investigation substantiated that the physicist had deliberately violated NRC reporting requirements for misadministrations; had failed to perform contamination surveys or wipe tests of radioactive sources; and had provided false information on required survey records. In FY 1995, the NRC issued an order prohibiting

involvement of this physicist in NRC-licensed activities. On May 20, 1996, the NRC issued an order imposing a civil penalty in the amount of \$8,000 on the Department of the Army, Madigan Army Medical Center.

SOUTH TEXAS PROJECT

An investigation disclosed that a former Ebasco, Inc., electrician had been the subject of employment discrimination for protected activities related to his work at South Texas Project. On September 19, 1996, the NRC issued a civil penalty to the licensee in the amount of \$100,000.

Federal Court Actions

NATIONAL CIRCUITS CARIBE, INC.

A joint investigation of this firm's activities was conducted by the EPA, the FBI, and the NRC, requiring extensive use of a Federal grand jury in Puerto Rico. As a result, the president of National Circuits was indicted for abandoning a gauging device containing byproduct material at the company facility in Fajardo, Puerto Rico. The indictment also charged the president with improper storage of hazardous wastes, an EPA violation. He was arrested by the FBI in October 1995. On June 6, 1996, in U.S. District Court, Baltimore, Maryland, he pleaded guilty to abandoning the gauge and was subsequently sentenced to 2 years probation, 150 hours of community service, and a \$100 fine.

BALL MEMORIAL HOSPITAL

An investigation revealed that two Ball Memorial supervisory nuclear medicine technologists had administered greater-than-prescribed dosages of radiopharmaceuticals to patients and also had instructed subordinate technicians to do so. Patients' records of radiopharmaceutical dosages were falsified to create the appearance that the correct prescription had been administered. This investigation was referred to the United States Attorney's office for prosecution. The two former supervisory nuclear medicine technicians pleaded guilty to these violations. On July 11, 1996, one technician was sentenced to 3 years of probation

and a \$5,000 fine for violations of the Atomic Energy Act. The second technician was sentenced to 1 year of probation and a \$1,000 fine for violations of the Atomic Energy Act. On April 19, 1996, Ball Memorial Hospital paid a \$300,000 settlement, based on a civil agreement with the U.S. Justice Department, for violations of NRC regulations and improper Medicare/Medicaid billings.

D. C. COOK NUCLEAR PLANT

An investigation disclosed that a contract insulator gained unauthorized access to the D. C. Cook Nuclear Plant in Bridgeman, Michigan, by falsifying information on a background questionnaire. The contract insulator was also found to have gained access to the James A. FitzPatrick NPP, Scribo, New York, and the Watts Bar Nuclear Plant, Spring City, Tennessee, by falsifying similar background questionnaires. On September 26, 1996, the contract insulator was indicted by a Federal grand jury in Grand Rapids, Michigan, on three counts of making material false statements and subsequently pleaded guilty.

OFFICE OF ENFORCEMENT

OE is responsible for managing the Commission's enforcement program. The NRC's enforcement program is addressed in the agency's Enforcement Policy, NUREG-1600, "General Statement of Policy and Procedure for NRC Enforcement Actions."

Escalated Enforcement Activities

All violations identified through inspections and investigations are subject to civil enforcement

action and may also be subject to criminal prosecution. After an apparent violation is identified, the severity is evaluated to determine the appropriate enforcement sanction. Severity levels range from Level I for the most significant violations, to Level IV for those of more than minor concern. Minor violations are not subject to formal enforcement action. The NRC considers violations categorized at Severity Level I and II to be very significant, as well as enforcement actions consisting of multiple Severity Level III violations. During Fiscal Year (FY) 1996, the agency issued 2 Severity Level I enforcement actions, 15 Severity Level II actions, and 6 multiple Severity Level III actions.

The NRC uses three primary enforcement sanctions: Notices of Violation (NOVs), civil penalties, and orders. The NRC considers civil penalties, orders, and Notices of Violation including Severity Level I, II, and III violations, as escalated enforcement actions.

An NOV sets forth one or more violations of a legally binding requirement and normally requires a response from the licensee describing the reasons for the violation, the corrective steps taken or planned, and the date when actions will be complete. During FY 1996, the agency issued 91 escalated NOVs. Twenty-five of these actions were issued to individuals (licensed and non-licensed) and other non-licensed persons (vendors). Appendix 7 includes a short summary description of each of the 66 actions issued to licensees.

A civil penalty is a monetary fine considered for Severity Level III violations and normally assessed for Severity Level I and II violations and knowing and conscious violations of reporting requirements of Section 206 of the Energy Reorganization Act, as amended. Section 234 of the Atomic Energy Act (AEA) provides for penalties of up to \$100,000 per violation per day. During FY 1996, the agency proposed 66 civil penalty actions. Appendix 7 includes a short summary description of each of these actions. Table 4.15 includes additional civil penalty information.

Table 4.15 Civil Penalty Information

	FY 96
Number of Proposed Civil Penalties	66
Number of Imposed Civil Penalties	9
Number of Civil Penalties Paid	56
Amount of Proposed Civil Penalties	\$3,832,500
Amount of Imposed Civil Penalties	\$44,500
Amount of Civil Penalties Paid	\$3,014,000

In addition to NOV's and civil penalties, orders may be used to modify, suspend, or revoke licenses. Orders may require additional corrective actions, such as removing specified individuals from licensed activities or requiring additional controls or outside audits. Persons adversely affected by orders that modify, suspend, or revoke a license, or that take other actions may request a hearing. During FY 1996, the agency issued 17 orders.

Nine of these orders were issued to licensees while eight of the orders were issued to individuals (one licensed and seven non-licensed). Appendix 7 includes a short summary description of each of the nine orders issued to licensees. In addition, nine civil penalty imposition orders were issued.

A predecisional enforcement conference is normally conducted with a licensee or individual before making an enforcement decision if escalated enforcement action appears to be warranted, and if the NRC concludes that it is necessary or the licensee or individual requests it. During FY 1996, the agency conducted a total of 143 conferences.

The NRC issues a press release with a proposed civil penalty or order. All orders are published in the *Federal Register*.

Table 4.16 includes a statistical breakdown of escalated enforcement activity by regional office.

Table 4.17 includes a statistical breakdown of escalated enforcement activity by the type of licensee, vendor, or individual.

Table 4.16 Escalated Enforcement Activity by Region

	Region I	Region II	Region III	Region IV	Other ¹	Total FY 96
Predecisional Enforcement Conferences	35	43	31	33	1	143
Escalated NOV's w/o Civil Penalties	20	16	32	20	3	91
Proposed Civil Penalties	16	14	15	20	1	66
Imposed Civil Penalties	2	2	1	4	0	9
Civil Penalties Paid	14	11	14	16	1	56
Orders	10	3	1	2	1	17
Total	97	89	94	95	7	382

¹This category includes one order initiated by OE, three escalated NOV's without civil penalties by the Office of Nuclear Reactor Regulation, and one proposed and paid civil penalty by the Office of Nuclear Material Safety and Safeguards.

Table 4.17 Escalated Enforcement Activity by Type of Licensee, Vendor, or Individual				
Type of Licensee	Escalated NOV's (w/o penalty)	Civil Penalties	Orders	Total FY 96
Academic	2	3	0	5
Physician	1	0	1	2
Fuel Facility	0	3	0	3
Gauge User	14	7	2	23
Hospital	8	5	0	13
Radiographer	2	6	1	9
Pharmacy	1	0	0	1
Operating Reactor	33	39	0	72
Materials Distributer	0	2	0	2
Mill	1	0	0	1
Other	4	1	5	10
Vendor	8	0	0	8
Licensed Individual	5	0	1	6
Non-Licensed Individual	12	0	7	19
Total	91	66	17	174

Additional information on the NRC's enforcement program and enforcement activities is available in the OE's FY 1996 Annual Report. This document is available in the Public Document Room and at Web address <http://www.nrc.gov/OE/>.

Continuation of Trial Program for Conducting Open Predecisional Enforcement Conferences

In light of the significant changes to the Enforcement Policy made on June 30, 1995, the Commission decided to continue a trial program of conducting approximately 25 percent of eligible conferences open to public observation pending further evaluation. (See 57 FR 30762; July 10, 1992, and 59 FR 36796; July 19, 1994). The intent of open conferences is not to maximize public

attendance, but is for determining whether providing the public with an opportunity to observe the regulatory process is compatible with the NRC's ability to exercise its regulatory and safety responsibilities. The provisions of the trial program have been incorporated into the Enforcement Policy. During FY 1996, 23 conferences were open to public observation under the trial program.

Enforcement Information on the Internet

To ensure timely and widespread public dissemination of enforcement information, a home page for the enforcement program was established on the World Wide Web in May 1996. The home page includes a general description of the enforcement program and its mission, enforcement contacts, the Enforcement Policy, the *NRC Enforcement Manual*, the Office of Enforcement

Annual Report for FY 1996, the policy statement for "Nuclear Employees Raising Safety Concerns Without Fear of Retaliation," a link to Department of Labor DOL adjudicatory decisions, and upcoming predecisional enforcement conferences. It

also includes copies of significant enforcement actions that the agency has issued arranged by reactor, materials, and individual actions. The Web address for OE's Home Page is <http://www.nrc.gov/OE/>.

Chapter 5

NRC
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Nuclear Materials Regulation

The Nuclear Regulatory Commission's (NRC's) Office of Nuclear Material Safety and Safeguards (NMSS) and the NRC's four Regional Offices regulate the safe use of nuclear materials under several broad programs: material safety, discussed in this chapter; fuel facility safety and safeguards, discussed in Chapter 6; and waste management activities, discussed in Chapter 7. One of these programs, storage and transport of nuclear fuel, is discussed in Chapter 2.

Activities covered in this chapter include licensing, certification, inspection, and other regulatory actions concerned with production and use of reactor-produced radioisotopes (byproduct material). Nuclear materials regulation during Fiscal Year (FY) 1996 comprised:

- Over 4600 licensing actions on applications for new byproduct materials licenses, amendments, and renewals of existing licenses, and reviews of sealed sources and devices; and
- Approximately 2100 materials licensee inspections.

MATERIALS LICENSING AND INSPECTION GENERIC ACTIVITIES

The NRC currently administers approximately 6400 licenses for the possession and use of nuclear

materials in medical and industrial applications. This represents a reduction of about 100 licenses in the past year. Table 5.1 shows the distribution of licenses by region. The 29 Agreement States administer about 15,000 licenses (see Chapter 8).

**Table 5.1 Distribution of NRC Nuclear Materials Licenses
(as of October 1, 1996)**

Region I	2262
Region II	841
Region III	2218
Region IV	863
Headquarters	211
Total:	6395

The program is designed to ensure that activities involving such uses of radionuclides do not endanger public health and safety. NRC regional staff completed 2122 inspections of materials facilities in FY 1996. The NRC Regional Offices administer almost all materials licenses, with the exception of exempt distribution licenses, sealed source and device design reviews, and licenses for companies that extract other metals from ores and slags containing uranium and thorium. These licenses are handled at NRC Headquarters.

The NRC completed 4579 licensing actions during FY 1996. Of this total, 289 were new licenses, 3043 were amendments, 1009 were license renewals, and 238 were sealed source and device reviews.

Materials Licensing Business Process Reengineering

In October 1994, the staff began to examine the process used to issue materials licenses and to identify ways to improve the process. As discussed in the *1995 Annual Report*, the staff found that the licensing process could involve anywhere from 54 to 94 steps that move an application between individuals and computer systems involved in the process during a routine license review. On average, the NRC took 84 days to complete a licensing action, but for much of this time the application was awaiting review or moving through the mail system. Using a disciplined approach known as Business Process Reengineering (BPR), the staff began a major effort to fundamentally change the way NRC licensing work is performed, in order to achieve significant improvements in speed, cost, and quality. The new process will lead to more clear, consistent, and timely regulatory guidance, and will ensure that there is no adverse effect on public health and safety. In the BPR Phase I effort, the staff developed a generalized vision of the new process.

During Phase II, which started in November 1995, the team began the detailed design and testing of the new licensing process. During 1996, the staff focused its efforts on (1) completing a pilot project to develop performance-based guidance using a team approach and (2) developing pilot projects to demonstrate the issues involved in testing a computer-assisted method for licensing portable gauges. In addition, the licensing pilot projects will determine the method's usefulness in handling similar types of applications (e.g., fixed gauges, gas chromatographs, and self-shielded irradiators). These broad use areas were chosen for the initial development effort since approximately 60 percent of the NRC's 6400 material licensees fall into one of these four categories.

In addition to the important pilot efforts during Phase II, the staff implemented a number of successful initiatives. The staff gained experience working in teams with a groupware computer software product that allowed staff in the NRC's regions to work from their offices with Headquarters staff, saving time and money by reducing travel. The staff also developed a

technical assistance request database containing more than 1000 documents discussing case-specific licensing and inspection policy decisions. This database will allow the staff to research and review previous policy decisions much faster than previously possible. Another NRC staff initiative involved rulemaking on a one-time basis to extend the expiration date of about 90 percent of materials licenses by five years. This extension made additional NRC resources available to the BPR project and to other NMSS initiatives. Licenses extended by this rulemaking posed relatively low risk and had good inspection histories. Finally, the staff created an Internet site where NUREG-series reports, information notices, and other regulatory documents may be readily accessed by the public.

The BPR Process. The BPR process is ongoing and iterative, employing multiple activities to test each process or subprocess activity to incorporate lessons and adjustments as needed.

Iterative Nature of the BPR Process. The BPR process involves elaboration and refinement of all aspects of the new licensing process, followed by determination not only of management structure and metrics, but also of jobs, skills, training, values and beliefs, and information technology. Iterative tests of the process or subprocess activities involve staff who will be working in the new system. These tests determine the validity of the developed goals and design using this holistic approach, allowing the BPR team to make any needed adjustments in the process itself and in the metrics used to assess its performance.

Frequent Evaluations by Participants. The team also incorporates lessons learned by conducting short debriefing sessions at the conclusion of team activities. Participants provide feedback on what worked well or poorly, and they offer suggestions for improvements that are incorporated into future activities to the extent possible.

Review of Past Experience of Other BPR Projects. The BPR team has reviewed publications describing the experiences of both Federal Government and non-Government organizations involved in BPR work that point out many factors critical to success of the BPR projects. In many instances, the NRC's experience parallels that of other organizations undergoing BPR.

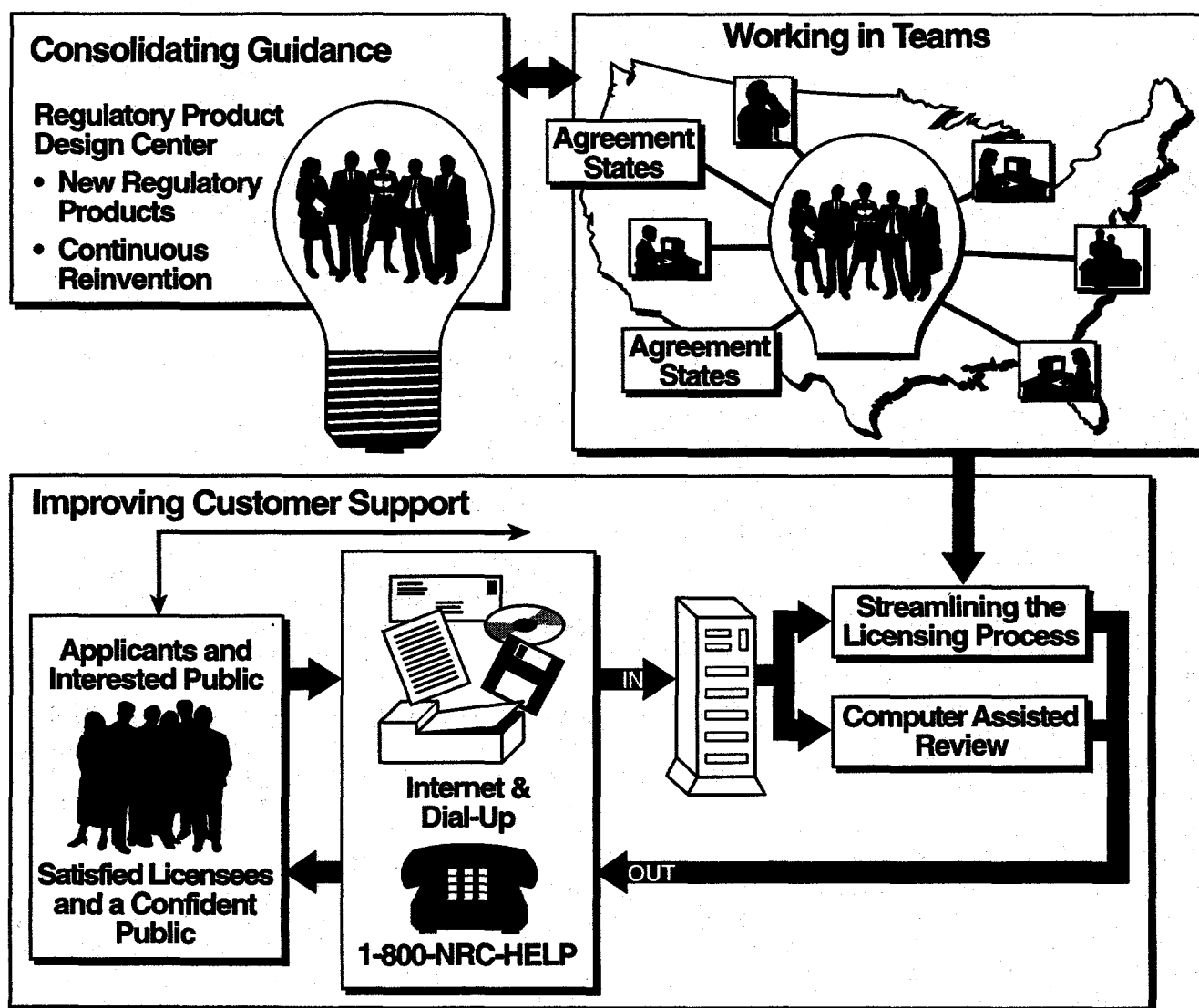


Figure 5.1 The Materials Licensing Process Vision

Project Scope. The staff proposed its vision of the new materials licensing process, incorporating three key features:

- a new way of working in teams,
- a new regulatory approach to guidance development, and
- a new licensing process that involves computer-assisted, individual, or team reviews of applications.

During FY 1996, the staff emphasized the first two aspects of the vision—working in teams and

consolidating and revising guidance used in materials licensing. Phase II is scheduled to be completed in early 1997. Roll-out and implementation of the new licensing system will occur during Phase III of the BPR, which is now scheduled to begin in 1997. The staff has divided the remaining Phase II work into three modules:

Module 1—Guidance Consolidation and Revision:

The staff published draft NUREG-1541, "Process and Design for Consolidating and Updating Materials Licensing Guidance," that describes a new methodology for rapidly consolidating and updating materials licensing guidance. The staff also wrote draft

NUREG-1556, Vol. 1, "Consolidated Guidance about Materials Licenses: Program-Specific Guidance about Portable Gauge Licenses" (September 1996). This document is the first NMSS guide prepared for electronic use by staff and licensees. Further guidance development activities have now been transferred to staff operating outside of the BPR project.

Module 2—Development of License Application Review System: The NRC and contractor staff continued development of computer screens and supporting information technology to—

1. Aid applicants in the preparation of their applications;
2. Assist reviewers in the review of applications;
3. Provide a mechanism for quality assurance reviews; and
4. Allow managers to quickly assess the performance of the licensing process.

In FY 1997, the NRC will complete a small Headquarters pilot and an expanded pilot in one or more of the regions to test the design of the computer-assisted licensing system. Plans for the regional pilot include the participation of regional licensing staff and managers, as well as Agreement State personnel, licensees, and portable gauge manufacturer representatives.

Module 3—Processes for Receiving Applications and Issuing Licenses: The major tasks currently underway in Module 3 involve modeling, developing, and testing methods for receiving license applications and issuing final licenses. As the result of an April 1996 public workshop in which participants identified the Internet as their preferred vehicle, the NRC is considering the Internet as the primary mechanism for transferring information between the NRC and applicants and licensees. However, the staff is mindful of the need to provide access to all applicants and will ensure that submittals in paper or other electronic forms remain a viable option in the new process.

Human Factors

An NRC human factors analyst assisted in reviewing proposals and made a presentation at a

multidisciplinary conference on "Examining Errors in Health Care." Several hundred people attended the presentation on "Translating a Human Factors Process from Nuclear Power Plants to Health Care."

Several presentations were made to the American Association of Physicists in Medicine, the NRC's Advisory Committee on the Medical Uses of Isotopes, and others on NUREG/CR-6125, "Human Factors Evaluation of Remote Afterloading Brachytherapy," and NUREG/CR-6277, "Human Factors Evaluation of Teletherapy." These presentations gave an overview of the goals, methods, and results of the evaluations. More importantly, the presentations described approaches to improving the performance of remote afterloading brachytherapy and teletherapy with respect to misadministrations.

An NMSS human factors analyst discussed identification of human factors problems that can contribute to an event at a workshop of Region III inspectors. A presentation on medical misadministrations also was prepared for NRC and Agreement State personnel attending Technical Training Center courses on nuclear medicine and on teletherapy and brachytherapy. This presentation addressed various types of misadministrations, required licensee and NRC followup of misadministrations, associated human factors problems, and factors contributing to the human factors problems.

Human factors issues associated with material and fuel cycle events were routinely identified, as appropriate, as part of daily briefings on regional coordination. A human factors analyst accompanied regional inspections as a followup to several of the events and provided assistance in identifying root causes and contributing factors, as well as in evaluating licensee responses to the events.

NMSS participated in the update and revision of the NRC's "Human Performance Program Plan." In addition, NMSS supported an Office of Nuclear Regulatory Research project identified in that plan. This project is using the results of NUREG/CR-6125 in an effort to determine the feasibility of using task network modeling for regulatory applications.

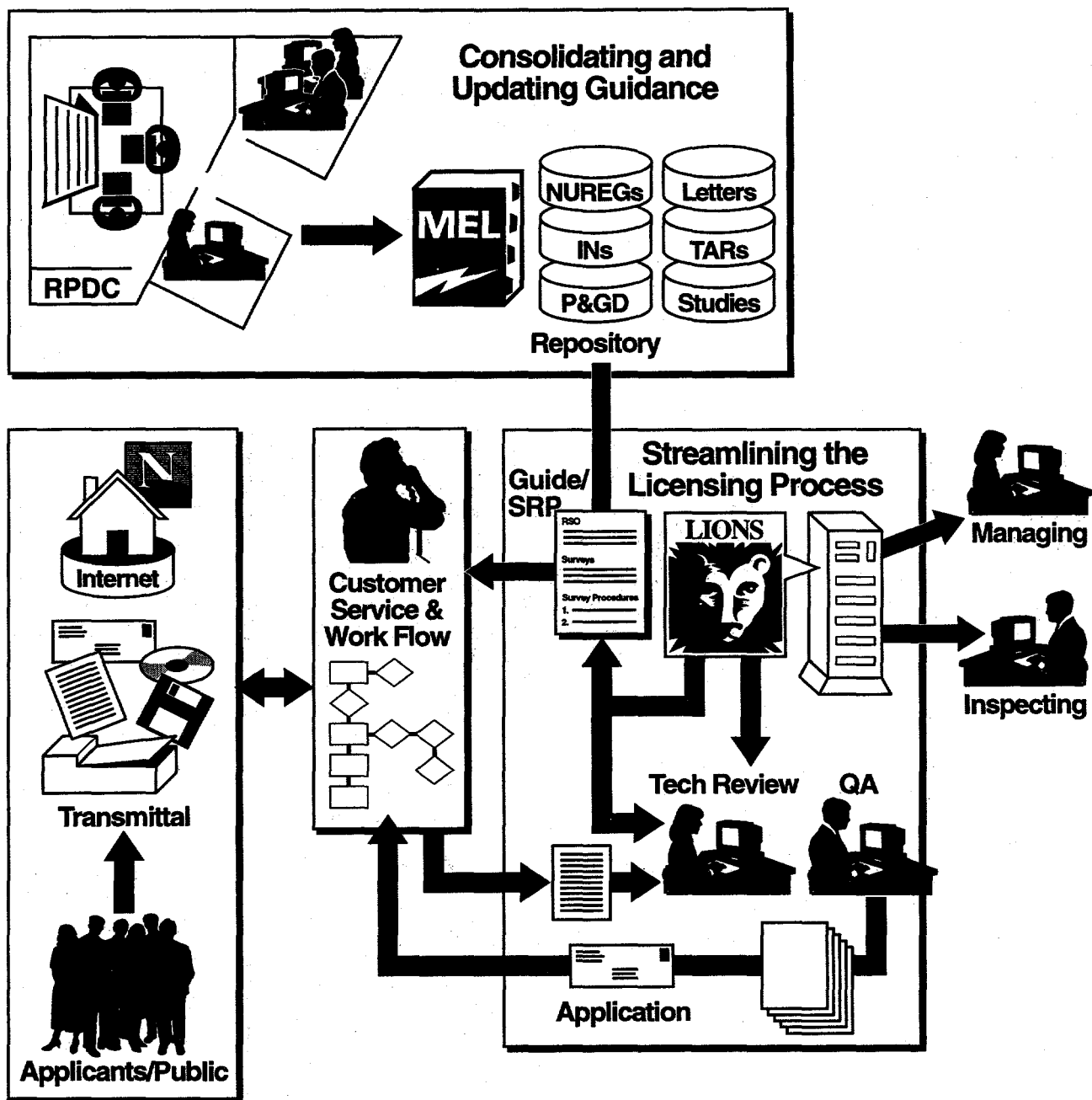


Figure 5.2 Automating the Licensing Process

Integrated Materials Performance Evaluation Program

In January 1994, the staff prepared SECY 94-011, "Management Directive on Use of Common Performance Indicators in Review of the Agreement State and Regional Materials Programs," which presented an approach for use of common performance indicators in review of Agreement State and NRC regional materials programs. The Commission approved use of five programmatic indicators as part of a pilot program in 1994-1995. The indicators allow a team comprising technical staff from NMSS and the Office of State Programs to evaluate a region or State based on the status of its materials inspection program, its technical staffing and training, the technical quality of its licensing and inspection programs, and its response to incidents and allegations. After a one-week, onsite review, the team issues draft reports for regional or State comment, considers the comments, and then prepares proposed final reports for approval of a senior-level NRC Management Review Board.

At the conclusion of the pilot program, the staff prepared SECY-95-047, "Staff Analysis and Recommendations on the Integrated Materials Performance Evaluation Program," presenting the findings from the pilot program and recommending a revised approach, based on comments received and experience gained from the pilot reviews. The Commission approved the staff's recommendations, and Management Directive 5.6, "Integrated Materials Performance Evaluation Program," was issued in final form in September 1995, and published in the *Federal Register* in October 1995.

The Commission directed the staff to implement the Integrated Materials Performance Evaluation Program (IMPEP) on an interim basis in 1996, pending the need for related Commission decisions on Agreement State program compatibility and adequacy. In FY 1996, the interim program included a series of seven Agreement State and two regional reviews. Following these reviews, the staff issued a Good Practices Report in July 1996, providing a forum for the Agreement States and regions to share successful innovations with one another. The staff provided a status report to the

Commission (SECY 96-234, "Status Report on Implementation of the Integrated Materials Performance Evaluation Program") containing the results of 1996 IMPEP activities, and the staff is scheduled to brief the Commission in 1997.

Industrial Uses

INDUSTRIAL RADIOGRAPHY

On January 10, 1996, a final provision of the regulations in 10 CFR 34.20, "Performance Requirements for Rulemaking Equipment," became effective. After that date, only radiographic exposure devices and associated equipment that comply with the requirements specified in 10 CFR 34.20 and that are authorized by the license may be used in industrial radiography operations conducted within the NRC's jurisdiction. The staff issued an NRC information notice reminding the NRC's industrial radiography licensees of the effective date and reminding Agreement State licensees working in areas of NRC jurisdiction under reciprocity (10 CFR 150.20) that they are also subject to these requirements. Another information notice discussed the applicability of 10 CFR 34.20 requirements to associated equipment used with radiography devices.

In October 1996, the Commission approved a final rule that will result in overall revision of 10 CFR Part 34. This final rule updates radiation safety requirements to enhance the level of protection for radiographers and the public. The final rule resolves a petition from the International Union of Operating Engineers, Local No. 2, requesting an amendment to the radiography regulations to require the presence of a minimum of two radiographic personnel when performing industrial radiography at temporary jobsites (PRM-34-4). Based on comments received on this petition in favor of a two-person requirement, the revision to 10 CFR Part 34 includes a provision for at least two qualified individuals to be present any time radiographic operations are undertaken outside a permanent installation.

The other major provisions of the final rule include—

1. Requiring mandatory certification of radiographers;
2. Specifying the qualifications and duties for a radiation safety officer;
3. Providing additional training requirements for radiographers' assistants; and
4. Clarifying the definition of a permanent radiographic installation.

The final rule also revised the format of 10 CFR Part 34 to place requirements into categories that more accurately describe the requirements found in the rule. The staff anticipates publishing this final rule in early 1997.

As has been described in several previous *NRC Annual Reports*, the NRC staff has been involved for some time with an initiative to develop a certification program for industrial radiographers. This initiative included supporting the American Society for Nondestructive Testing's implementation of its own "Industrial Radiography Radiation Safety Personnel" certification program. Publication of the final rule mandating radiographer certification completes this initiative.

SOURCE AND DEVICE REGISTRATION

Manufacturers and distributors of radiation sources and devices containing radiation sources are required to submit safety information about their products and information about their quality assurance (QA) programs to the NRC or an Agreement State. The regulatory agency evaluates the information to ensure that each product is adequately designed to protect public health and safety and to meet all applicable radiation safety requirements and that the company's QA program is adequate to ensure the product meets the design specifications. The regulatory agency then issues a registration certificate to the vendor. The registration certificate is used by the NRC or the Agreement State in its issuance of specific licenses to users of the products.

The NRC maintains a nationwide registry of these registration certificates that includes those issued by the NRC and the Agreement States. The registry consists of a hard-copy file system of all

registration certificates, two database systems that contain the information commonly found on the first page of a registration certificate, and background files containing supporting information for the registration certificates generated by the NRC. The NRC also maintains a tracking system to facilitate the retrieval of information regarding requests made for new registration certificates or for amendments to existing registration certificates. In support of the performance of these evaluations of products, the NRC also did the following:

- Created and maintains a Bulletin Board System (BBS) on the FedWorld System containing current information and documents related to the registration of sealed sources and devices. The information includes electronic copies of guidance documents, the Radiography Cross-Reference program, the PC database Registry system, and the Sealed Source and Device Newsletter. Information on the BBS is updated frequently and can be downloaded remotely.
- Further reduced the number of pending requests for review and decreased the turnaround time required for review of a request. To accomplish this goal, the staff completed nearly 250 sealed source and device reviews—significantly above the normal number completed in a year. This reduced the number of pending requests from 200 to approximately 100, thereby also reducing the total time required to issue a registration certificate.
- Issued the following information notices (INs) to alert users and license reviewers to specific problems encountered:
 - IN 96-20: "Demonstration of Associated Equipment Compliance with 10 CFR 34.20," on April 4, 1996.
 - IN 96-51: "Residual Contamination Remaining in Krypton-85 Handling Systems After Venting," on September 11, 1996.
 - IN 96-52: "Cracked Insertion Rods on Troxler Model 3400 Series Portable Moisture Density Gauges," on September 26, 1996.

SEALED SOURCES, DEVICES, AND OTHER RADIOACTIVE MATERIAL RETRIEVED BY THE DEPARTMENT OF ENERGY (DOE)

Several thousand NRC licensees possess material that either exceed 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," Class C limits, and thus will need to be stored for an extended time—until DOE provides a disposal facility—or for which control cannot be assured owing to the licensees' financial or other difficulties. The NRC has negotiated an agreement with DOE to provide assistance with managing radioactive material that poses threats to public health and safety. On two occasions during the year, the NRC requested DOE assistance to retrieve, control, or dispose of material that had become a threat to public health and safety because of a licensee's loss or potential loss of control of the material. In both cases, DOE assisted in managing the material.

A number of Agreement States have noted similar problems with licensees in their respective States. The NRC/DOE agreement has been extended to include licensees located in Agreement States where such States are unable to manage the material and request assistance from the NRC. In the past year, the NRC has asked for assistance from DOE only once on behalf of a State.

The staff has generated procedures for determining if DOE's assistance is appropriate and for making such a request. In addition, NRC and DOE staffs have been working to formalize the agreement under which the NRC requests DOE assistance. A Memorandum of Understanding (MOU) has been drafted for this purpose, was approved by the NRC, and was forwarded to DOE for approval. The DOE provided comments on the MOU, and NRC and DOE staffs are working to finalize the document. NRC and DOE staffs have also been working to explore other options to resolve the issues involved regarding licensees that have limited or no disposal options and that cannot ensure control of their material. Figures 5.3, 5.4, and 5.5 show, respectively, a doubly encapsulated sealed source, a density gauge within a paper manufacturing facility, and corroded radioactive labels on a density gauge.

SEALED SOURCE AND DEVICE DESIGN SAFETY TESTING CONTRACT

Throughout FY 1996, the NRC had a contractor perform third-party examinations of products containing radioactive material for which safety evaluation had been performed. As needed, NRC would request that the contractor examine a product and the accompanying information supplied in support of the application for safety review and approval to evaluate the product's ability to perform as intended and to provide adequate radiological safety for the intended and actual conditions of use. In addition, the contractor was requested to evaluate products that (1) had known or suspected generic design defects; (2) were suspected of being inadequately designed or constructed for their intended conditions of use; and (3) had failed, and for which the mode of failure needed to be determined. These contractor tasks have supported incident investigations and rulemaking efforts for the NRC, as well as the Agreement States, when requested. In the past year, the contractor issued one final report on an evaluation performed. This contract expired in August 1996, and the NRC staff was working to issue a new contract to continue these examinations as FY 1996 closed.

CONTROL OF RADIOACTIVE DEVICES

Since 1983, there have been 24 reports of radioactive sources accidentally smelted in the United States as a result of becoming mixed with metal scrap intended for recycling. Sixteen of these events occurred at steel mills. Although no significant radiation doses from these or other events in the United States have been documented, similar events in Mexico in 1983, and in Estonia in 1994, resulted in radiation injuries and death.

In 1995, the Commission approved a staff plan to form a joint Agreement State-NRC Working Group to evaluate current regulatory programs for devices containing radioactive material. To obtain information to address the problem adequately, the Working Group held public meetings, workshops, and made formal and informal presentations to professional and public groups. The Working Group completed its task and provided its final recommendations to the NRC in

July 1996. Specifically, the Working Group recommended that—

1. The NRC and Agreement States increase regulatory oversight for users of certain devices;
2. The NRC and Agreement States impose penalties on persons losing devices;
3. The NRC and Agreement States ensure proper disposal of orphaned devices;
4. The NRC encourage States to implement similar oversight programs for users of naturally-occurring or accelerator-produced radioactive material; and

5. The NRC encourage non-licensed stakeholders to take appropriate actions, such as instituting programs for material identification.

The staff planned to evaluate the Working Group's recommendations and brief the Commission on its findings in early FY 1997.

Medical Uses

NATIONAL ACADEMY OF SCIENCES STUDY

In January 1994, the NRC contracted with the National Academy of Sciences, Institute of

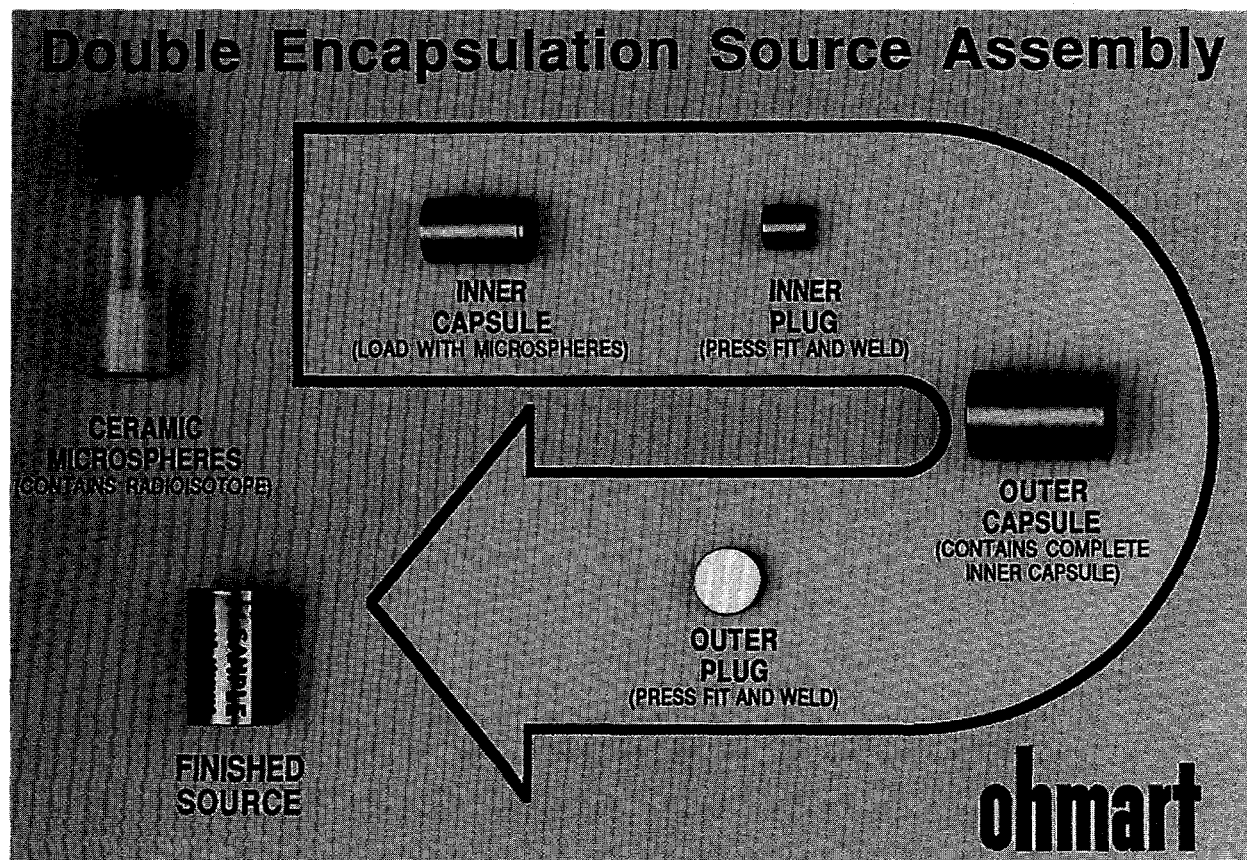


Figure 5.3 The Parts of a Doubly Encapsulated Sealed Source. The radioactive material is sealed within two distinct capsules. The assembled source has a 0.5-inch diameter and is 0.75-inch long.

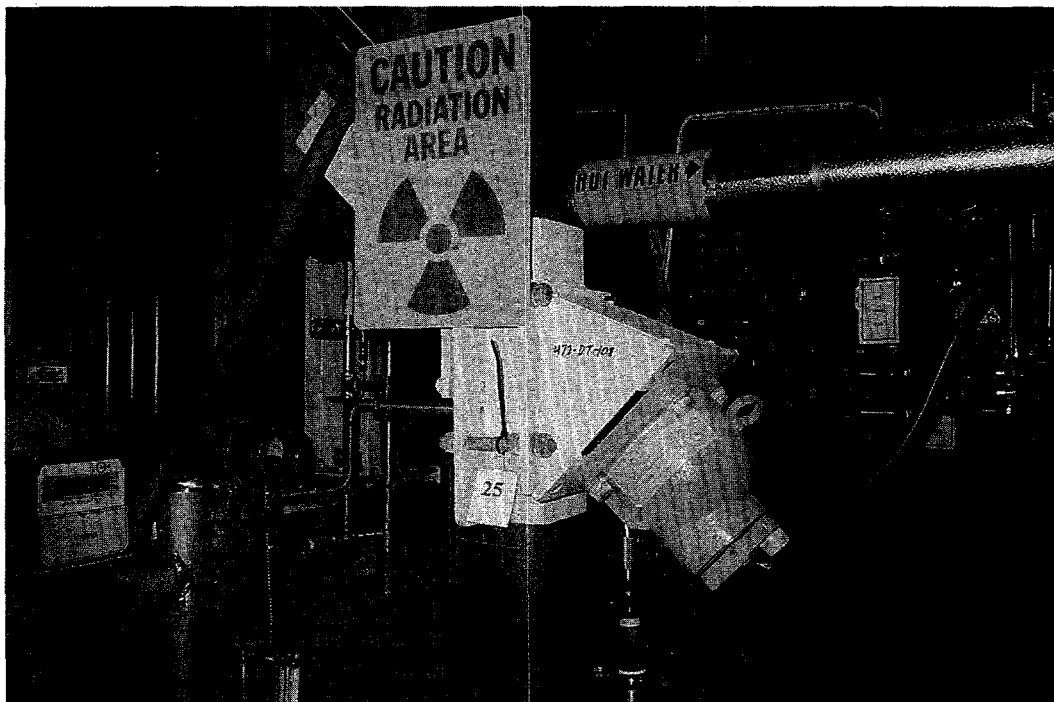


Figure 5.4 A Density Gauge Mounted on a Process Line Within a Paper Manufacturing Facility. This gauge is designed to continually measure the density of process materials, allowing the density of the material to be adjusted without stopping the material flow. The NRC evaluates the design of the gauge to ensure that the gauge maintains its integrity and continues to provide shielding for the radioactive material.

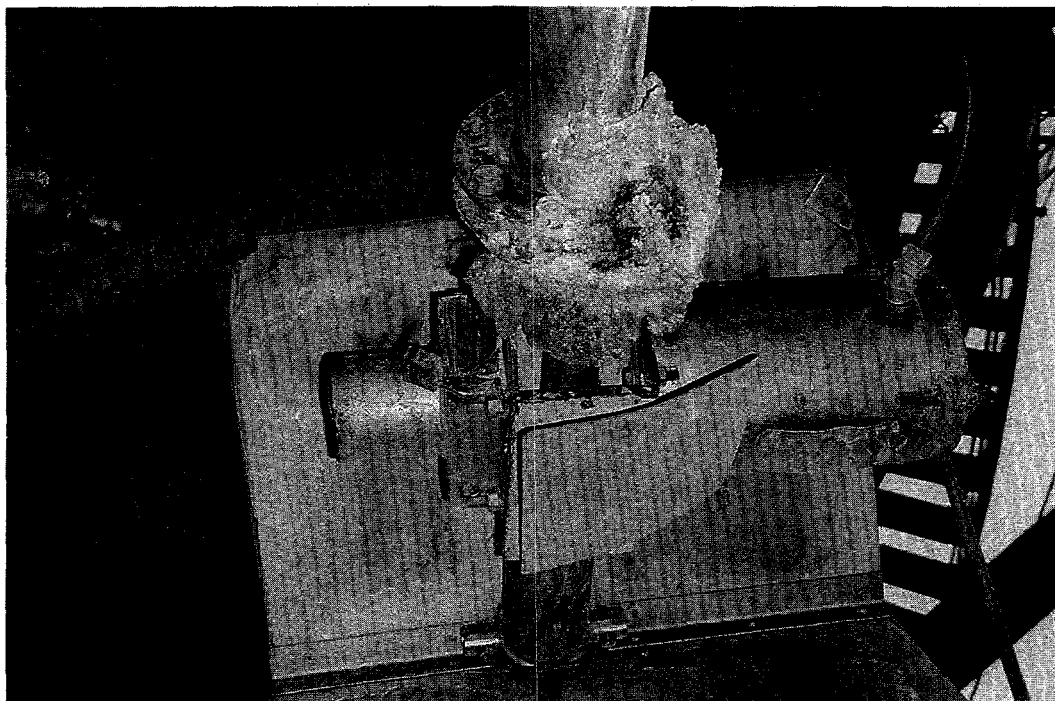


Figure 5.5 Radioactive Labels on a Density Gauge That Became Corroded and Illegible Over Time. Such illegible labels lead to radioactive material from such devices becoming mixed with other scrap metal when process lines are decommissioned.

Medicine (IOM), to conduct an external review of the NRC's medical regulatory program. The goal of the external review was to assess the adequacy and appropriateness of the current framework for the medical use of byproduct material. The IOM submitted its report in December 1995. The NRC provided copies of the report to all Agreement States, non-Agreement States, and U.S. territories; appropriate Federal agencies (U.S. Departments of Health and Human Services, Defense, Labor, and Transportation, the Veterans Administration, and the Environmental Protection Agency); the Conference of Radiation Control Program Directors; the Organization of Agreement States; and the NRC's Advisory Committee on the Medical Uses of Isotopes (ACMUI). In addition, the NRC published a *Federal Register* notice (61 FR 1648) on January 22, 1996, and issued a press release acknowledging receipt of the report and requesting comments on the possible impacts of the report, including any views on policy, legislative, rulemaking, and guidance issues. The Commission was briefed by members of the IOM committee and the ACMUI during early 1996. The Commission then directed the staff to consider the IOM report and comments received within its strategic assessment and rebaselining efforts.

STRATEGIC ASSESSMENT— REGULATION OF MEDICAL USES

The NRC's Strategic Assessment (SA) initiative is intended to provide a sound foundation for the agency's direction and decisionmaking for the rest of this decade and into the next century. The SA initiative has four phases, one of which includes the development of Direction-Setting Issue Papers (DSIs). DSI 7, entitled "Materials/Medical Program," was released to the public for comment on September 20, 1996, along with 15 other DSIs, a stakeholder involvement process paper, and a strategic planning framework paper that explains how the issues relate to the strategic plan and how the plan will be developed. In FY 1997, the Commission will consider public comments on the DSIs before providing direction to the staff on the medical use program.

QUALITY MANAGEMENT RULE IMPLEMENTATION

On January 27, 1992, regulations became effective that required medical licensees to establish and implement a quality management program (QMP) in compliance with 10 CFR 35.32, "Quality Management Program." This performance-based rule focuses on therapeutic applications of byproduct material, and any patient dosage of sodium iodide-125 or -131 in quantities greater than 30 microcuries. A Temporary Instruction (TI) for the inspection of implemented QMPs became effective on August 1, 1994, and closed on August 1, 1996. This TI established areas of inspection and created a procedure for determining compliance. Data collected from the TI were used in the evaluation of the effectiveness of the regulation and in responding to a directive from the Commission to the staff to analyze the quality management rule three years after the effective date and consider the need for a comprehensive QA rule. The results of this analysis will be available in FY 1997.

GAMMA KNIVES

The NRC has seen significantly increased interest in the medical use of cobalt-60 for gamma stereotactic radiosurgery. The device used is commonly known as a "Gamma Knife," and it is used primarily to treat a specific type of benign lesion in the brain. This spherical-shaped device contains 201 cobalt-60 sources of approximately 30 curies each, which are in fixed locations, collimated and arranged to precisely focus their radiation to a point. The patient's head position is adjusted to align the intended treatment location for irradiation with the fixed beam focal point (Figures 5.6 and 5.7).

Installation of the device (and subsequent source exchanges that are scheduled at approximately five-year intervals) is a complex process involving the construction of a temporary hot cell equipped with remote handling equipment. Regional staff completed licensing for medical use of two Gamma Knife facilities during FY 1996 and observed the initial source loading at one of these facilities.

STRONTIUM-90 EYE APPLICATORS

The NRC has issued many licenses to use strontium-90 (Sr-90) applicators in the treatment

of certain eye diseases. Licensees are authorized to use these applicators in accordance with 10 CFR Part 35. A typical applicator is shown in the diagram below.

Two significant misadministration events, which occurred late in 1995, required NRC regulatory action. The first was discovered by an inspector from Region II during an NRC inspection. The licensee used an incorrectly calibrated applicator, which resulted in the delivery of the incorrect radiation dose to over 100 patients. The licensee used a dose rate of 0.24 Gray/second (24 rads/second), which was actually a dose rate of 0.53 Gray/second (53 rads/second). The NRC issued an Order to the licensee in October 1996, which required action to identify and notify the affected patients.

In the second case, the licensee incorrectly calculated the radiation decay for the Sr-90 source. As a result, 16 patients received a radiation dose higher than intended. This case was also discovered during a routine NRC inspection by Region IV. The NRC issued an information notice (IN 96-66) to all NRC medical use licensees on December 13, 1996, which identified these two events and conveyed the root causes.

THE ADVISORY COMMITTEE ON THE MEDICAL USES OF ISOTOPES

The ACMUI met in October 1995, February 1996, and May 1996. Topics of discussion at these meetings included—

1. The IOM's Review of NRC's Medical Use Program;
2. Advance Notice of Proposed Rulemaking for 10 CFR Part 33, "Specific Domestic

Licensees of Broad Scope for Byproduct Material";

3. Draft licensing modules;
4. "Guide for the Preparation of Applications for Medical Use Programs," including a subcommittee review report;
5. Training and Experience Exemptions;
6. Intravascular Brachytherapy Issues;
7. Inspection Manual 1360: Role of the Medical Consultant;
8. Manual Chapter on patient followup;
9. Discussion of a proposed rulemaking, "Reporting Requirements for Unauthorized Use of Licensed Radioactive Material";
10. Petition for Rulemaking: Exemption for Commercial Distribution for *in vivo* testing;
11. Updates on rulemakings and guidance regarding—
 - release of patients (Section 35.75),
 - guidance for the Radiopharmaceutical Rule,
 - pregnancy and nursing, and
 - "Wrong Patient," and
12. Discussion of NUREG-series reports on Human Factors Evaluations of Teletherapy and Brachytherapy.

As directed by the Commission, ACMUI members serve two-year terms and are limited to three terms. The current membership of the committee is shown in Appendix 3.

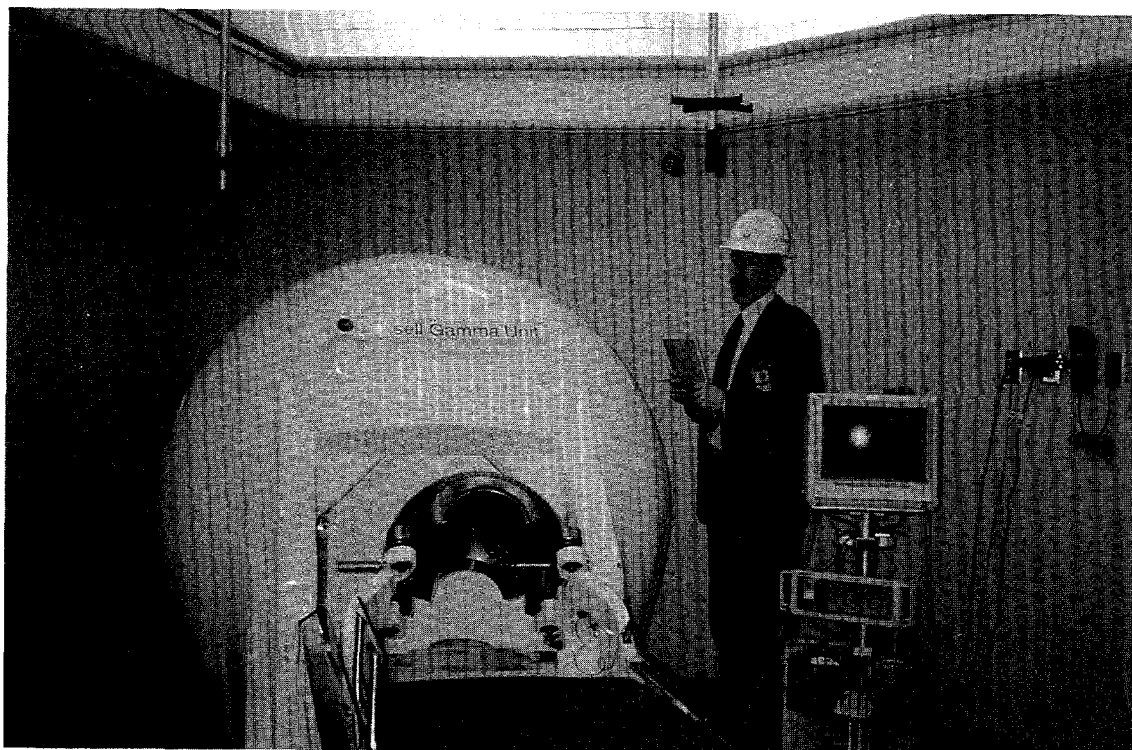


Figure 5.6 Region I Nuclear Materials Safety Senior Inspector, Thomas K. Thompson, Looks Over the New Gamma Knife Unit at the Wills Eye Hospital in Philadelphia, Pennsylvania. The facility is used to provide multiple beams of gamma rays for the treatment of a specific type of benign lesion in the brain.

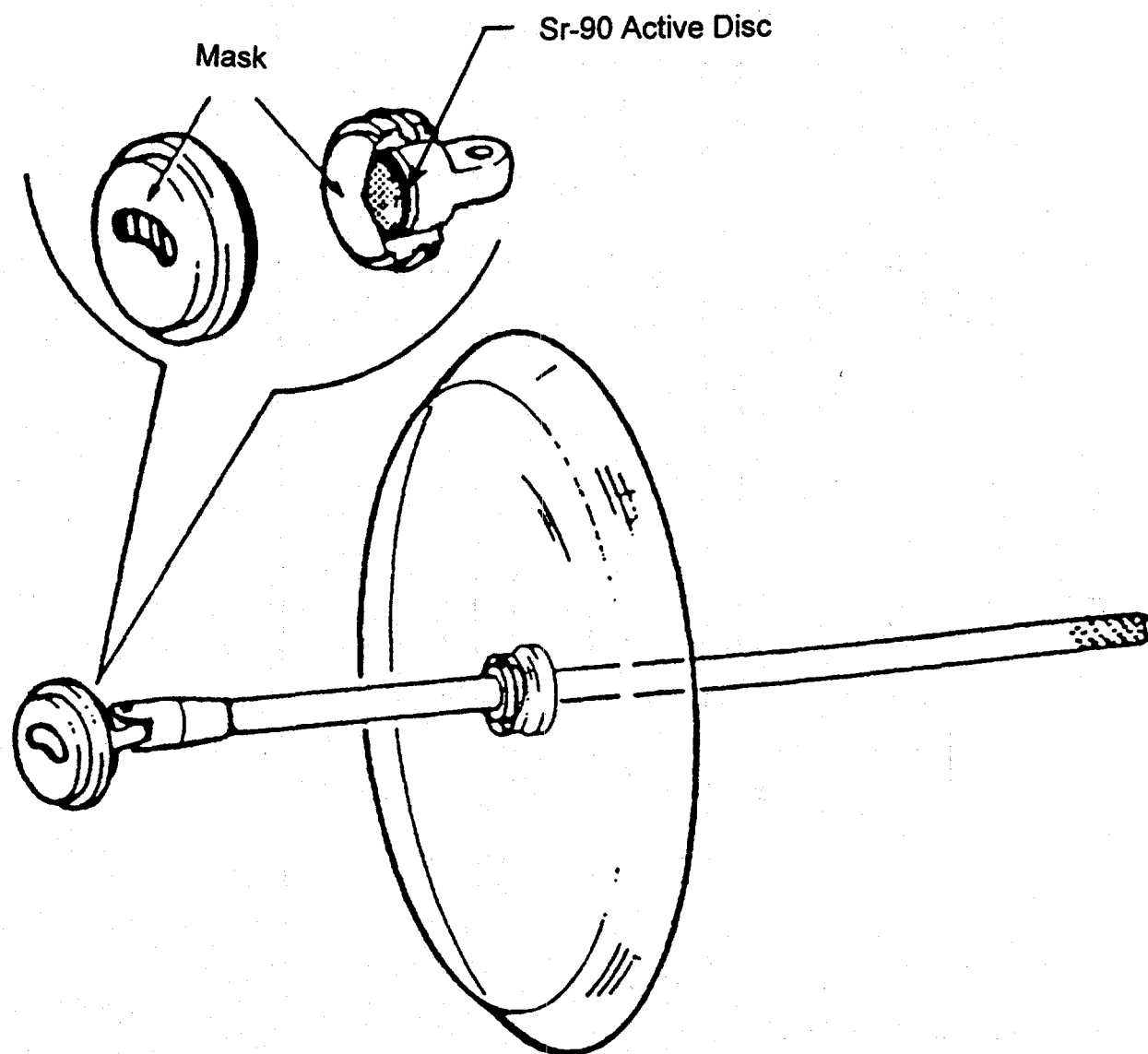


Figure 5.7 Diagram of a Gamma Knife

Chapter 6

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Fuel Cycle Safety and Safeguards

The regulation of nuclear fuel cycle safety and safeguards in the United States is the responsibility of the U.S. Nuclear Regulatory Commission's (NRC's) Office of Nuclear Material Safety and Safeguards (NMSS) and the NRC's four Regional Offices. NMSS is responsible for developing, implementing, and evaluating overall agency policy with regard to the safety and safeguards of fuel cycle and special nuclear material (SNM) processing facilities licensed under the Atomic Energy Act of 1954 (AEA), as amended, or certified in accordance with the Energy Policy Act of 1992. NMSS also carries out the agency's principal licensing, certification, inspection, and regulatory activities to ensure adequate safety and safeguards of licensed fuel cycle facilities.

NMSS develops and continually evaluates the NRC's *design-basis* threats and assesses threats to the domestic environment affecting all NRC-licensed activities. NMSS also directs the NRC's contingency planning and emergency response operations for accident events, incidents, threats, thefts, or radiological sabotage related to NMSS-licensed activities. In addition, NMSS provides technical support (in the form of safeguards reviews) for export and import requests, retransfers, implementation of Agreements for Cooperation, and transportation of strategic special nuclear material (SSNM).

Interaction between NMSS and the International Atomic Energy Agency (IAEA) occurs in connection with the implementation of the U.S./IAEA Safeguards Agreement and technical support to strengthen IAEA safeguards.

FUEL CYCLE REGULATORY ACTIVITIES

Action Plan for Regulating Fuel Cycle Facilities

As a result of a series of incidents with licensed activities for uranium conversion and fuel fabrication, the NRC has been exploring methods for improving its regulatory oversight of these operations.

In Fiscal Year (FY) 1996, a public workshop was conducted that provided a forum for discussions among the NRC, industry, and other interested parties on improving the safety regulations in 10 CFR Part 70. From this information exchange, the staff developed and submitted to the Commission six alternatives for regulating SNM followed by a briefing on the proposed alternatives. Representatives from industry and other interested parties also briefed the Commission and, although industry representatives did not indicate that a total rewrite of Part 70 was necessary, they supported performing an integrated safety analysis (ISA). The Commission encouraged the industry to submit a Petition for Rulemaking (PRM) that would reflect industry's position. Industry representatives submitted a PRM, dated September 30, 1996, that presented their proposed changes to Part 70. The Commission is reviewing the six alternatives proposed by the staff and will also consider the alternative associated with the PRM.

In concert with developing the potential changes to Part 70, the staff prepared a draft standard review plan (SRP) and corresponding draft revisions to the Standard Format and Content Guide (SF&CG). The NRC staff will use the SRP to review applications, and license applicants may use the SRP to understand the intent of the proposed rule revisions. The SF&CG will be useful to applicants in preparing applications for licenses, license amendments, and license renewals associated with SNM at fuel fabrication and enrichment facilities. In addition, the staff completed a draft document that will provide applicants or licensees guidance in performing an ISA. Further development of these documents is awaiting the Commission's decision on the overall approach for upgrading the regulatory base.

During FY 1996, the enhanced training program for NRC inspection and licensing staff continued. Courses were given on general health physics practices for fuel cycle facilities, nuclear criticality, and fire protection. In addition, inspectors and license reviewers attended a commercially available course on process hazard analysis for nuclear facilities.

FUEL CYCLE LICENSING AND INSPECTION

Fuel Cycle Licensing Activities

By the end of FY 1996, the NRC had completed 93 fuel cycle licensing actions. The following table shows these licensing actions by category.

Table 6.1 Fuel Cycle Licensing Actions (Safety/Safeguards) Completed in FY 1996

<i>Category</i>	<i>No. of Actions</i>
Fuel Fabrication and Conversion	48
Critical Mass Materials	1
Fuel Research, Development, Pilot, and Fresh Fuel Storage	12
Other Source Materials	5
Material Control and Accounting	16
Physical Security	7
West Valley Demonstration	3
Department of Energy Waste Processing	1

FUEL CYCLE SAFETY

Fuel Cycle Safety Licensing

Babcock & Wilcox Company (B&W), Pennsylvania Nuclear Services Operations, Parks Township, Pennsylvania. The B&W Parks Township License, SNM-414, has been in timely renewal since May 31, 1989. The primary activities conducted at B&W Parks Township include decontamination, repair, maintenance, and testing of equipment and components contaminated with radioactive material; volume reduction of low-level radioactive waste; decontamination of onsite facilities; and management of an onsite burial area known as the Shallow Land Disposal Area.

In the *Federal Register* of November 3, 1993, the NRC published a "Notice of Opportunity for a Hearing" pertaining to the renewal of License SNM-414. Citizens' Action for a Safe Environment and the Kiski Valley Coalition to Save our Children filed a joint request for a hearing, dated January 5, 1994. On January 3, 1995, the Atomic Safety and Licensing Board Panel (ASLBP) issued an initial decision resolving all issues raised in the hearing, and authorized the

renewal of License SNM-414. On October 24, 1995, the NRC renewed License SNM-414 in two parts: a 5-year license, SNM-414, for the Parks Township operating facility; and a 10-year license, SNM-2001, for the management of an onsite burial area known as the Shallow Land Disposal Area.

West Valley Demonstration Project (WVDP)

Oversight. Throughout FY 1996, the staff continued to provide technical and regulatory consultation to the Department of Energy (DOE) WVDP located near Buffalo, New York. The purpose of the WVDP is to demonstrate the preparation and solidification of high-level waste from spent nuclear fuel reprocessing for disposal in a Federal repository. The majority of the high-level waste is contained in a 750,000-gallon carbon steel tank and is composed of plutonium/uranium recovery extraction waste, thorium/uranium recovery extraction (THOREX) waste, and cesium-coated zeolite used during preprocessing activities. In July 1996, the WVDP successfully began vitrification (solidification) of the high-level wastes in borosilicate glass. The vitrification operations are expected to take about 30 months.

The NRC staff monitors public health and safety aspects of the WVDP through inspections at the WVDP site and review of safety analysis reports (SARs) that the DOE submits for each process. The staff reviews each submittal and issues a corresponding safety evaluation report, stating the NRC's conclusions on public health and safety implications of the process segment. In FY 1996, the DOE submitted an update for an SAR that provides a general project overview and a draft environmental impact statement (DEIS) that discusses alternatives for site closure.

In FY 1996, the staff continued to monitor the completion of construction and start-up operations for the vitrification process building. The staff also continued to assess durability data from cement-solidified waste forms that had been produced in earlier years during "sludge washes" and "THOREX washes," and issued technical evaluation reports regarding the cement waste forms. The NRC issued a letter report stating that the NRC's finding of no significant impact (FONSI) to public health and safety and the environment was not affected by the changes in the updated general project overview SAR. The

staff completed its review of the site closure DEIS and began discussions to develop decommissioning criteria for the WVDP and areas that are licensed under the 10 CFR Part 50 license held by the State of New York.

Shieldalloy Metallurgical Corporation (SMC).

Since 1955, SMC has operated a facility located in Newfield, New Jersey, where it has manufactured specialty steel and super alloy additives. Under an NRC source material license, SMC-743, the licensee is authorized to conduct activities at the site related to processing a mineral concentrate (pyrochlore) to recover niobium. The pyrochlore contains, by weight, more than 0.05 percent natural uranium and thorium that, as source materials, require a license under 10 CFR Part 40. During the manufacturing process, these radioactive materials are concentrated in high-temperature slag and baghouse dust. The slag contains the highest concentrations and volumes of source material, whereas the baghouse dust contains, on average, less than 0.05 percent source material by weight.

In September 1993, SMC notified the NRC that it had filed for bankruptcy protection under Chapter 11 of the U.S. Bankruptcy Code. The disposal of slag and baghouse dust at the Newfield facility is one of SMC's largest and least-defined liabilities. In December 1995, SMC submitted a conceptual decommissioning plan suggesting that SMC be permitted to export the slag for use in steel processing in a foreign country and that the baghouse dust be sold for domestic use in the cement industry because of its high lime content. SMC proposed that the remainder of the site be decommissioned for unrestricted use.

SMC's operating license has been in timely renewal since July 1985. The Newfield facility continues to operate and to provide a source of revenue for the corporation. During FY 1996, the staff presented preliminary environmental assessment (EA) information showing no significant impact on public health and safety and the environment at a public meeting in Newfield, New Jersey. Because of ongoing reviews regarding financial assurance requirements in relation to SMC's financial condition, the staff has not finalized the EA.

Nuclear Fuel Services (NFS). In December 1993, NFS submitted, for NRC review and approval, an interim decommissioning plan for phased

remediation of portions of the NFS facility in Erwin, Tennessee, under License SNM-124. The NRC found the plan acceptable and, in June 1994, issued a confirmatory order permitting NFS to begin decontamination and decommissioning activities, including the removal of radiation sources from a previously authorized burial area. Additional NRC approval will be required for final decontamination and decommissioning of the Erwin site, after termination of plant operations, before the facility can be released for unrestricted use.

NFS is currently separating buried contaminated debris from the soil in the "Pond 4" area, using special segregation equipment. A new ground-water treatment system is being used to decontaminate the groundwater pumped from this area as well as the water generated during soil washing. NFS has proposed further work of this kind on other areas of the plant site.

NFS has applied to the NRC for approval to partially remediate the North Site Burial Ground, a portion of the area north of all plant structures. This work has been proposed as a prelude to a complete decontamination and decommissioning of this area pursuant to a work plan to be submitted to the NRC in April 1997.

NFS ceased production of U.S. Navy fuel material in 1993, and that activity has not restarted. In February 1996, NFS was awarded a contract to produce nuclear fuel for the Navy, with production planned to start in 1999. NFS received NRC approval to return to Category I physical security status in April 1996. Subsequently, NFS plans to recover uranium from material previously stored at DOE's Rocky Flats facility and also plans to pursue other contracts for additional uranium recovery operations.

In May 1996, NFS applied for renewal of its license, SNM-124. During the NRC review of the renewal application, the current license remains in force.

Babcock & Wilcox (B&W) Naval Nuclear Fuel Division. On October 2, 1995, the NRC issued a 10-year renewal of License SNM-42, which authorizes B&W to fabricate high-enriched uranium (HEU) fuel for U.S. Navy, university and research reactors, and to provide analytical

services for commercial nuclear reactors at its Lynchburg, Virginia, facility. This action followed an EA, a supplemental EA, and a FONSI published in the *Federal Register* on August 30, 1995.

On May 6, 1996, the NRC amended B&W's license, SNM-42, to authorize the purifying and downblending of high-enriched uranium/beryllium material from Kazakhstan under the U.S./Kazakhstan cooperative effort referred to as "Project Sapphire."

Westinghouse Electric Corporation Commercial Nuclear Fuel Division. On November 3, 1995, the NRC issued a 10-year renewal of License SNM-1107, which authorizes Westinghouse to fabricate low-enriched uranium fuel (LEU) for commercial nuclear power reactors at its Columbia, South Carolina, facility.

This action followed an EA and a FONSI published in the *Federal Register* on July 12, 1995.

Siemens Power Corporation (SPC), Nuclear Division. SPC continued to be in timely renewal during FY 1996 (the license was renewed in early FY 1997). During this period, four license amendments were issued. In addition, a process issue concerning the measurement and concentration of uranium in sludge generated at the Richland City waste water treatment plant was resolved. In FY 1996, the licensee continued constructing a new building to house their planned dry conversion facility for conversion of low-enriched uranium hexafluoride to uranium dioxide for use in commercial power reactors.

GASEOUS DIFFUSION URANIUM ENRICHMENT

The Energy Policy Act of 1992 created the United States Enrichment Corporation (USEC) and directed DOE to lease the two gaseous diffusion plants (GDPs) located in Portsmouth, Ohio, and Paducah, Kentucky, to the USEC. The USEC is to operate the plants and to market the enriched product on a profitable and efficient basis. Further, the USEC is to negotiate the purchase of HEU offered by any State of the former Soviet

Union as part of the U.S. effort to dispose of weapons-grade material. The USEC is also to assume management of new alternative technologies for the enrichment of uranium, including the "atomic vapor laser isotope separation" technology.

The Energy Policy Act further provides that NRC shall regulate safety and safeguards at the GDPs operated by the USEC. In consultation with the Environmental Protection Agency and DOE, the NRC is to report to Congress at least once each year on the status of health, safety, and environmental conditions at the plants. The report is to include a determination of whether the plants are in compliance with applicable NRC regulations. The NRC is also required by the Energy Policy Act to establish a certification process to ensure that the USEC complies with the regulations. The USEC is required to apply periodically, at no greater than 5-year intervals, to the NRC for a certificate of compliance with the NRC regulations. This certification process is in lieu of the requirement for a license.

Because the plants were built about 40 years ago, the Energy Policy Act contemplates that the plants will not be in full compliance with all applicable NRC regulations at the time of certification. The DOE is to prepare a plan for bringing the plants into full compliance in areas where full compliance is lacking at the time of certification. This plan is to be submitted to the NRC together with the USEC's initial application.

In compliance with the Energy Policy Act, a new rule (10 CFR Part 76) to govern the certification of the GDPs was issued in proposed form in February 1994, and in final form in September 1994. This regulation establishes standards for adequate protection of public health and safety and the environment, as well as for safeguarding nuclear materials in the interest of national security. This rule applies only to the GDPs operated by the USEC.

An initial application was submitted by the USEC in mid-FY 1995 and shortly thereafter rejected by the NRC. In September 1995, after numerous discussions with the NRC, the USEC resubmitted its application, and the NRC began an expedited review based on the requirements of 10 CFR Part 76. The public was notified of receipt of the

application. Written public comment was invited, and locally advertised public meetings to receive verbal comments were held in late 1995 near the Kentucky and Ohio plant sites. The NRC review continued from September 1995 until August 1996, and resulted in numerous questions from the NRC to the USEC and numerous changes to the application. In September 1996, satisfied that the revised application met the requirements of Part 76 and that public comments had been properly considered, the NRC announced its intention to issue certificates of compliance.

Some citizens objected to the issuance of the certificates and petitioned the Commission for review of certain aspects of the certification process. This petitioning process is provided for in Part 76. After consideration, the Commission rejected the petitions for various legal and technical reasons, as detailed in two Commission orders, CLI-96-10 and CLI-96-12 (see Chapter 11).

In November 1996, the certificates of compliance were issued. The certificates specify safety, safeguards, and environmental requirements for the two plants and call for the NRC to assume regulatory jurisdiction in March 1997. The interim period, from November 1996 to March 1997, allows the USEC to make an orderly transition to the NRC requirements. The DOE will continue to regulate the plants until the NRC assumes jurisdiction (Figure 6.1).

An important part of the certification process was the NRC assessment of the GDPs, based on the requirements listed in 10 CFR Part 76. In support of the certification process, the Headquarters and Region III staff jointly performed numerous safety and safeguards assessments at the GDPs. The results of these assessments are presented in the more than 30 observation reports issued during FY 1995 and FY 1996.

Gas Centrifuge Uranium Enrichment

In November 1990, the President signed into law the "Solar, Wind, Waste, and Geothermal Power Production Incentives Act of 1990" (Public Law 101-575). This law amended the AEA to establish new requirements for regulation of



Figure 6.1 Senior officials present to witness the November 26, 1996, presentation of the Certificates of Compliance for the Portsmouth and Paducah Gaseous Diffusion Plants by NMSS Director Carl J. Paperiello (seated left) to USEC Vice-President George P. Rifakes (seated right) to include, standing, from left to right, Elizabeth Q. Ten Eyck, Director, Fuel Cycle Safety and Safeguards Division, Randall M. Devault, U.S. Department of Energy, J. Dale Jackson, Regulatory Oversight Manager, U.S. Department of Energy, Robert Woolley, Manager of Regulatory Affairs, USEC, Walter S. Schwink, Enrichment Branch, and John W. N. Hickey, Chief of the NRC's Enrichment Branch.

commercial uranium enrichment facilities. The NRC published rule changes implementing the amendment in the *Federal Register* on September 16, 1991.

In January 1991, the Louisiana Energy Services, L.P., submitted an application for a license to construct (at a projected cost of over \$800 million) and operate a gas centrifuge uranium enrichment plant, to be known as the Claiborne Enrichment Center (CEC). The CEC will be located in Claiborne Parish near Homer, Louisiana, and will have a capacity of 1.5 million kilograms of "separative work units per year," about 15 percent of the annual enrichment service requirements of U.S. nuclear utilities. A brief history of the licensing process to date for this facility is found in the *1995 Annual Report* (pg. 111).

ASLBP hearings were held in 1995, and, on April 26, 1996, the ASLBP issued a partial initial decision with respect to three safety issues. Citizens Against Nuclear Trash subsequently appealed this decision to the Commission. Two of the three issues decided by the ASLBP have been resolved, but one remains in litigation. On December 3, 1996, the ASLBP issued a second partial initial decision, sustaining aspects of the intervenor's contentions on the issues of need for the facility, treatment of the no-action alternative, and financial qualifications of the applicant. The ASLBP has yet to rule on the remaining issues.

Fuel Cycle Safety Inspections

Headquarters-Based Inspection Activities. Since February 7, 1993, Headquarters staff has conducted chemical process safety and nuclear criticality safety inspections, as well as material control and accounting (MC&A) inspections, and has developed and initiated the chemical process safety inspection program. A total of 15 criticality safety and chemical safety inspections and assessments were performed during FY 1996.

A technical assistance contractor assisted the staff in development of a new criticality safety inspection program and procedures. Proof-testing of the procedures has been completed, and the procedures were issued for use in December 1996. In addition, Headquarters staff provided technical expertise to regional inspectors to address design, integration, and adequacy concerns in the areas of criticality and chemical process safety.

Region-Based Inspection Activities. The four regional offices conducted more than 108 safety inspections at 18 operating and decommissioning fuel cycle facilities during FY 1996. This includes resident inspector activities at one facility. The areas covered by the regional staff included criticality safety, radiation protection, emergency preparedness, environmental safety, and transportation.

FACILITIES AND TRANSPORTATION SAFEGUARDS

Fuel Cycle Safeguards Licensing

Eight active, licensed nuclear fuel cycle facilities were subject to the NRC's comprehensive safeguards requirement during FY 1996. Of these eight facilities, two contained significant quantities of HEU. One of those two facilities had previously reduced its possession of HEU, but in FY 1996, it reinstated its program and safeguards requirements in order to possess and process significant quantities of HEU. That facility, NFS in Erwin, Tennessee, updated its safeguards program and prepared to demonstrate its readiness to receive the increased level of HEU. It demonstrated its ability, through tactical performance testing, to meet the safeguards requirements necessary for the possession of significant quantities of HEU. Another facility, General Atomics in San Diego, California, has ceased all activities and applied for possession-only license status. This has led to a reduction in material stored at that site and to a corresponding reduction in the level of safeguards required.

The fully implemented physical protection requirements provide for performance testing through the use of mandated tactical drills and exercises. The two Category I facilities, B&W's Naval Nuclear Fuel Division (NNFD) and NFS, continue to increase performance and to provide more effective implementation of physical protection measures as a result of lessons learned during performance testing. In addition, as previously noted, NFS provided additional tactical performance testing to demonstrate readiness to return to a Category I status before receiving

significant quantities of HEU. Both sites developed additional drill scenarios during FY 1996 to further test their physical protection programs.

Fuel Cycle Safeguards Inspections

During FY 1996, the Headquarters staff conducted 29 comprehensive MC&A inspections or observations at the fuel cycle and GDP facilities, while the regional and resident inspectors performed 21 physical security inspections or observations at major fuel fabrication and GDP facilities. Performance-based inspection procedures were used by the physical security inspectors during all of these inspections.

Transportation Safeguards

Spent Fuel Shipments. Safeguards requirements were applied to 14 shipments of irradiated spent reactor fuel made over approved routes during FY 1996. (Ten shipments were by rail.) Two of the shipments were imports and one was an export.

SSNM Shipments. Twenty domestic shipments of less than five but more than one kilogram of HEU were completed during FY 1996. There was one transient shipment. No export or import shipments were made of five or more kilograms of HEU during FY 1996.

Tracking International Shipments of SNM. The NRC regulations require licensees to notify the NRC of international shipments of SNM and natural uranium. During FY 1996, the NRC received about 277 such notifications. When appropriate, these were forwarded to the Department of Transportation for notification of international authorities.

INTERNATIONAL ACTIVITIES

International Safeguards Activities

The NRC is responsible for implementing IAEA safeguards at licensed and certified nuclear facilities in the United States. At this time, one NRC-licensed facility is under IAEA inspection. In addition, the U.S. continues to report to the IAEA all exports and imports, as well as all accounting information required by the Protocol to the U.S./IAEA Safeguards Agreement for five fuel fabrication facilities. The NRC also ensures that licensed facilities maintain their MC&A systems and carry out their reporting responsibilities to meet the terms of the U.S./IAEA Agreement, as specified in 10 CFR Part 75.

The NRC continues to contribute to the total U.S. support of IAEA safeguards through interagency efforts that also involve DOE, the Arms Control and Disarmament Agency, the Department of State (DOS), and the Department of Defense.

During FY 1996, an NRC staff member served as Chair of the Subgroup on IAEA Safeguards in the United States, which oversees all activities related to the implementation of IAEA safeguards at United States facilities. By the end of the year, four sites in the U.S. were being inspected by the IAEA—three DOE sites, which were selected in previous years, and one NRC-regulated site, which was selected in August 1996. The NRC site is downblending HEU from Kazakhstan to LEU. Another NRC staff member served as a member of the Subgroup on Safeguards Technical Support, which seeks to strengthen and improve IAEA safeguards. During FY 1996, this subgroup, among many other activities, supported funding for the IAEA's replacement of aging safeguards equipment with state-of-the-art equipment. Both of these subgroups report to the Subcommittee on International Safeguards and Monitoring (SISM) of the IAEA Steering Committee. The NRC is also represented in SISM which, in addition to monitoring the activities of these referenced subgroups, took an active role during FY 1996 in

collaborating with U.S. allies on international safeguards issues during multilateral meetings.

During FY 1996, the NRC continued to support IAEA Program 93+2 to enhance IAEA safeguards capability to detect undeclared nuclear facilities. This effort focused on aiding interagency efforts to achieve international consensus on acceptance of a Protocol to be included with States' Safeguards Agreements that would enable the IAEA to implement the Part 2 measures in Program 93+2. These Part 2 measures include broader access to countries to resolve questions of possible undeclared nuclear activities and increased activity reporting, including research and development activities supported by governments.

The NRC is responsible for licensing exports and imports of nuclear facilities, equipment, material, and related substances, as authorized by the AEA, as amended. Further, under amendments to the AEA adopted in the Nuclear Non-Proliferation Act of 1978, the DOS must consult with the NRC about new agreements for peaceful nuclear cooperation. Also, DOE must consult with NRC before authorizing subsequent arrangements for the retransfer of nuclear materials of U.S. origin from one country to another and before providing technological assistance to foreign nuclear energy activities. During FY 1996, the NRC performed 125 international safeguards technical reviews regarding export applications, agreements for peaceful nuclear cooperation, subsequent arrangements, and technology transfers.

In 1996, the Division of Nuclear Materials Safety at NRC Region II conducted two safeguards and radiation control inspections of irradiated reactor fuel being transported to the DOE facility in Aiken, South Carolina. These inspections were part of the continuing efforts by DOE and DOS to eliminate nuclear material proliferation throughout the world. Other Federal agencies involved in these shipments include the Department of Transportation, the Federal Emergency Management Agency, the U.S. Coast Guard, and the U.S. Navy. Numerous State and local authorities have also actively assisted in supporting the safety and security of these shipments.

One shipment from overseas research reactor facilities was off-loaded at the Naval Station in Charleston, South Carolina, and proceeded by rail car to the DOE Aiken facility. Another shipment came from a research reactor in Canada and was

transported via highway (Region I also assisted on this shipment). The shipments were inspected at their points of origin, en route, and at the DOE facility. No violations or security issues were identified.

In keeping with the NRC responsibility to ensure application of IAEA safeguards to exported U.S. nuclear material, the NRC supports the improvement of effective international safeguards. The NRC also continues to contribute to U.S. Government efforts to strengthen IAEA safeguards and to maintain the effectiveness of implemented safeguards. During FY 1996, the NRC continued special studies with respect to difficult issues associated with bringing new material under IAEA safeguards and establishing criteria for terminating IAEA safeguards on nuclear materials contained in waste. During this reporting period, a staff member continued to serve as the Chair of the Technical Coordinating Committee, which oversees a multinational effort to develop the IAEA safeguards approach for the final disposal of spent fuel. An NRC employee also serves as the U.S. member of the Standing Advisory Group on Safeguards Implementation (SAGSI), an advisory group to the Director General of the IAEA. Recent SAGSI reviews have focused on measures to improve the efficiency and effectiveness of IAEA safeguards.

The NRC participated in a "Consultants Meeting" at the IAEA Headquarters in June 1996 to provide additional guidance on and clarification of certain aspects of INFCIRC/225/Rev. 3, "The Physical Protection of Nuclear Materials." The resulting guidance will be published for member states to use in implementing the recommendations of INFCIRC/225/Rev. 3.

Assistance to the Republics of the Former Soviet Union

During FY 1996, the NRC continued to provide safeguards support to the regulatory agencies in Russia, Ukraine, and Kazakstan under the Cooperative Threat Reduction and Lisbon Initiative Programs. The NRC's primary role is to assist these Republics in establishing national regulatory systems for MC&A and physical

protection. Assistance is provided in the development of regulations, licensing and inspection programs, and associated implementing guidance.

In FY 1996, the NRC participated in MC&A inspections conducted by the Russian regulatory agency at nuclear facilities in Moscow and St. Petersburg, Russia. The NRC conducted an MC&A workshop for Russian regulators at the NRC Headquarters, which included discussion of the NRC's rulemaking process, regulatory guides, export-import licensing process, and MC&A regulations. Russian physical protection experts visited an NRC Regional Office and accompanied a regional inspector on a physical protection inspection at a reactor (Figure 6.2).



Figure 6.2 Kazakstani, Ukrainian, and Armenian Regulators Attending NRC Security Licensing Workshop at NRC Headquarters

During January 1996, Ukrainian regulators observed an MC&A inspection at the Westinghouse Commercial Nuclear Fuel Division facility. The Ukrainians observed and discussed how the NRC inspects such areas as records and reports, measurement systems, and measurement control. The Ukrainians were also briefed by facility personnel on such topics as conducting physical inventories, performing shipper/receiver difference determinations, and use of measurement equipment. During February 1996, a Ukrainian MC&A specialist attended a course at the NRC Headquarters in nuclear material sampling and measurements. While attending the course, he had discussions with the NRC staff concerning development of a national information system for nuclear materials safeguards. During March 1996, a group of five Ukrainian regulatory and facility personnel and five Kazakstani representatives attended a seminar on Category I HEU nuclear material physical protection licensing issues. The

seminar was augmented by a trip to the NFS facility, where NFS personnel discussed how they implemented the NRC regulations and developed security plans. An NRC license reviewer and security inspector were also present to discuss their duties and relationship to the facility. Several NRC MC&A and physical protection specialists traveled to the Ukraine in April 1996 to provide practical guidance in using the training received during the past year. The staff visited Ukrainian nuclear facilities along with Ukrainian inspectors and advised them on how to conduct inspections. The staff also discussed the development and review of facility licensing plans.

In October 1995, a Kazakstani regulator observed an MC&A inspection at the ABB Combustion Engineering fuel fabrication facility. The inspection focused on the facility's physical inventory, and facility staff discussed its methodology for development of a Fundamental Nuclear Material & Control plan. In November 1995, a delegation of four Kazakstanis visited the same facility to discuss and observe how the site implements the NRC Category III nuclear material physical protection regulations. The visit included tours and discussions with facility personnel. In November 1995, the NRC staff conducted a workshop for Kazakstani representatives on development of safeguards regulations at NRC Headquarters. The delegation also traveled to the North Anna Nuclear Power Plant to observe how NRC safeguards regulations are implemented at a U.S. facility. In December 1995, a Kazakstani physical protection specialist observed an NRC security inspection at the Turkey Point Nuclear Power Plant. The inspection covered various topics, including perimeter testing, alarm station operations, audits, and handling Safeguards Information.

In June 1996, the NRC staff conducted a mock MC&A inspection at a Kazakstani nuclear facility. In September 1996, the staff accompanied representatives from the Republics of Kazakstan, Ukraine, and Armenia to Diablo Canyon Nuclear Power Plant to observe their Operational Safeguards Response Evaluation inspection. After this inspection, the delegation returned to Washington to attend a Physical Protection Licensing Workshop

conducted at NRC Headquarters for the Republic of Kazakstan (Figure 6.3).

In addition to the training and other activities, the NRC safeguards regulations and guidance documents now have been translated into Russian for use by the FSU regulators. Copies have been provided to some FSU facilities.

The NRC also serves in a technical advisory capacity on an Interagency Working Group (IWG) on the Disposition of Excess Weapons Plutonium. The IWG is considering technical, economic, nonproliferation, scheduling, and environmental aspects of the disposition of surplus plutonium. The staff has provided input to the IWG and the DOE on regulatory and international safeguards issues and has participated in meetings related to the joint U.S./Russia disposition study, meetings with Canadian officials regarding the CANDU option, and DOE public scoping meetings. The NRC also participates in an interagency group examining alternative verification approaches for excess weapons components.

During FY 1996, the NRC continued to work with DOE and DOS to implement the provisions of the U.S./Russia Transparency Agreement. Progress was made in defining the scope of transparency visits in the U.S. and on the content of reports that will be provided to Russia. Visits to the NRC-licensed fuel fabrication facilities are anticipated in late 1996 or early 1997.

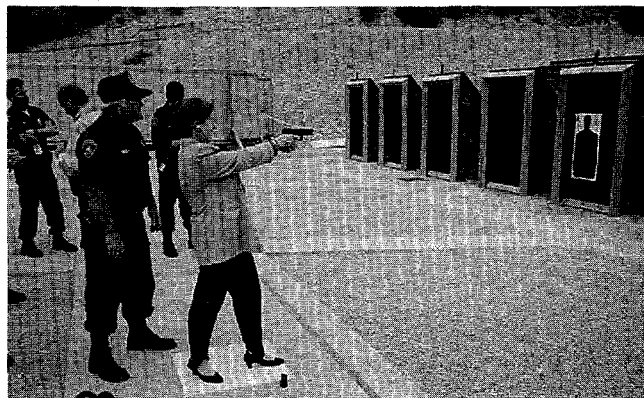


Figure 6.3 Ukrainian Delegation Participating in Weapons Familiarization Course at Diablo Canyon Nuclear Power Plant

International Physical Protection Activities

Bilateral consultations on physical protection of nuclear facilities and materials are arranged with countries that have SNM of U.S. origin or material derived therefrom. These bilateral consultations are designed to share technical information and experience concerning physical protection of civilian nuclear activities. During FY 1996, the NRC visited Italy, Turkey, Mexico, Brazil, Argentina, Chile, and Canada. In addition, the NRC conducted a followup visit to Colombia to resolve outstanding issues from an earlier inspection.

The NRC continued to receive notification of a number of reported and alleged incidents of smuggling in international areas and offers for sale of alleged weapons—usable nuclear materials—demonstrating the importance of ensuring a high level of physical protection for materials and facilities.

NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM

Jointly funded by DOE and NRC, the Nuclear Materials Management and Safeguards System (NMMSS) is an accounting system encompassing all licensed SNM and foreign source material in the United States. The NMMSS charter includes materials that originated in the United States and elsewhere. Material is tracked between facilities, on a continuing basis, from original refinement to eventual disposal. Import/export transactions are also tracked using this system. Selected data, based on NMMSS output, are used to fulfill U.S. international obligations and bilateral agreements.

In October 1994, a new NRC rule to streamline the collection of nuclear material transaction data and increase the accuracy of the reported data became effective. In September 1995, the DOE successfully transferred the NMMSS system to a new contractor that uses a downsized computer

platform that provides all licensees the option to transmit data to NMMSS electronically.

In September 1996, a new data entry program was developed to allow licensees to enter NMMSS data into a personal computer and automatically transfer it to a diskette for transmission to the NMMSS contractor. The program includes sophisticated data validation routines that should eliminate most of the possible errors that could be made in entering the data. This should significantly decrease the amount of time NMMSS contractor staff now need to follow up with licensees to resolve inconsistencies in data received by NMMSS. After testing among a small group of actual users, the software will be made available without charge to all interested licensees.

SAFETY AND SAFEGUARDS EVENT EVALUATION AND RESPONSE

Reporting of Nuclear Criticality Safety Events

In October 1991, NRC Bulletin 91-01, "Reporting Loss of Criticality Safety Controls," was issued to all NRC-licensed facilities with activities including hot cell operations, enriched uranium operations, uranium fuel research and development, or critical mass operations. This bulletin requested that licensees inform the NRC of their criteria and procedures to ensure prompt evaluation and reporting of conditions and events involving nuclear criticality safety.

During FY 1996, under Bulletin 91-01, Supplement 1, licensees reported seven safety-related events. Lack of administrative controls and adherence to procedures were the dominant root cause of the reported events. NMSS uses a computer database for the analysis of trends and patterns to focus NRC inspection resources on the areas of greatest concern.

Threat Assessment and Liaison/Design-Basis Threat/Incident Response Activities

The NRC staff continually reviews the threat environment worldwide; assesses threats to NRC-licensed facilities, materials, and activities; reviews the adequacy of the design-basis threats; and prepares safeguard incident response plans for responding to actual thefts of nuclear material or radiological sabotage of nuclear facilities or activities. In performing these functions, the safeguards staff continues its ongoing review of the threat environment and provides its findings to the Commission and senior NRC management on a semiannual basis. The safeguards staff maintains close contact with the intelligence community, including participation in regular meetings of Federal agencies that are prepared to address terrorism.

Liaison activities include briefings and consultations with the representatives of other governments regarding the NRC threat assessment and incident response activities. During FY 1996, the NRC continued to participate in a variety of sessions to train intelligence community threat analysts and others to augment their understanding of nuclear-related matters. During FY 1996, the NRC also participated in an FBI training program for special agents regarding the NRC programs.

During FY 1996, the NRC reviewed and updated its fuel cycle safeguards incident response plan.

During FY 1996, the NRC worked closely with DOE and other interested agencies to investigate reported attempts to sell alleged nuclear materials. The NRC also continued to participate in a high-level interagency group concerned with the Federal Government's response to nuclear smuggling and other events involving alleged nuclear materials. In addition, during FY 1996, the multidisciplinary NRC/DOE Communicated Threat Credibility Assessment Team was called on periodically to assess attempts to sell alleged nuclear and radioactive materials.

Safeguards Summary Event List

During FY 1996, the staff continued to analyze safeguards events related to threats and incidents to identify trends, patterns, and anomalies. On the basis of its analysis, the staff published the Safeguards Summary Event List (SSEL), NUREG-0525, Volume 2, Revision 4. The SSEL is a compilation of brief summaries of several hundred safeguards-related events involving nuclear materials or facilities regulated by the NRC, which occurred and were reported from January 1, 1990, through December 31, 1995. (Events reported through December 31, 1989, were published in SSEL Volume 1, issued December 31, 1992.) During FY 1996, the SSEL was distributed to members of the domestic and international intelligence community, as well as to the licensed community.

SAFETY AND SAFEGUARDS REGULATORY ACTIVITIES AND ISSUES

Final Rules

During FY 1996, the NRC completed the following rulemaking action:

- **Security Plan Format Changes.** On October 16, 1995, the NRC published a final rule that amended 10 CFR Parts 50 and 70. This rule eliminated the requirement for applicants for power reactor and Category I fuel cycle licenses to submit physical security plans in two parts. The two-part format was restrictive and had no regulatory advantage. Licensees with physical security plans that were approved before the effective date of the final rule would not be required to adopt the new format. They may, however, revise their security plans to conform to the new format on a voluntary basis, pursuant to the rules that permit licensees to make changes in

security plans provided that the changes do not diminish the effectiveness of the plans.

Proposed Rules and Studies

During FY 1996, the NRC continued the following rulemaking actions and studies to determine the need for rulemakings:

- **Safeguards for Spent Nuclear Fuel or High-Level Radioactive Waste.** The NRC staff postponed final action on this rulemaking, which was published as a proposed rule in the *Federal Register* on August 15, 1995, to give due consideration to the comments received during the public comment period. The proposed rule is intended to improve regulatory predictability by codifying the safeguards requirements for storage of spent fuel in spent fuel pools of permanently shut down reactors and in independent dry cask storage installations not covered by the general license provisions of 10 CFR Part 72, Subpart K. It is also to clarify the domestic safeguards requirements for monitored retrievable storage and the geologic repository operations area. In FY 1997, the NRC will select among the options under consideration and proceed with this rulemaking.
- **Independent Spent Fuel Storage Installations Vehicle Bomb Study.** An analysis of the potential consequences of a vehicle bomb attack on the dry storage casks currently in use was completed in FY 1996. A peer review of the report and recommendations to the Commission will be completed in FY 1997.
- **Safety of Fuel Cycle Facilities and Others Licensed for SNM.** A draft was completed on major revisions to the rule (10 CFR Part 70) governing the possession and use of SNM. The primary objective was to update and enhance the regulatory base for facilities possessing large amounts of SNM. After the draft was discussed with industry and other interested parties at a public workshop, the Commission directed the staff to continue an open dialogue with these parties to develop a better understanding of the Part 70

rulemaking and to discuss alternatives to upgrading the regulatory base. As a result, this rulemaking is *on hold* pending further NRC staff review and consideration of an industry petition for a rulemaking alternative. A Commission decision on an approach for upgrading the regulatory base is expected during FY 1997.

- **MC&A Rulemaking.** During FY 1996, a rulemaking was initiated to amend the NRC's MC&A regulations. These changes would incorporate performance-oriented requirements and general MC&A requirements for Category II facilities, replacing the current prescriptive requirements found in Part 70. The rulemaking also moves the Category II requirements and general MC&A requirements to 10 CFR Part 74, thereby consolidating all MC&A requirements. The rulemaking would also correct certain outdated terminology and implementation dates.

Guidance Documents

- **ISA of Fuel Fabrication Facilities.** An ISA is a systematic examination of the hazards that could lead to loss of confinement of radioactive materials or other hazards, such as hazardous chemicals related to the processing of NRC-licensed materials. During FY 1996, the NRC completed an ISA draft document, NUREG-1513, to guide licensees in performing an ISA. Draft NUREG-1513 was made available to the industry and the public for comment. This document was prepared in concert with development of proposed revisions to 10 CFR Part 70. It is *on hold* pending a decision by the Commission on the approach for upgrading the regulatory base.
- **SRP for the Review of a Licensing Application for a Uranium Fuel Processing or Fabrication Facility.** The SRP provides guidance for the NRC staff to use in reviewing and evaluating the health and safety aspects of applications for licenses to possess and use SNM. This document was prepared in concert with the development of

proposed revisions to Part 70. This document is on hold pending a Commission decision on an approach for upgrading the regulatory base.

- **Standard Format and Content Guide (SF&CG).** The SF&CG describes the scope and type of information applicants should submit with their application for a new license, a license amendment, or for renewal of an existing license. The current SF&CG does not request information about chemical safety or about an ISA. Drafting of a replacement for the existing SF&CG (Regulatory Guide 3.52, Revision 1, published November 1986) also was done in concert with development of proposed revisions to Part 70. This document also is *on hold* pending a Commission decision on the approach for upgrading the regulatory base.
- **Uranium Hexafluoride Vapor Cloud Model Study.** This study, which the NRC initiated in FY 1995, is to assess the usefulness of various analytical source terms and dispersion models to estimate the consequences resulting from an inadvertent release of uranium hexafluoride (UF_6)—one of the most serious potential accidents at most NRC-licensed uranium conversion/fabrication facilities. Because of the complex chemical reaction of UF_6 with the moisture in the air, which produces toxic hydrogen fluoride and uranyl fluoride, UF_6 consequences are more difficult to model than those of most other hazardous chemicals.
- **Accident Analysis Handbook.** During FY 1996, the NRC awarded a contract to revise NUREG-1320 (Nuclear Fuel Cycle Facility Accident Analysis Handbook). This contract will implement recommendations made in the FY 1995 "Project Definition Study." The revisions to NUREG-1320 will address accident consequences and risks for types of fuel cycle operations, such as uranium isotope enrichment and downblending of HEU to LEU, and will add accident consequences associated with uranium fuel chemical processes. Work accomplished in FY 1996 included updating a March 1994 report on "Accident Scenarios and Source Terms," and the initial development of sample problems to be used throughout the handbook.
- **Chemical Process Safety at Fuel Cycle Facilities.** During FY 1996, the staff finalized a draft report (Draft NUREG-1601) to provide guidance for chemical process safety at fuel cycle facilities. This report is in the final review process. It notes the importance of chemical safety at facilities that handle, process, and store nuclear materials. It provides information on protection of nuclear materials and nuclear material workers from chemical hazards and on controlling process chemistry to prevent misdirected material events. The emphasis on chemical safety at facilities that process, handle, or store nuclear materials is expected to decrease the potential for worker, public, and environmental exposures.
- **Physical Protection Guidance.** To ensure detection of, and initiation of, appropriate response to unauthorized intruders, intrusion detection systems are relied on by licensed power reactor sites and fuel facilities that possess more than five kilograms of U-235 in HEU, two kilograms of U-233, or two kilograms of Pu. During FY 1996, the staff considered comments received on draft Regulatory Guide DG-5007, "Perimeter Intrusion Alarm Systems." This draft is the proposed Revision 3 to Regulatory Guide 5.44. This revision includes new technologies and reflects generic lessons learned from NRC site reviews and from licensee reports.
- **MC&A Guidance.** Among other purposes, tamper-indicating seals are used by industry to verify the integrity of prior measurement of the contents of sealed containers of SNM. During FY 1996, comments were received on draft Regulatory Guide DG-5005, "Tamper-Indicating Seals for the Protection and Control of Special Nuclear Material," a proposed update of Regulatory Guide 5.15. The comments were reviewed and changes to the draft were made before publishing the final revision in FY 1997.

Chapter 7

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Waste Management

HIGH-LEVEL WASTE PROGRAM

Early in 1995, the Nuclear Regulatory Commission (NRC) staff recognized the need to refocus its preclicensing repository program on resolving the issues most significant to repository performance. Since that time, three major events have driven a significant restructuring of the NRC repository program:

1. A reduction in congressional appropriations for the repository program for both the NRC and the U.S. Department of Energy (DOE);
2. A reorganization of the DOE high-level waste (HLW) work in what became known as the *Program Approach* in 1994 and its modification in 1995; and
3. A report issued to the U.S. Environmental Protection Agency (EPA) by the National Academy of Sciences (NAS), which contained recommendations for setting a safety standard for a proposed HLW repository at Yucca Mountain.

The scope of the NRC preclicensing program was adjusted to focus on only those topics most critical to repository performance—these topics are called the key technical issues (KTIs). The scope was adjusted, recognizing that items not on the current list of KTIs may be found to be important to repository performance in the future, carrying some risk of either having to make overly conservative assumptions about such items or causing a delay in regulatory actions.

The NRC revised approach focuses on resolving 10 KTIs. Other HLW activities necessary for licensing have been deferred as a result of Fiscal Year (FY) 1996 budget reductions. The 10 KTIs are as follows:

1. Igneous activity
2. Structural deformation and seismicity
3. Evolution of the near-field environment
4. Container life and source term
5. Thermal effects on flow
6. Repository design and thermal-mechanical effects
7. Total system performance assessment (TSPA) and integration
8. Activities related to development of the EPA Yucca Mountain Standard
9. Unsaturated and saturated flow under isothermal conditions
10. Radionuclide transport

Because each of the 10 KTIs encompasses a number of important sub-issues and because resources are severely limited, the staff is using a “vertical slice” or audit approach that has been successfully used in other areas of NRC responsibility, including reactor licensing. To further focus the work within each KTI, the NRC staff will evaluate a few narrow slices or topics (focused and with a well-defined scope) in depth, while conclusions about resolution of the broader issues

will be inferred from examining these topics in detail. Within a particular vertical slice, the NRC staff plans to conduct appropriate activities, such as—

- evaluating alternate conceptual models, including underlying data and assumptions;
- conducting independent modeling for use in sensitivity and importance analyses;
- performing limited technical investigations, including laboratory tests, to develop an independent understanding of relevant processes;
- reviewing DOE data and independent literature;
- establishing acceptance criteria to use as guidance during reviews and in issuing resolution; and
- establishing clear objectives for each interaction with the DOE and others to ensure progress toward issue resolution.

The NRC approach is to focus all activities on resolution of the 10 KTIs at the staff level. Issue resolution is achieved when the NRC staff has no further questions or comments about how the DOE is addressing the issue in its program. However, the staff recognizes that in some cases, reaching a common understanding regarding differences in the NRC and the DOE points of view may be all that can be achieved. The NRC staff will prepare periodic issue resolution status reports to document significant progress and give the DOE timely feedback about specific issues or sub-issues. In addition, an annual report will summarize the significant technical work completed for all KTIs during the preceding fiscal year. The results of the staff's efforts this fiscal year are in NUREG/CR-6513. To the extent that the NRC and the DOE can resolve issues prior to the *Viability Assessment* for the repository, NRC would have greater confidence that the potential licensing vulnerabilities have been properly addressed by the DOE in its *Viability Assessment*.

Numerous advantages are apparent in refocusing the NRC program on KTIs, using the vertical slice approach. Scarce resources are keyed to those issues most significant to repository performance,

thus enhancing attention to safety. Issue resolution is facilitated by acknowledging the appropriate bounding of less significant effects and aiming interactions with the DOE on those factual or interpretive differences with the greatest significance to performance. The audit nature of the vertical slice approach effectively evaluates a wide range of DOE activities and identifies how well they are integrated. Integration of the NRC HLW program is improved by coordinating necessary activities and technical disciplines in the review of each issue. Stressing issues that are potential licensing vulnerabilities is a robust approach that is not highly dependent on the DOE products and, thus, less likely to be seriously impacted by potential future changes in the DOE program. Finally, the approach is sufficiently flexible to allow necessary changes to the issues or priority of activities based on new site information or new insights regarding repository performance.

As with any approach, there are some disadvantages. The audit nature of focusing only on the 10 KTIs and selected vertical slices within each issue will result in areas of the DOE program not being examined in detail during preclicensing. Also, if some vulnerabilities are not recognized as KTIs and effectively addressed during preclicensing, the licensing review could be extended.

Significant progress has been made in developing paths to resolution for various sub-issues in the 10 KTIs. The path to resolution takes into consideration the data and analyses from DOE, available in the literature, from NRC, and from proposed DOE investigations and an understanding of the impact of the sub-issue on the overall performance of the repository. DOE is ultimately responsible for developing an integrated safety case for the repository and may choose to adopt a different path to issue resolution than the NRC would develop.

For each individual KTI, the specific path to resolution is unique and reflects both the nature of the issue and progress of DOE and NRC technical work to date. Overall, for most of the KTIs, activities in FY 1996 concentrated on establishing a sound technical basis for future issue resolution. For a few KTIs, this involved data collection to improve the understanding of parameters or processes thought to be important to various analyses and for which data were not available. Activities also emphasized refining or,

in some cases, completing development of models and associated computer codes representing various subsystems or processes of the repository. These models were then used to conduct sensitivity/importance analyses in FY 1996 at the repository subsystem or process level to help focus further resolution work on those factors having a dominant effect on the subsystem or specific processes. Subsystem or process models will provide additional value either by calculating parameter input for use in the TSPA computer code or by being abstracted as modules in the TSPA code during FY 1997. The resulting updated TSPA computer code will be used for sensitivity/importance analyses in FY 1997 that integrate the various subsystems and processes that can then be used to confirm the importance of various parameters and processes to the total system performance measure of dose. Such integrated analyses are necessary to support resolution of individual issues or sub-issues that cannot be resolved in isolation of the total system. These analyses will also help to develop acceptance criteria during FY 1997. In FY 1996, various approaches were evaluated as to how acceptance criteria could be identified and used to support the issue resolution process. Presently, these are envisioned to be part of the technical basis for issue resolution.

General Program Accomplishments

Although resolution of many KTIs depends on additional work in FY 1997, some important progress was made this past year. Interactions between the NRC and the DOE during FY 1996 were successful in achieving informal agreements to be documented in issue resolution status reports during FY 1997. Examples include narrowing the range of tectonic models, identifying an acceptable seismic design methodology, and resolving design control process concerns.

Another major step toward issue resolution was made in the TSPA area. NRC and DOE identified differences between the NRC and DOE TSPAs, causes, and potential future resolution actions.

The staff completed a Branch Technical Position (BTP) on an acceptable methodology for the use of expert elicitation. This guidance, published as NUREG-1563, resolved questions with DOE on when and how to use expert elicitation for areas of major uncertainty, and currently is being used by the DOE to conduct and plan future expert elicitation.

During FY 1996, the NRC continued the ongoing effort to ensure that the regulations at 10 CFR Part 60 governing the disposal of HLW are clear and sufficient to protect the health and safety of the public and workers. Specifically, the staff completed its review of the public comments received on the proposed amendments to Part 60 that were published in the *Federal Register* in FY 1995 ("Disposal of High-Level Radioactive Wastes in Geologic Repositories; Design Basis Events"). With due consideration of these comments, the staff developed a proposed final rule in June 1996 (SECY-96-136) for Commission approval. This final rule would enhance and clarify existing requirements that govern the protection of workers and the public from radiation caused by a range of normal conditions and by accidents that might occur before a repository is permanently closed. The final rule also provides for greater consistency with other NRC regulations governing facilities conducting similar activities, such as the handling and storage of spent fuel. The Commission is currently considering the final rule, and final Commission action and publication of the final rule are anticipated by the end of Calendar Year 1996.

Finally, the progress made on each KTI in FY 1996 is briefly described in the following paragraphs. More detailed abstracts of KTI technical activities are included in NUREG/CR-6513.

IGNEOUS ACTIVITY

In this KTI, work in FY 1996 focused on determining an upper bound for the probability of repository disruption by future volcanic eruptions. The probability estimates obtained from historical data were conditioned by knowledge about the geologic structure. The range of this probability was determined to be between 10^{-7} to 10^{-8} per year, similar to the range determined by the DOE through formal elicitation of an expert panel. Sensitivity analyses of consequences of such disruptions indicated that the number of waste

packages impacted in a volcanic event, the resulting fuel particle size, and the incorporation ratio of fuel into the volcanic ash were critical to determining dose to a postulated critical group.

STRUCTURAL DEFORMATION AND SEISMICITY

Two sub-issues found to be most critical to performance in this KTI are (1) potential impact of faulting and seismicity on waste packages and (2) the effect of structure and tectonic stresses on groundwater flow. Understanding of the regional tectonic setting is required to resolve both sub-issues. Work in this KTI has reduced the number of conceptual tectonic models to five and has shown that seismicity along the Bare Mountain fault is critical. Analyses of the effects of stress and deformation on groundwater flow indicate that discrete networks of fractures and faults may strongly influence both local and regional flow patterns.

EVOLUTION OF THE NEAR-FIELD ENVIRONMENT

Rates of waste package failures and waste dissolution are affected by evolution of the environment close to waste packages. The work in this KTI was directly focused on investigating several components of the DOE *Waste Containment and Isolation Strategy* (e.g., low water flux through the repository, slow corrosion of waste containers, and low waste dissolution rates). An equivalent porous medium model that coupled thermal, hydrological, and chemical processes was completed. Analyses using this model indicated a wide variation in pH and salinity—strong functions of the repository thermal loading. It was concluded that for bounding the near-field environment, approaches other than the equivalent porous medium may need to be considered.

CONTAINER LIFE AND SOURCE TERM

An assessment tool called the Engineered Barrier System Performance Assessment Code (EBSPAC) was developed in this KTI. Through a sensitivity analysis using EBSPAC, the NRC concluded that galvanic coupling between the inner and outer overpacks was perhaps the most important factor

in determining container life. Higher galvanic efficiency caused an increase in container life. In the absence of galvanic protection, intermediate heat loads tended to produce lower container lives than either the low or the high heat loads.

THERMAL EFFECTS ON FLOW

Work in this KTI focused on estimating the effect of thermal load on water and vapor flow through the repository. Results of sensitivity analyses showed that backfill initially lowered the waste package temperature as thermal energy was consumed in evaporating pore water in the backfill. Once the backfill was dry, however, it acted as an insulator and increased waste package temperature. Depending on heat load, the insulation effect may persist for hundreds of years. Another analysis indicated that ventilation during the preclosure phase can lower the drift wall temperature by tens of degrees.

REPOSITORY DESIGN AND THERMAL MECHANICAL EFFECTS

Thermal effects on design of the underground facility constituted the primary sub-issue considered for resolution in this KTI. Phase I of a sensitivity analysis was undertaken to bound the effects of key parameters on drift stability. Thermal loading and properties and patterns of rock joints were found to significantly influence drift stability. Efforts at developing a suitable rock joint constitutive equation that will apply to the situation of multiple reversals of shear displacements resulting from seismic events are continuing at this time. The NRC, however, was able to resolve several methodology sub-issues regarding seismic design of the repository.

TOTAL SYSTEM PERFORMANCE ASSESSMENT AND INTEGRATION

An audit and detailed review of the latest iteration of DOE's TSPA-95 was performed in this KTI. On the basis of the audit review, the staff selected five topics for detailed review:

1. Water flux through the repository;
2. Dilution in the saturated zone;

3. Temperature and humidity in the near-field environment;
4. Waste package failure modes, and
5. Model abstraction.

A comparison of the cumulative complementary distribution function in TSPA-95 and the one obtained using the NRC/CNWRA TSPA computer code, together with TSPA-95 data, indicated significant differences attributable to differences in model abstraction. These differences, their causes, and potential resolution were discussed with the DOE.

Also included in this KTI was the completion of a BTP on expert elicitation. In addition, NUREG-1464, "NRC Iterative Performance Assessment Phase 2: Development of Capabilities for Review of a Performance Assessment for a High-Level Waste Repository," was published in early FY 1996. This report documented the results of the staff's second phase of its Iterative Performance Assessment efforts. Finally, a licensing support system test bed accessible through the *Internet* was brought on line. This test bed allows for searching, retrieving and downloading documents, and obtaining user feedback.

ACTIVITIES RELATED TO DEVELOPMENT OF THE EPA YUCCA MOUNTAIN STANDARD

With the goal of contributing to the development of reasonable and implementable standards for Yucca Mountain, activities in this KTI focused on analyses of critical components of the standard. These analyses can also be applied to future development of the NRC regulations to implement these standards. These critical components included—

- definition of the compliance period;
- determination of critical groups;
- establishment of methods to deal with human intrusion scenarios; and
- provision of details for other disruptive scenarios.

Comparing a hazard assessment for a naturally occurring uranium ore body with that of a hypothetical HLW repository indicated that hazards were comparable at 10,000 years, providing a rationale for adopting 10,000 years as the compliance period. Stylized analysis of human intrusion showed that exploratory drilling was an unlikely event and that its consequences would be low. The staff concluded that the consequences of human intrusion should be analyzed separately from other scenarios and that such consequences would not need to be incorporated into the overall risk assessment. The results of these analyses will be published in FY 1997 as NUREG-1538.

In addition to the scoping calculations, numerous interactions conducted with EPA achieved the following:

- a consistent understanding of NAS recommendations and implementation complexities;
- general acceptance in many areas of appropriate approaches for the proposed standard; and
- clear identification of where significant differences remain, such as in the area of groundwater protection.

UNSATURATED AND SATURATED FLOW UNDER ISOTHERMAL CONDITIONS

On the basis of analyses of paleoclimatic data in the Yucca Mountain region, the staff concluded in this KTI that an upper bound on future precipitation can be estimated at two to three times the present rate. Efforts were also made to bound the rate of shallow infiltration under present-day conditions. Considering space-time variability of climatic and sub-soil conditions, the average shallow infiltration was estimated to lie between 10 to 20 millimeters per year. This study will be extended to estimate bounds on deep percolation. In FY 1996, the preliminary modeling study of existing perched waters indicated a possible average rate of deep percolation of about 6 to 8 millimeters per year.

RADIONUCLIDE TRANSPORT

The scope of this KTI is to investigate processes and conditions that affect radionuclide transport

from the proposed repository to the accessible environment at Yucca Mountain and, thereby, affect the overall performance of the repository system. In the heterogeneous fractured media of the Yucca Mountain site, processes such as matrix diffusion, sorption, and dilution may act to reduce radionuclide concentrations during transport. In FY 1996, this KTI developed mechanistic explanations for the sorption of uranium and neptunium on various mineral substrates. The significance of this work is that laboratory results can be extrapolated to site conditions for use in performance assessment calculations.

LOW-LEVEL WASTE MANAGEMENT PROGRAM

The main objective of the NRC's low-level waste (LLW) program is to ensure that LLW management adequately protects the public health and safety and the environment in accordance with the Low-Level Radioactive Waste Policy Amendments Act of 1985. During FY 1995, the NRC staff had assessed the implications of terminating NRC's LLW disposal program. The staff's continued analysis of options is part of the agency's overall strategic assessment. The staff will provide revised recommendations to the Commission based on the agency's strategic assessment and stakeholder input.

Regulations and Guidance

RULEMAKINGS

Staff from the NRC Division of Waste Management (DWM) supported two rulemakings during the fiscal year. The DWM supported the Office of Nuclear Regulatory Research (RES) in a final rule amending 10 CFR Part 20, "Standards for Protection Against Radiation," to include radiological criteria for decommissioning. The staff also provided support for the revision of

10 CFR 50.82, "Application for Termination of License."

GUIDANCE

During FY 1996, the staff continued its program to develop LLW performance assessment (PA) guidance and to enhance staff expertise in PA. Guidance-related staff activities focused on three main objectives:

1. Inform the Commission on key issues in the draft Branch Technical Position (BTP) on LLW PA and request approval for publication of the draft BTP for public comment (SECY-96-103).
2. Revise the BTP consistent with SECY-96-103 and the resulting staff Requirements Memorandum.
3. Gain experience with integrated PA modeling through an NRC-developed test case model.

These activities will provide license applicants with additional guidance on acceptable approaches for evaluating the long-term performance of an LLW disposal facility and will further improve the NRC's ability to provide technical assistance to the Agreement States. The staff plans to publish the BTP for public comment, respond to public comments, and finalize the BTP in FY 1997. Additionally, the staff plans to perform a final PA analysis with the NRC-developed test case model in support of the BTP.

In response to concerns from the steel industry and others, DWM staff published a proposed staff technical position, "Disposition of Cesium-137 Contaminated Emission Control Dust and Other Incident-Related Material" (January 22, 1996, 61 FR 1608). This position concerns materials contaminated with cesium-137 from the accidental melting of sealed sources. The NRC has been closely coordinating the development of the draft position with the EPA. Additional guidance development activities related to mixed waste are described under the heading "Cooperation with Other Federal Agencies."

Technical Assistance to the States

During FY 1996, the DWM staff continued support to the NRC Office of State Programs in providing technical assistance to the States as they implement their plans for LLW disposal facility development and licensing. Technical assistance to the States included the following activities:

- Participation in meetings of the LLW Forum and Host State Technical Coordinating Committee. NRC staff attended a number of these meetings and made presentations on a wide variety of NRC activities that potentially affect State development of new LLW disposal facilities. These included deregulation of the nuclear utility industry, Federal laws and regulations that apply to private LLW disposal facilities, and NRC's strategic assessment process. Chairman Jackson discussed NRC's LLW program at the May 1996 LLW Forum meeting in Annapolis, Maryland.
- Review of the Commonwealth of Massachusetts' regulations for LLW disposal to determine compatibility with NRC regulations in 10 CFR Part 61.
- Consultation with the State of Nebraska Department of Environmental Quality on PA for LLW disposal facilities. NRC staff met with Nebraska staff and their contractors in May 1996 in Rockville, Maryland.

Cooperation With Other Federal Agencies

During FY 1996, the DWM staff worked with EPA in five principal areas, including risk harmonization, radioactive mixed waste, regulation of air emissions of radionuclides, development of radiological criteria for decommissioning, and sewage sludge. The cooperative activities are generally governed by the March 1992 General Memorandum of Understanding between the agencies on regulation of radionuclides in the environment.

The Interagency Steering Committee on Radiation Standards (ISCORS). ISCORS, which meets quarterly, includes representatives from NRC, EPA, DOE, the Department of Defense (DOD), the Department of Transportation, the Department of Health and Human Services, and the Occupational Safety and Health Administration. The Risk Harmonization Subcommittee conducted a seminar on comparative risk in October 1996, and is writing a background paper on this subject. The Cleanup Subcommittee is evaluating radionuclide concentrations for screening decommissioning sites. The Mixed Waste Subcommittee is a forum for exchanging information on mixed waste. The Recycle Subcommittee is evaluating rulemaking scenarios and parameters. The Sewage Subcommittee is assisting in the development of an NRC/EPA sewage survey and a sewage guidance document.

In FY 1996, the NRC published a proposed technical position on the management of emission control dust that is contaminated by the inadvertent melting of licensed sealed sources. The NRC also gave the EPA specific recommendations for reforming regulations that implement the Resource Conservation and Recovery Act and the Toxic Substances Control Act.

NRC and EPA coordinated rulemakings to eliminate unnecessary dual regulation of airborne effluents of radioactive materials. Presently, air emissions of radionuclides from NRC-licensed facilities, other than nuclear power plants, are subject to EPA regulation under 40 CFR Part 61, Subpart I. (EPA rescinded Subpart I for nuclear power plants on September 5, 1995). EPA agreed to rescind its existing regulations in 40 CFR Part 61, Subpart I, if the NRC amends 10 CFR Part 20 to add a 10-mrem/yr constraint level for air emissions of radionuclides. The final NRC constraint rule was published in the *Federal Register* on December 10, 1996. EPA will take final action concerning rescission of Subpart I for licensees other than licensees of power reactors as soon as practicable.

The NRC is conducting an Enhanced Participatory Rulemaking on radiological criteria for decommissioning. The proposed NRC rule was published in the *Federal Register* in August 1994 (59 FR 43200) as proposed amendments to 10 CFR Part 20, and the staff expects the final rule to be published in early 1997. EPA plans to publish a similar proposed

cleanup rule in early 1997. NRC and EPA have been actively cooperating by exchanging information and jointly evaluating technical methods necessary to support and implement the radiological criteria in these two proposed rules. The objective of the agency discussions is to allow EPA to find that NRC requirements provide sufficient protection of the public and the environment. On the basis of such a finding, EPA would exclude NRC and Agreement State licensees from the scope of its standards.

NRC and EPA are sponsoring a joint sewage survey to characterize radioactive materials in sewage sludge and ash (from the incineration of sludge) at publicly owned treatment works (POTWs). POTWs will be asked to fill out a short questionnaire, and then samples will be collected voluntarily from several hundred POTWs nationwide. The NRC plans to use this information in assessing whether to apply further restrictions on the licensed radioactive material that is being discharged to the sewer system. Because this survey includes several hundred facilities, the survey will require U.S. Office of Management and Budget clearance. NRC and EPA are currently testing the survey on nine POTWs.

Cooperation with DOE during FY 1996 was limited in waste management program areas other than uranium mill tailings and HLW. The agencies continued to cooperate by sharing information about remediation of radiation-contaminated sites, mixed waste, and risk harmonization activities through ISCORS.

International Cooperation

During 1996, the NRC staff continued to support development of international standards and criteria for the safe management of radioactive wastes, and to participate in activities to develop international consensus on methodologies for long-term safety assessments for waste disposal facilities. In 1996, the International Atomic Energy Agency (IAEA) reorganized its program for developing international consensus standards for nuclear safety, radiation protection, transportation of radioactive materials, and safe management of radioactive wastes. The IAEA

standards development activities are coordinated by the Advisory Committee on Safety Standards (ACSS), which consists of senior managers from national regulatory organizations. The NRC Executive Director for Operations is the U.S. representative on ACSS. Standards in the waste management area are reviewed by the Waste Safety Standards Advisory Committee (WASSAC). During 1996, the NRC has reviewed and provided comments to WASSAC on the scope of the IAEA waste management standards program and on a draft Safety Standard on Near Surface Disposal of Radioactive Waste.

The NRC staff has also been participating as a member of the U.S. delegation negotiating an International Convention on the Safety of Radioactive Waste Management. The Convention, when in force, will promote a high level of safety worldwide in the management of radioactive waste through enhancement of national measures and international cooperation. The staff participated in three meetings during 1996, developing a draft convention that is planned to be opened for signature in late 1997.

The NRC staff is participating in a working group to Committee 4 of the International Commission on Radiological Protection to clarify its current recommendations as they apply to the disposal of solid radioactive waste. The staff also briefed a number of visitors from foreign countries on the NRC's regulatory program for LLW management and related topics.

DECOMMISSIONING OF NUCLEAR FACILITIES

Regulations and Guidance

During the last year, DWM continued support to RES on a rulemaking to establish radiological criteria for license termination. A proposed rule was published in the *Federal Register* on August 22, 1994 (59 FR 43200). The proposed criteria would apply to the decommissioning of almost all licensed facilities subject to NRC jurisdiction. The

intent of the rulemaking is to provide a clear and consistent regulatory basis for determining the extent to which lands and structures must be remediated before a site can be considered decommissioned. During FY 1996, DWM staff assisted with the review and resolution of comments on the proposed rule and participated in the development of associated regulatory guidance. The final rule is expected in 1997.

Materials Decommissioning

The NRC terminates several hundred materials licenses each year, and the majority of NRC-licensed operations result in little or no contamination of buildings or soil. Consequently, decommissioning actions leading to termination of most licenses normally proceed in a routine fashion. Nonetheless, over the past several years, the NRC has recognized the need to strengthen its decommissioning program, particularly for non-routine cases. These non-routine cases involve sites where buildings, former disposal areas, large piles of tailings, groundwater, and soil are contaminated with low levels of uranium or thorium (source material) or other radionuclides. Consequently, they present varying degrees of radiological hazard, cleanup complexity, and associated cost.

SITE DECOMMISSIONING MANAGEMENT PLAN

The NRC developed the SDMP in 1990 to focus on identifying non-routine decommissioning cases and ensuring that generic, as well as case-by-case, issues affecting the timely decommissioning of these contaminated sites receive the appropriate level of managerial attention. The SDMP has been effective in ensuring coordination and resolution of policy issues affecting site decommissioning. An update of the policy and program issues at SDMP sites was provided to the Commission on September 25, 1996 (SECY-96-207.)

Since May 1995, six sites have completed decommissioning and have been removed from the SDMP, exceeding the goal for this year set by the Office of Nuclear Material Safety and Safeguards. In addition, NUREG-1444, Supple-

ment 1, projected that a total of nine sites would be removed from the SDMP by May 1997. This goal is also expected to be met or exceeded. No sites have been added to the SDMP list.

Six additional sites have essentially completed remediation (or are otherwise no longer appropriate for inclusion in the SDMP), and several are expected to be removed from the SDMP list before May 1997. These sites are—

- Anne Arundel County/Curtis Bay, Baltimore, Maryland;
- Babcock and Wilcox, Apollo, Pennsylvania;
- RTI, Inc., Rockaway, New Jersey;
- Texas Instruments, Inc., Attleboro, Massachusetts;
- Aberdeen Proving Ground, Maryland; and
- Watertown Arsenal, Watertown, Massachusetts.

Decommissioning plans have been approved for five sites in the last year, allowing remediation to begin. Two of the sites—BP Chemicals America, Lima, Ohio, and Chemetron Corporation (Harvard Avenue), Cleveland, Ohio—have received approval to place the contaminated material into onsite disposal cells. After the disposal cells are capped, the sites will be released for unrestricted use. Work continues toward decommissioning and removing from the list all 45 sites currently listed in the SDMP.

The staff is developing environmental impact statements (EISs) for four SDMP sites:

- Shieldalloy Metallurgical Corporation, Cambridge, Ohio;
- Babcock & Wilcox Shallow Land Disposal Area, Parks Township, Pennsylvania;
- Sequoyah Fuels Corporation, Gore, Oklahoma; and
- the U.S. Army Jefferson Proving Ground, Madison, Indiana.

The contamination levels at each of these sites could result in a dose to a member of the public in

excess of one mSv/yr (100 mrem/yr) assuming an intruder or resident farmer pathway scenario. The waste volumes and physical distribution of the radioactive material on these sites make decommissioning to levels suitable for unrestricted use prohibitively expensive (i.e., up to approximately \$1 billion). Onsite disposal of the material requires an exemption from existing regulations, supported by an EIS.

For the Shieldalloy site, the staff published a draft EIS (DEIS) for comment in July 1996. A preliminary DEIS for the Parks Township site was provided to the Commonwealth of Pennsylvania for review in June 1996, with a DEIS scheduled for March 1997. A DEIS is scheduled to be issued for the Sequoyah Fuels and Jefferson Proving Ground sites in fall 1997 and spring 1998, respectively. The decommissioning alternative proposed by the licensees at all four sites involves leaving contaminated material on site, with reliance on land-use restrictions and institutional controls. The staff is currently holding discussions with DOE to determine if DOE would be willing (1) to accept custody of these sites after the waste is stabilized on site and (2) to provide long-term control and surveillance at the sites, under the authority in Section 151(b) of the Nuclear Waste Policy Act.

The staff was planning to initiate EISs for other SDMP sites with contamination and volumes of waste similar to the Shieldalloy site. However, on the basis of the experience from the four EISs being developed, the staff is assessing the feasibility of a generic EIS addressing onsite disposals of similar wastes, and whether such a generic approach might be feasible to cover a number of sites (estimated to be 10 to 20) that might otherwise require site-specific EISs under 10 CFR Part 51.

Of the 45 sites currently listed in the SDMP, 42 have completed all or part of the required site characterization. In many cases, this activity included staff review and approval of characterization plans. After characterization, 19 of the sites submitted decommissioning plans for all or part of the site; the NRC has approved 14 of these plans. By May 1997, three additional sites are scheduled to be removed from the SDMP.

PROGRAM IMPROVEMENTS: PROGRAM MANAGEMENT PLAN AND INSPECTION AND DECOMMISSIONING PROCEDURES AND GUIDANCE

The staff is implementing the management plan described in NUREG-1444, Supplement 1 (November 1995). In accordance with this plan, additional guidance for inspectors and license reviewers has been developed, and changes have been made to the process for reviewing characterization plans and reports and for performing confirmatory surveys.

The staff has established a decommissioning inspection program (Inspection Manual Chapter (MC) 2602), and has issued decommissioning inspection procedures (IPs) for materials and fuel cycle facilities. NRC issuance of IP 87104, "Decommissioning Inspection Procedure for Materials Licensees," and IP 88104, "Decommissioning Inspection Procedure for Fuel Cycle Facilities," formally establishes inspection requirements and guidance for facilities undergoing decommissioning. These IPs describe inspection frequency and define the decommissioning activities to be inspected at various stages in the decommissioning process. The staff has also developed a qualification program (MC 1246, Appendices IX and X) for technical, project management, and inspection staff working in the area of decommissioning. The qualification program ensures that staff has at least minimum technical qualifications to effectively review decommissioning plans and other related submittals.

The staff is modifying its approach for NRC confirmatory surveys at remediated sites consistent with the management plan in SECY-95-209. This management plan called for a reduction in the number and scope of confirmatory surveys, relying instead on inspections of the licensee's final survey program, supporting quality assurance documentation, and past performance to provide the NRC with the confidence that the final survey data reported by the licensee is valid and accurate. A limited number of NRC confirmatory measurements may also be collected as part of the performance-oriented inspection. This program is being implemented on a trial basis at the Fort St. Vrain power reactor site.

A Laboratory Transition Plan was developed to improve the efficiency of the NRC's radiological

measurements laboratories by consolidating the four regional laboratories (one in each region) into two laboratories (one each in Regions I and III), while ensuring that NRC maintains the independent measurement capabilities necessary for a viable regulatory program. In addition to increased efficiency, the transition plan seeks to enhance overall confidence in the quality of measurements at the remaining two laboratories and NRC's contractor laboratory through a more rigorous quality assurance program. The overall effect of the consolidation effort, which is currently underway, will be a reduction in resources devoted to NRC radioanalytical efforts, improved quality of laboratory analyses, and improved consistency between NRC laboratories.

An information notice (IN) on decommissioning former onsite burials was issued on August 19, 1996 (IN 96-47). This IN iterated the Commission's expectation, as noted in the "Statement of Considerations for the 1988 Decommissioning Rule" (53 FR 24018), that former onsite disposals are to be evaluated, and if necessary excavated, before the disposal area is released for unrestricted use. Sections 30.36, 40.42, 70.38, and 70.54 of the regulations state that if a site includes buildings or outdoor areas that contain residual radioactivity and have not been in use for 24 months, the licensee is required to notify the NRC of this situation. Within 12 months of this notification, the licensee is required to begin decommissioning or to submit a decommissioning plan for these areas if they are not suitable for release in accordance with NRC requirements. In addition, an administrative letter outlining licensee responsibilities under the timeliness rule was issued on November 5, 1996. Feedback from Regional and Headquarters staff indicated that licensees were not fully aware of their obligations under the timeliness rule. Therefore, the administrative letter will serve as a reminder and will provide additional explanation of the rule.

In addition to providing guidance on the implementation of the timeliness rule, the staff is preparing an enforcement strategy for licensees found to be in noncompliance with the final rule on "Clarification of Decommissioning Funding Requirements" (60 FR 38235, November 29, 1995), and is continuing with the development of the technical bases to support the ongoing rule-making on radiological criteria for decommissioning.

One of these technical basis documents is the Multi-Agency Radiological Survey and Site Investigation Manual (MARSSIM), which is intended to provide guidance on methods for demonstrating compliance with decommissioning criteria. The MARSSIM is being developed by a working group consisting of representatives from NRC, DOE, EPA, and DOD. A draft for public comment should be completed in late Calendar Year 1996. (Draft NUREG-1575 (see also Web address <http://www.epa.gov/radiation/cleanup/>).)

On November 4, 1996, NRC staff published a draft Branch Technical Position (BTP), "Screening Methodology for Assessing Prior Land Burials of Radioactive Waste Authorized under Former 10 CFR 20.302 and 20.304" (61 FR 56716). The BTP provides a screening methodology that the staff finds acceptable in determining the need for further characterization or remediation of prior low-level radioactive waste disposals conducted under the provisions of former 10 CFR 20.304 and 20.302. The BTP was issued for interim use and comment for 90 days.

In FY 1996, the staff also completed development of Inspection MC 2605 and a comprehensive handbook on decommissioning nuclear facilities subject to NRC jurisdiction. During reviews of the SDMP program by the U.S. General Accounting Office and the NRC Office of the Inspector General in 1994 and 1995 and other continuing managerial reviews, NRC found that while the NRC staff was overseeing the decommissioning program at nuclear facilities in a manner that protects the public health and safety, progress in decommissioning many sites was slow. As a result of the conclusions drawn from these reviews and the reviewers' recommendations, the NRC determined that formal written procedures should be developed to facilitate the timely decommissioning of licensed nuclear facilities in a manner that was consistent throughout the NRC and in accordance with all applicable regulatory requirements. The MC and Handbook were developed to aid NRC staff in achieving this goal. These documents define a streamlined decommissioning process in which the rigor of review is consistent with potential contamination levels. The full spectrum of sites is covered, from small, routine sites, to large, complex sites, including those listed on the SDMP. Consolidation of the procedures, policies, and guidance into these documents upgrades the NRC decommissioning program and ensures

consistent and effective site decommissioning and license termination for all NRC licensees.

During FY 1996, DWM also conducted workshops, in cooperation with DOE, to acquaint NRC staff with various dose assessment codes (software programs) that can be used in licensing decisions involving contaminated sites. Such codes include RESRAD and MEPAS, developed by Argonne National Laboratory and Pacific Northwest National Laboratory, respectively.

Reactor Decommissioning

During FY 1996, the staff revised 10 CFR 50.82, "Application for Termination of License." Licensees are now authorized to perform most activities necessary to decommission their facilities under the provisions of 10 CFR 50.59. However, under the new requirements, the staff will review a licensee's termination plan before terminating the license.

In FY 1996, the NRC staff revised Inspection MC 2560 entitled, "Reactor Facility Decommissioning Management and Inspection Program," to provide the regional inspection staff with guidance for evaluating the compliance of a licensee's decommissioning program with NRC regulations. NRC staff also prepared a draft Standard Review Plan for Evaluating Part 50 License Termination Plans. This document contains NRC staff guidance for implementing the revised 10 CFR Part 50 decommissioning rules and is currently under review. In addition, the staff prepared a draft regulatory guide entitled "Decommissioning of Nuclear Power Reactors," which also implements the new 10 CFR Part 50 decommissioning rule.

Detroit Edison Company is now evaluating the feasibility of beginning active decommissioning of the Fermi 1 facility. The Fermi 1 reactor was permanently removed from operation in 1972. The facility has remained in a SAFSTOR condition since that time. The licensee continues to meet with the staff to keep the NRC informed of its efforts in this matter and to resolve any questions that might arise during this process.

Fort St. Vrain, a high-temperature gas-cooled reactor in Weld County, Colorado, owned and

operated by the Public Service Company of Colorado (PSC), has nearly completed dismantlement and final survey activities. The NRC is currently reviewing PSC's Final Survey Report, and license termination is scheduled for early 1997.

MANAGEMENT OF URANIUM RECOVERY AND MILL TAILINGS

The NRC staff in the uranium recovery and mill tailings program license and regulate uranium mills, commercial in-situ solution mining operations, uranium extraction research and development projects, and disposal of uranium mill tailings and wastes. This regulation requires the detailed health, safety, and environmental review and inspection of facilities to provide reasonable assurance of safe operation. It also requires developing NRC regulatory guidance to implement EPA standards for regulating mill tailings, and the site-by-site approval of licensee plans for disposal of mill tailings. In addition, the NRC evaluates and concurs in DOE remedial action projects for inactive uranium mill tailings sites and associated vicinity properties, as required by Title I of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA).

Of 26 NRC-licensed uranium recovery facilities, 18 are uranium mills, 5 are in-situ leach facilities, 1 is an ion-exchange facility, 1 is a heap leach, and 1 is a mill tailings waste disposal facility. At the close of FY 1996, three commercial in-situ mining operations were in operation, and two were under construction. One conventional uranium mill was in operation, one was processing mine water, two were in standby, and the remainder were in decommissioning and reclamation. The market price of uranium has risen considerably during FY 1996 and many industry analysts expect it to remain relatively high. As a result, industry has become interested in increasing uranium production. Two existing in-situ facilities are undergoing expansion; there are two applications for new in-situ solution mining facilities currently under licensing review; and there are indications that six additional applications may soon be submitted. In addition,

one conventional mill on standby has submitted an application, environmental report, and revised designs in anticipation of resuming operations, while the second mill on standby anticipates making the necessary submittals in late FY 1997. Over the next few years, much of the casework confronting the Uranium Recovery Program will be in the area of remedial activity for the shutdown facilities, including decommissioning of mills, reclamation of mill sites and tailings disposal areas, remediation of groundwater contamination, and the environmental assessment of such activities.

During FY 1996, the staff held two meetings with representatives of the uranium recovery industry and States to review the status of general uranium recovery issues. The NRC staff plans to continue holding such meetings twice a year, including a large workshop in the spring.

Regulatory Development and Guidance

In January 1996, the NRC published the final technical position on Alternate Concentration Limits (ACLs) for contaminants in groundwater. ACLs are one of three options (along with maximum concentration limits and background levels) for demonstrating compliance with EPA and NRC groundwater protection standards. In March 1994, the NRC staff issued a revised draft technical position on ACLs for uranium mills. A major issue, which was unresolved at that time, was the appropriate level of risk to use in evaluating ACLs. In September 1994, NRC and EPA reached agreement on this issue. In January 1995, interim guidance was issued to the staff on the appropriate risk level to be used in ACL reviews, and the final technical position was published in January 1996.

Licensing and Inspection Activities

In FY 1996, Region IV performed 31 inspections of uranium recovery facilities; each site was inspected at least once. Headquarters led the final inspection of the ARCO site in Grants, New

Mexico, which was performed as part of the review for license termination scheduled for early 1997. During the fiscal year, the NRC issued 103 license amendments. TVA's license for the Edgemont, South Dakota, site has been terminated. It became the first UMTRCA Title II site transferred to the DOE for long-term care under the general license in 10 CFR 40.28.

Remedial Action at Inactive Sites

Under UMTRCA, DOE has designated 24 abandoned uranium mill tailings sites to receive remedial action. UMTRCA requires that the NRC concur with DOE's selection and performance of remedial action to ensure that the action meets appropriate standards promulgated by EPA. DOE has established the Uranium Mill Tailings Remedial Action (UMTRA) Project to implement these remedial actions. The sites will be held by DOE under an NRC general license for long-term care, once all remedial work is completed.

During FY 1996, NRC staff completed 39 review actions pursuant to its responsibilities at sites under Title I of UMTRCA. These included 2 inspection plan reviews, 2 remedial action plan (RAP) reviews, 9 RAP modification reviews, 7 other site-specific reviews, 2 completion/certification report reviews, and 17 reviews of generic items. The staff prepared two completion review reports documenting its review of DOE's remedial action completion for sites in Durango, Colorado, and Tuba City, Arizona.

The submittal of a site Long-Term Surveillance Plan (LTSP) for NRC approval is one of the final actions the DOE must take before a site comes under the NRC general license for long-term care under 10 CFR 40.27. During FY 1996, DOE submitted, and the NRC staff reviewed, two final LTSPs, resulting in final acceptance of the LTSPs and their inclusion under the NRC general license. These were for the sites in Canonsburg, Pennsylvania, and Durango, Colorado. In addition, the Shiprock, New Mexico, site was accepted under the NRC general license in FY 1996, bringing the total number of sites subject to the general license in 10 CFR 40.27 to seven. The site in Spook, Wyoming, was the first site subject to the general

license in 10 CFR 40.27, followed by the sites in Lowman, Idaho; Burrell, Pennsylvania; and Lakeview, Oregon.

In support of the UMTRA Project casework, the staff visited many of the sites. Inspections of remedial action in progress and site visits associated with NRC staff reviews were conducted at the sites in Gunnison, Colorado; Salt Lake City, Utah; Green River, Utah; Falls City, Texas; Ambrosia Lake, New Mexico; Rifle, Colorado; Lakeview, Oregon; Tuba City, Arizona; Maybell, Colorado; Naturita, Colorado; Slick Rock, Colorado; and Grand Junction, Colorado.

Activities for the groundwater remediation phase of the UMTRA Project continued during FY 1996. The initial Site Observational Work Plans (SOWPs) for this phase of the UMTRA Project are being submitted for NRC's informational review. The NRC has reviewed SOWPs for sites in Ambrosia Lake, New Mexico; Falls City, Texas; Riverton, Wyoming; and Spook, Wyoming. These work plans lay out the groundwater cleanup strategy the DOE plans to implement at each site. The SOWPs identify the quantity and quality of available groundwater data at the sites, and identify any additional data needs for developing groundwater restoration programs at the sites.

ADVISORY COMMITTEE ON NUCLEAR WASTE

The Advisory Committee on Nuclear Waste (ACNW) was established by NRC in 1988. The ACNW reports to and advises the NRC on nuclear waste disposal facilities as directed by the Commission. This includes 10 CFR Parts 60 and 61 and other applicable regulations and legislative mandates such as the Nuclear Waste Policy Act, the Low-Level Radioactive Waste Policy Act, and the Uranium Mill Tailings Radiation Control Act, as amended. The primary emphasis is on disposal facilities. In performing its work, the committee will examine and report on those areas of concern referred to it by the Commission or its designated representatives and will undertake other studies

and activities related to those issues as directed by the Commission.

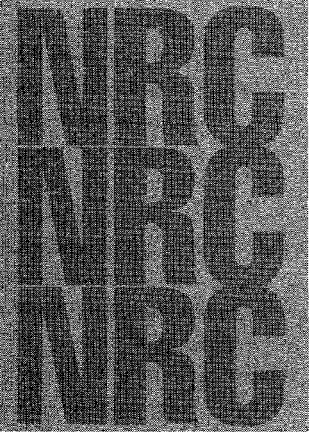
ACNW reports, other than those that may contain classified material, are made part of the public record. The ACNW Web address is <http://www.nrc.gov/acrsacnw>. Activities of the committee are conducted in accordance with the Federal Advisory Committee Act, which provides for public attendance at and participation in committee meetings. The ACNW membership is drawn from scientific and engineering disciplines and includes individuals experienced in geosciences, risk assessment, radioactive waste treatment, environmental engineering, and nuclear engineering.

During fiscal year 1996, the ACNW sent the following reports to the Commission:

- The High-Level Radioactive Waste Research Program in Hydrology
- SECY-95-201 and the NRC Activities Regarding Low-Level Radioactive Waste
- Issues and NRC Activities associated with the National Research Council's Report, "Technical Bases for Yucca Mountain Standards"
- High-Level Waste Prelicensing Program Strategy and Key Technical Issues
- Time Span for Compliance of the Proposed High-Level Waste Repository at Yucca Mountain, Nevada
- Health Effects of Low Levels of Ionizing Radiation
- Elements of an Adequate NRC Low-Level Radioactive Waste Program
- The Final Draft Branch Technical Position on the Use of Expert Elicitation in the High-Level Radioactive Waste Program

In performing the reviews and preparing the reports cited, the ACNW holds working group meetings as needed, and full committee meetings regularly throughout the year.

Chapter 8



Communicating With the Public and the Government

The Nuclear Regulatory Commission maintains regular communication with a broad range of governmental entities and with the general public. Several NRC Headquarters Offices and the Regional Offices participate in the dissemination of information about NRC activities. Commissioners and senior managers frequently take part in Congressional Hearings, and appropriate Congressional Committees are kept regularly and fully informed of NRC decisions and actions. Liaison with the general public, the Congress, Federal and State agencies, Indian Tribes, local community organizations, and the news media is maintained mainly through four offices of the NRC: the Office of the Chief Information Officer, the Office of Congressional Affairs, the Office of Public Affairs, and the Office of State Programs. (The NRC's international programs and exchanges are carried out through the NRC Office of International Programs, whose activities are covered in Chapter 9.) The NRC also maintains a World Wide Web (WWW) site of mission-related news and information. Visit us at Web address <http://www.nrc.gov>.

COMMUNICATION WITH THE PUBLIC

Commission Meetings

The NRC Commissioners meet to discuss agency business in the Conference Room of the NRC

Headquarters building located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland. Members of the public are welcome to attend and observe most Commission meetings. However, a Commission meeting may be closed to members of the public if it is convened to deal with one or more of certain subjects specified in the Government in the Sunshine Act. Specifically, the Sunshine Act allows the closing of meetings involving classified documents, information deemed confidential by statute, trade secrets, investigations, adjudicatory matters, internal personnel matters, matters involving personal privacy, or similar information. Members of the public attend Open Commission sessions as observers, but they may not actively participate unless specifically requested to do so by the Commission. During Fiscal Year (FY) 1996, the Commission held 64 meetings that were open to public observance.

The Commission endeavors to provide meaningful public observation and understanding of open meetings. The Commission's Headquarters Conference Room is equipped with multiple overhead speakers and a closed-circuit television system to ensure that every person desiring to attend a meeting can see and hear the proceeding. A pamphlet entitled "Guide to NRC Open Meetings" is available in the Conference Room and in the Public Document Room (PDR), located at 2120 L Street, N.W., Lower Level, Washington, D.C. The guide describes the normal seating arrangement for participants at the conference table, the general functional responsibilities of these participants, Commission procedures for voting on agenda items, general rules for public conduct at Commission meetings,

and sources of additional information on the Commission and its meetings. "NRC Collection of Abbreviations" (NUREG-0544, Rev. 3) is also available in the PDR to define and explain the many technical abbreviations used in Commission meetings and papers.

Copies of viewgraphs and the principal staff papers to be considered at open meetings are normally made available by the Office of the Secretary (SECY) at the entrance to the Conference Room before the meeting commences. At the conclusion of each open meeting, the Secretary places a transcript of the meeting in the PDR for inspection and copying, along with any papers made available to the public at the meeting. The Secretary also makes a copy of the transcript available in electronic form on the NRC Web site at <http://www.NRC/NRC/COMMISSION/TRANSCRIPTS/index.htm>. The public is permitted to tape record Commission discussions at open meetings. The Commission's practice is to allow camera and television coverage of open meetings and briefings without prior notification. In addition, the Commission makes available video tapes of open Commission meetings for reviewing and copying in the PDR.

In all cases, the Commission attempts to provide advance notice at least one week before a Commission meeting is held. Accordingly, the Office of the Secretary publishes notice of the next four weeks of Commission meetings each week in the *Federal Register*, and an electronic copy of the four-week schedule is posted on the NRC Web site at <http://www.nrc.gov/SECY/smj/schedule.htm>. Copies are also distributed via e-mail over the Internet system. Notice of meetings is given to the press through the wire services and by mailings to individuals who have requested such notice. Commission meetings are also regularly announced on a recorded telephone message (301-415-1292), providing the schedule for upcoming Commission meetings and voting sessions. In addition, an announcement is displayed on a television monitor in the lobby of NRC Headquarters and is posted in the PDR. The announcement discloses the time, place, and subject matter of the meeting; states whether it is an open or closed meeting; and gives the name and telephone number of an official designated to respond to requests for information about the meeting. Persons interested in additional

information concerning the conduct of Commission meetings may write to the Secretary of the Commission, Washington, DC 20555-0001, call 301-415-1969, or visit the Secretary's Home Page on the NRC web site at <http://www.nrc.gov/SECY/smj/secy.htm>.

Advisory Committees

The NRC engages the expertise and experience of a wide segment of the public through their service on the Commission's standing advisory committees and on its *ad hoc* committees. Members of NRC committees are drawn from a broad cross-section of the scientific, technical, and medical communities, as well as from State and local governmental organizations, the National Congress of American Indians, and private citizens. Committee members provide advice and recommendations to NRC on a wide range of issues affecting NRC policies and programs. Appendix 3 briefly states the purpose of each NRC standing advisory committee and affiliations of current members.

In accordance with the requirements of the Federal Advisory Committee Act, NRC advisory committees meet in public sessions at Headquarters locations and in venues throughout the United States. Notice of advisory committee meetings is published in the *Federal Register* and in NRC press announcements. Notice of meeting dates and topics is also posted on the NRC Web site at www.nrc.gov and at the NRC PDR. Transcripts or minutes of meetings are also available for inspection and copying at the NRC PDR. Persons interested in committee meetings or the activities of a particular committee may write to the NRC Advisory Committee Management Officer, Office of the Secretary, Washington, D.C. 20555-0001, call 301-415-1968, e-mail alb@NRC.gov, or visit the Web site: <http://www.nrc.gov/acrsacnw>.

Public Meeting Notice System

The NRC's Final Policy Statement on Staff Meetings Open to the Public, dated September 14, 1994, was published in the *Federal Register* on

September 20, 1994 (59 R 48340). The statement revised the Commission's long-standing open meeting policy. The new policy still provides meaningful opportunities to inform the public of NRC activities but without unduly affecting open and candid discussions between licensees and the NRC staff or unduly burdening the staff's ability to exercise its regulatory and safety responsibilities. A toll-free telephone recording (800-952-9674) announces upcoming public meetings, and a toll-free electronic bulletin board system (BBS) contains searchable information on each meeting. Both are operational 24 hours a day. The telephone recording accommodates multiple concurrent users. The BBS can be accessed directly (800-952-9676) or through NRC at FedWorld (800-303-9672, access through the GATEWAY option). Since October 1996, open meetings have been listed on NRC's WWW site.

In January 1996, NRC began to announce Commission and Advisory Committee meetings and Atomic Safety and Licensing Board (ASLB) hearings on the Public Meeting Notice System (PMNS). More than 1,140 open staff, Commission, and Advisory Committee meetings and ASLB hearings were announced through the PMNS during the second year of the revised policy.

People using the toll-free telephone recording and the toll-free BBS can also leave messages should they care to leave comments or need assistance accessing the public meeting database. The NRC responds to messages within 24 hours. In addition, the telephone recording, the BBS, the WWW site, and the reports posted in the PDR and Local Public Document Rooms (LPDRs) contain the name and phone number of the NRC meeting contact should a member of the public need additional information on an upcoming meeting.

Headquarters Public Document Room

Through its comprehensive document release policies, the NRC has made available more than two million documents for public viewing and copying in the Headquarters Public Document Room (PDR) since its establishment in 1975. Serving as a bridge between the agency and the

public, the PDR maintains a comprehensive collection of unrestricted documents related to NRC licensing proceedings and other significant decisions and actions, as well as documents from the regulatory activities of the former Atomic Energy Commission. The computerized, online Bibliographic Retrieval System (BRS) includes extensive indices to the collection, an online module for ordering the reproduction and delivery of specific documents, and a function for automatically alerting individuals to new items of interest to them (Selective Dissemination of Information—SDI). The Commission has enhanced the BRS to include full electronic text for selected material in a number of categories; this information is also made available through an electronic bulletin board (NRC—PDR Library on FedWorld). The PDR is open Monday through Friday (except Federal holidays), from 7:45 a.m. to 4:15 p.m., eastern time. However, the BRS is available for dial-in access 24 hours a day, 7 days a week.

Persons interested in detailed, technical information about nuclear facilities and other licensees find this specialized research center to be a major resource. With some exceptions, documents from the collection can be reproduced on paper, microfiche, or on diskette, for a nominal fee. The PDR also offers a Standing Order Subscription service for automatic mailing of selected serially published documents and reports. Certain items of immediate interest, such as press releases and meetings notices, are posted in the Reading Room at the facility.

The wide variety of agency documents available to the public at the PDR are—

- NRC NUREG-series reports,
- transcripts and summaries of Commission meetings and NRC staff and licensee meetings,
- existing and proposed regulations and rulemakings, licenses and amendments, and
- correspondence on technical, legal, and regulatory matters.

Most of the documents relate to the design, construction, and operation of nuclear power plants and to nuclear materials, including the transportation and disposal of radioactive wastes.

The PDR does not contain books, journals, trade publications, or documentation of industry standards.

Persons wishing to visit and use the PDR or to obtain additional information regarding the PDR may—

- call 202-634-3273 or 1-800-397-4209, Monday through Friday, between 8:30 a.m. and 4:15 p.m. (eastern time);
- send a facsimile to 202-634-3343, transmit to Internet address PDR@NRC.GOV;
- or write to the U.S. Nuclear Regulatory Commission, Public Document Room, Washington, D.C. 20555-0001.
- Electronic information about the PDR, including the *Users' Guide* may be found on the NRC Web site at <http://www.nrc.gov/NRC/PDR/pdr1.htm>.

The PDR staff make the BRS data base available to the public either onsite (using terminals in the Reading Room) or offsite (via modem). Offsite access (at 1200, 2400, and 9600 baud) is available for searches 24 hours a day, 365 days a year, through a toll-free (800) number. Access to the BRS may be arranged by calling the telephone numbers previously given. Procedures for use of the system may be learned by either an online tutorial or personal instruction at the PDR. The NRC segment of FedWorld and Internet may also be accessed from terminals in the PDR Reading Room.

During a typical month, the PDR serves about 1,300 users. The PDR/BRS users group comprises members of Congressional staffs; personnel from other government agencies, foreign embassies and governments, law firms, utilities, consulting firms, public interest groups, and other institutions; media representatives; and individual members of the public. Technical reference librarians are available to assist onsite users and those who call

or write with information requests. In addition, the PDR provides the BRS, document delivery, and general reference service to foreign nuclear regulatory organizations who participate in the agency's international safety cooperation arrangements (see Chapter 9).

Local Public Document Room Program

Through the local public document room (LPDR) program, citizens living or working near nuclear power reactors and certain other nuclear facilities have access to the records used by the NRC in licensing and regulating those local facilities. Appendix 4 presents a complete list of NRC's LPDRs.

LPDR collections are maintained in academic, public, and State libraries that have evening and weekend hours (Figures 8.1 through 8.4). The NRC's LPDR program staff has daily contact with the public and with local LPDR librarians and assists them in locating records in the collections. Persons wishing to contact the NRC's LPDR program staff may do so by calling 800-638-8081.

Because the NRC converted the site-specific paper collections to microfiche several years ago at all LPDRs supporting power reactors and the proposed high-level waste repository, the public now has local access to more than 1.5 million records released by the NRC since 1981. These records include information about all NRC-licensed facilities as well as NRC staff and contractor publications, rulemaking documents, and generic issues documents. Online access to a database of publicly available records is currently available at 45 power reactor and 2 high-level waste LPDRs. Toll-free searches can be conducted each business day, from 7 a.m. to 8 p.m. Eastern time. Records identified in searches can be viewed and copied from microfiche records at each LPDR.

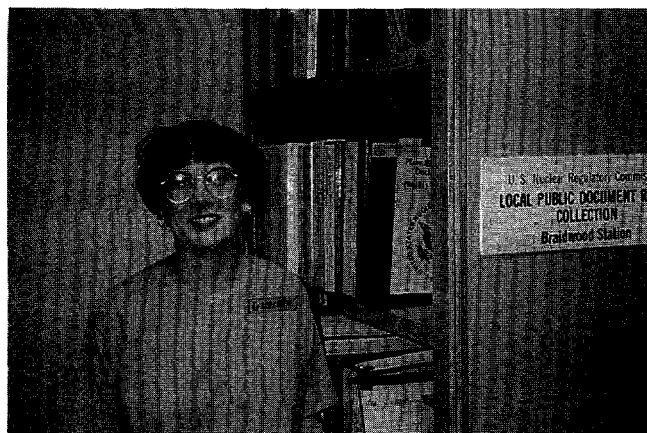


Figure 8.1 Renee Specht, Clerk, Wilmington Public Library, Wilmington, Illinois. LPDR for Braidwood Station

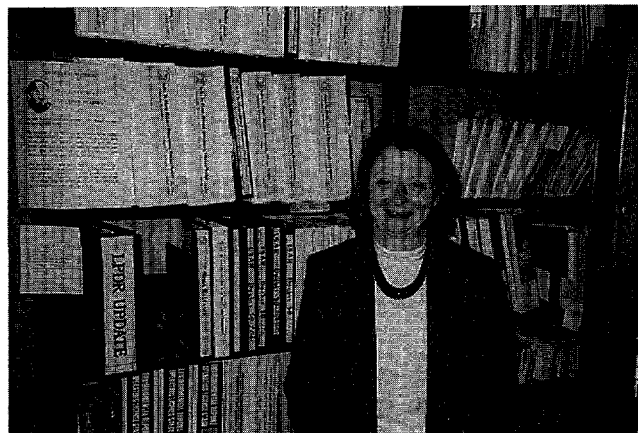


Figure 8.2 Kay Collins, U.S. Government Publications Librarian, University of California, Irvine Library. LPDR for San Onofre Nuclear Generating Station

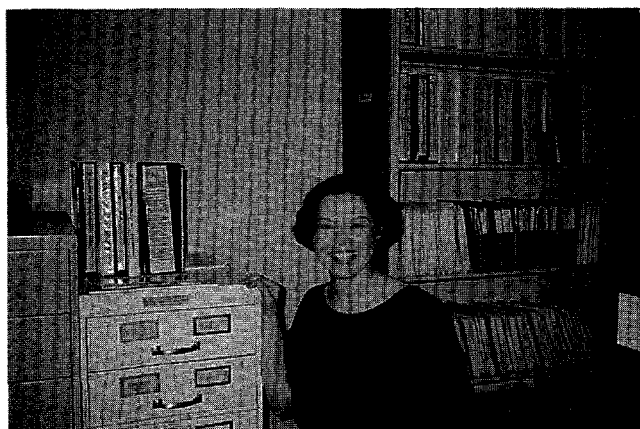


Figure 8.3 Mary Maleney, Assistant Reference Librarian, York County Library, Rock Hill, North Carolina. LPDR for Catawba Nuclear Station

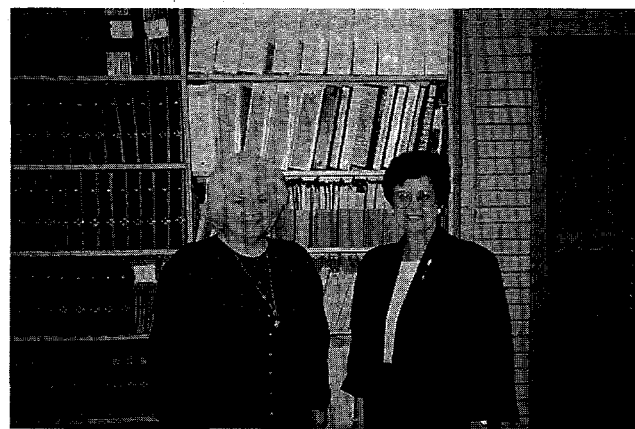


Figure 8.4 Susie Schachte, Library Clerk (left), and Peggy McCutcheon, Director, Scottsboro Public Library, Scottsboro, Alabama. LPDR for the Bellefonte Nuclear Plant

Commission History Program

Through the Commission History Program, conducted by the Office of the Secretary, the origins and evolution of NRC regulatory policies are explored and set forth in their historical context. Research on the evolution of these policies is drawn from the archives of a number of government agencies, personal interviews, and the personal papers of former Government officials and others involved in regulatory issues. The History Office is currently conducting

research for the third volume of a detailed, scholarly history of nuclear regulation. The first volume, *Controlling the Atom: the Beginnings of Nuclear Regulation, 1946–1962*, was published in 1984. The second volume, *Containing the Atom: Nuclear Regulation in a Changing Environment, 1963–1971*, was published in 1992. Both were published by the University of California Press. The volumes are intended to serve as historical references for the agency staff and the general public. A brief summary of the books and the period after 1971 is available in “A Short History of Nuclear Regulation, 1946–1990,”

NUREG/BR-0175, which is available from the Government Printing Office (GPO), or by sending an e-mail request to jsw@nrc.gov. The Short History may also be found on the NRC Web site at <http://www.nrc.gov/SECY/smj/shorthis.htm>.

PUBLIC INFORMATION

The NRC's Office of Public Affairs (OPA) develops policies for completely and accurately informing the public and the media of NRC's programs, policy decisions, and activities. The office prepares and distributes news releases, brochures, fact sheets, and other materials to keep the media and the public informed. OPA also apprises NRC management of media coverage of the agency, responds to public inquiries, oversees the activities of public information staff located at regional offices, and administers a cooperative program with schools to educate students and teachers about the agency's responsibilities.

Media Workshop

For the first time at headquarters, OPA held a two-day workshop for reporters that covered current issues facing nuclear utilities across the nation. At the workshop, NRC senior managers and staff spoke to over a dozen reporters from all over the country about deregulation of the electric industry, reactor and materials decommissioning, radiation protection, spent fuel storage, radioactive waste, nuclear plant aging issues, and other topical subjects. Reporters took the opportunity to interview staff on particular issues of interest and toured the NRC Operations Center. The reporters expressed enthusiasm about the workshop and said it should help them better understand and report on events at nuclear facilities in their communities.

Published Information

OPA published four brochures targeted at specific issues:

1. "Public Involvement in the Nuclear Regulatory Process," NUREG/BR-0215,
2. "Radioactive Waste: Production, Storage, Disposal," NUREG/BR-0216,
3. "The Regulation and Use of Radioisotopes in Today's World," NUREG/BR-0127, and
4. "Reporting Safety Concerns to the NRC," NUREG/BR-0240.

OPA also expanded its information on the internet from press releases and speeches to include periodic reports on the performance of nuclear power plants, known as SALP (which stands for Systematic Assessment of Licensee Performance) reports, the semiannual *watch list* of nuclear power plants requiring close oversight, and updates on technical issues affecting the nuclear industry. In addition, all agency press releases and speeches of senior officials were provided electronically to about 1,000 worldwide subscribers free of charge.

News Conferences

Chairman Jackson held three news conferences during the year, two of which discussed events at the Millstone Nuclear Power Plant (NPP). The Chairman held her annual news conference in March at headquarters, shortly after *Time* magazine carried a front-page story on activities at Millstone NPP and their safety implications. In August, the Chairman held a press conference on Millstone NPP near the plant in Waterford, Connecticut, to address the licensee's performance and NRC's oversight activities. In her third news conference, in early December, the Chairman briefed the news media about top-level organizational and staff changes at the NRC.

Each of the NRC's four Regional Administrators conducted periodic news briefings during the year at various NPPs. Sessions were held at the Indian Point plant in New York, the Millstone plant in Connecticut, the Crystal River and St. Lucie plants in Florida, the Perry plant in Ohio, the Clinton plant in Illinois, the Wolf Creek plant in Kansas, the Diablo Canyon plant in California and the WNP-2 plant in Washington. Press conferences were also held in Miami, Florida, and in Raleigh, North Carolina. Media coverage focused on the

performance of nuclear power plants, emergency response, waste issues, dry cask storage of spent fuel, and enforcement actions.

Continuation of Trial Program for Conducting Open Predecisional Enforcement Conferences

In light of the significant changes to the Enforcement Policy made on June 30, 1995, the Commission decided to continue a trial program of conducting approximately 25 percent of eligible conferences open to public observation pending further evaluation. (See 57 FR 30762; July 10, 1992, and 59 FR 36796; July 19, 1994). The intent of open conferences is not to maximize public attendance, but is rather to determine whether providing the public with an opportunity to observe the regulatory process is compatible with the NRC's ability to exercise its regulatory and safety responsibilities. The provisions of the trial program have been incorporated into the Enforcement Policy. During FY 1996, 23 conferences were open to public observation under the trial program.

Enforcement Information on the Internet

To ensure timely and widespread public dissemination of enforcement information, a home page for the enforcement program was established on the World Wide Web in May 1996. The home page includes a general description of the enforcement program and its mission, enforcement contacts, the Enforcement Policy, the *NRC Enforcement Manual*, the Office of Enforcement Annual Report for FY 1996, the policy statement for "Nuclear Employees Raising Safety Concerns Without Fear

of Retaliation," a link to Department of Labor DOL adjudicatory decisions, and upcoming predecisional enforcement conferences. It also includes copies of significant enforcement actions that the agency has issued arranged by reactor, materials, and individual actions. The Web address for OE's home page is www.nrc.gov/OE/.

School Volunteers Program

NRC employees continued their commitment toward their communities by volunteering in area schools through NRC's School Volunteers Program. This year, approximately 100 employees visited area schools near headquarters. Similarly, employees in the four regions continued to volunteer in their local schools. NRC employees typically participate in career days, and they tutor and mentor students, judge science fairs, and use classroom activities to describe NRC's mission and explain science and math concepts with visual and hands-on demonstrations.

For the sixth year, NRC provided judges for the Montgomery Area Science Fair in Gaithersburg, Maryland, and bestowed awards on special students with exceptional science projects. These students presented and explained their winning projects before the Commission and other employees at headquarters, as shown in the following five photographs (Figure 8.5).

The NRC received an award from the Montgomery County Alliance for Educational Excellence for playing a leadership role in organizing workshops for teachers each year. NRC hosted 45 Montgomery County teachers for a 1-day workshop at headquarters to teach them about science and technology applications in the workplace. The NRC was one of fifteen agencies and businesses that participated in this workshop. At NRC, teachers were briefed on low-level waste, radioactivity, and basic reactor operations, followed by a tour of the Emergency Operations Center.

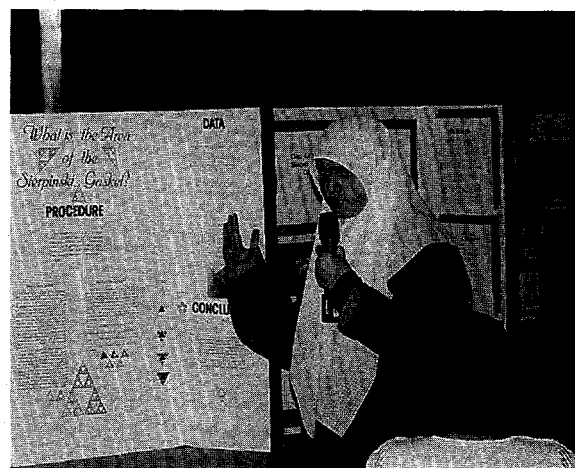
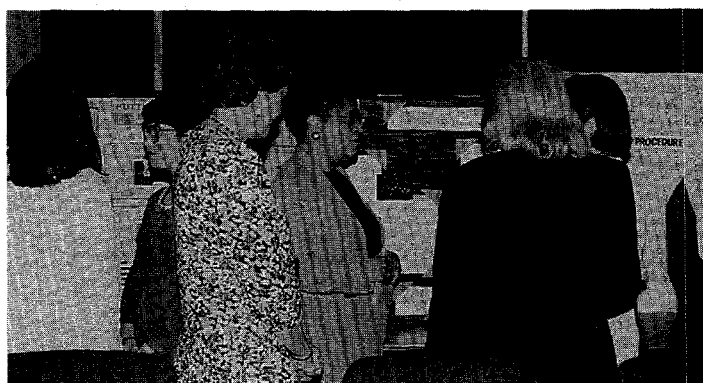
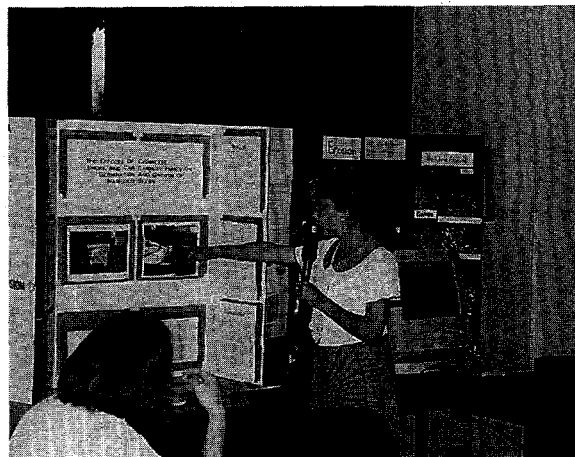
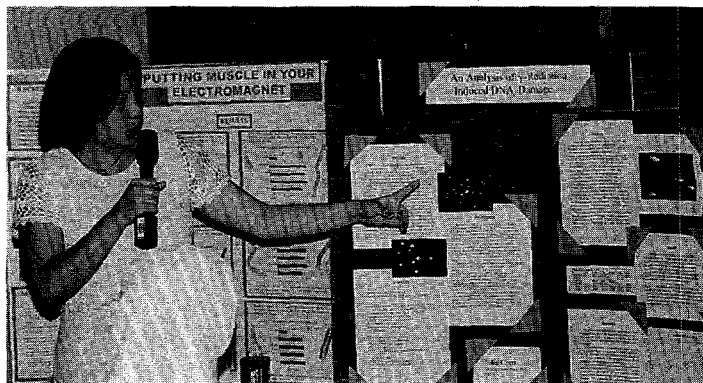


Figure 8.5 Students Who Received Special Awards from NRC at the Montgomery Area Science Fair. They are describing their science projects to NRC Commissioners and staff during a special awards ceremony at headquarters.

COMMUNICATION WITH THE CONGRESS

The Office of Congressional Affairs is responsible for developing, managing, and coordinating relations with the Congress and is the principal point-of-contact between the agency and Congress. The office coordinates the appearances and testimony of all NRC officials at hearings,

monitors and tracks bills relevant to the NRC, keeps the Congress informed of current agency activities, and keeps the NRC apprised of Congressional concerns and interests.

During FY 1996, NRC witnesses or Commissioner nominees testified or submitted testimony at six hearings before Congressional Committees and Subcommittees, as shown in Table 8.1. Congressional Affairs staff attended and prepared summaries and reports for approximately 50

hearings and *markups* (i.e., legislation marked for revision).

COOPERATION WITH STATES, INDIAN TRIBES, AND OTHER FEDERAL AGENCIES

The NRC's program of cooperation with Federal, State, and local governments; interstate organizations; and Indian Tribes is administered primarily through the Office of State Programs (OSP). The goals of the office are (1) to ensure that the NRC maintains effective relations and communications with these organizations and (2) to promote greater awareness and mutual understanding of the policies, activities, and concerns of all parties involved as they relate to radiological safety at NRC-licensed and at Agreement State-licensed facilities. The office's activities encompass three general areas:

- The Agreement State Program;
- State, Local, and Indian Relations; and
- Federal Liaison.

These programs are implemented through Headquarters and the Regional Offices.

Agreement States Program

A total of 29 States have formal agreements with the NRC, by which those States have assumed regulatory responsibility over byproduct, source, and small quantities of special nuclear material. Approximately 15,000 radioactive materials licenses are regulated by the Agreement States, representing about 70 percent of all radioactive material licenses issued in the United States. The States of Massachusetts, Ohio, Oklahoma, and Pennsylvania continue to actively work toward becoming Agreement States.

Table 8.1 Congressional Hearings at Which NRC Witnesses or Commissioner Nominees Testified or Submitted Testimony During FY 96

<i>Date</i>	<i>Committee</i>	<i>Subject</i>
11/29/95	Committee on Governmental Affairs Subcommittee on Oversight of Government Management and DC (Senate)—Testimony Supplied for the Record	Administrative Dispute Resolution Act, S. 1224
12/14/95	Committee on Energy and Natural Resources (Senate)—Testimony Supplied for the Record	Nuclear Waste Policy Act of 1995, S. 1271
03/27/96	Committee on Appropriations Subcommittee on Energy and Water Development (House)	NRC's FY 97 Appropriation
07/24/96	Committee on Environment and Public Works (Senate)	Nomination of Dr. Nils J. Diaz
07/24/96	Committee on Environment and Public Works (Senate)	Nomination of Mr. Edward J. McGaffigan
09/05/96	Committee on Commerce Subcommittee on Energy and Power (House)	Oversight of the NRC

IMPROVING COOPERATION WITH STATES

Continuing the NRC's efforts to ensure early and substantial involvement of Agreement States in NRC rulemaking and other regulatory issues, the staff participated in a number of public meetings and workshops with States during the year. NRC's rulemaking process was revised to provide Agreement States an opportunity to comment on draft rulemaking plans. The use of electronic communication, via e-mail and bulletin boards, has greatly facilitated the transfer of information, including announcements of meetings and workshops of a regulatory nature; this resource has greatly facilitated the expanded involvement of States in these procedures. Joint NRC-Agreement State Working Groups have been established to evaluate improvements in the regulation of radioactive material and to develop implementing procedures for the Policy Statement on Adequacy and Compatibility of Agreement State Programs.

REVIEW OF STATE REGULATORY PROGRAMS

The Atomic Energy Act of 1954, as amended, requires NRC to periodically review Agreement State radiation control programs. The NRC, during Fiscal Year 1996, conducted two kinds of reviews: IMPEP reviews and follow-up reviews. IMPEP, which is the Integrated Materials Performance Evaluation Program, is used in the evaluation of NRC Regional Office and Agreement State materials licensing and inspection programs in an integrated manner. Beginning October 1, 1995, NRC implemented IMPEP, on an interim basis, in the evaluation of Agreement State Programs, until such time as final implementing procedures for the policy statements, "Statement of Principles and Policy for the Agreement State Program" and "Policy Statement on the Adequacy and Compatibility of Agreement State Programs," and any revisions to these policy statements are approved by the Commission.

IMPEP uses five common performance indicators: status of materials inspection program; technical staffing and training; the technical quality of licensing; the technical quality of inspection; and response to incidents and allegations. Program

areas unique to NRC Regions and Agreement States are reviewed as non-common indicators. These reviews were conducted using interdisciplinary teams with members drawn from the Offices of Nuclear Material Safety and Safeguards (NMSS) and OSP, the NRC Regions, and the Agreement States. This arrangement, along with involvement by the Regions and the Agreement States in Management Review Boards (MRBs), proved to be effective both in terms of evaluating the adequacy and compatibility of the materials programs and improving technical and programmatic exchange of information between NRC and the Agreement States. Followup or special reviews are conducted as needed, and they tend to focus on State actions in specific areas.

In FY 1996, NRC performed seven IMPEP reviews of Agreement States and two follow-up reviews. In five of the Agreement State IMPEP reviews, the programs were found adequate and compatible. The reviews for two States conducted late in the fiscal year are not yet complete.

Conforming revisions to IMPEP in connection with the completion of work on two policy statements will be done as appropriate. IMPEP will then be implemented as a final program.

POLICY STATEMENTS AND AGREEMENT STATE PROGRAM POLICY DECISIONS

In 1995, the Commission approved, in principle, two policy statements: "Statement of Principles and Policy for the Agreement State Program" and "Policy Statement on Adequacy and Compatibility of Agreement State Programs." Because of the need to have Agreement State perspectives, and the extent of work required in development of implementing procedures for the "Policy Statement on Adequacy and Compatibility of Agreement State Programs," NRC staff convened a working group of NRC and Agreement State staff to develop implementing procedures for this particular policy statement. Subsequently, the implementing procedures for the two policy statements were submitted to the Commission in October 1996.

The first policy statement, "Statement of Principles and Policy for Agreement State Programs," describes the respective roles and responsibilities of the NRC and the States in the administration of programs carried out under

Section 274 of the Atomic Energy Act of 1954, as amended. The document provides broad guidance in delineating the NRC's and the States' respective responsibilities and expectations in the administration of a regulatory program for the protection of public health and safety in the industrial, medical, and research uses of nuclear materials.

The second, "Policy Statement on Adequacy and Compatibility of Agreement State Programs," establishes a basis for NRC determinations that an Agreement State Program is adequate to protect public health and safety and compatible with NRC's regulatory program. It strikes a balance between the extent of uniformity required in a State program and the extent of flexibility allowed to a State in tailoring its program to the individual circumstances within that particular State. The underlying philosophy of this approach is that the State program must be adequate to protect public health and safety within the State and must be compatible, in that it incorporates those elements of the NRC program necessary to achieve the national interest in radiation protection. The elements of an adequate program have been developed to reflect those that are essential to ensuring protection of the public health and safety.

NRC TECHNICAL ASSISTANCE TO STATES

The NRC continues to provide technical assistance to Agreement States in the areas of licensing, inspection, enforcement, and in response to incidents. Technical assistance is provided by responding to requests for information, performing limited confirmatory license application reviews, and dealing with specific or unusual radiation applications requiring specialized expertise and knowledge. This fiscal year, the NRC provided technical assistance to the States dealing with medical regulation issues, industrial licensing issues, and worker exposure analysis, sealed source and device evaluations, uranium milling, retention of terminated license files, regulation changes, and jurisdictional determinations.

TRAINING OFFERED STATE PERSONNEL BY THE NRC

The NRC sponsors training courses and workshops for Agreement State and NRC staff to assist State radiation control personnel in their goal of maintaining high quality regulatory programs. Course subjects are diverse, covering health physics, industrial radiography safety, well-logging, radiation protection engineering, environmental monitoring, irradiator technology, transportation of radioactive nuclear materials and low-level radioactive waste, site decommissioning characterization, nuclear medicine, inspection procedures, and materials licensing. In addition, special workshops on specific areas are held, as needed. In March 1996, a combined NRC and Agreement State technical workshop was held in Vancouver, Washington. The use of breakout sessions facilitated discussions on the National Academy of Sciences' Institute of Medicine report, industrial radiography certification, and the accountability of radioactive devices. The NRC-Agreement State Adequacy and Compatibility Working Group also provided a status report at the plenary session of the technical workshop. The NRC sponsored 32 such training courses and workshops attended by 600 State radiation control personnel during the fiscal year. The sessions were also attended by NRC staff and by military personnel, in addition to officials from Canada and Mexico.

A workshop on the evaluation of sealed sources and devices was also held. The workshop was designed to familiarize State licensing personnel with the latest evaluation practices and guidance used by NRC staff.

ANNUAL AGREEMENT STATES MEETING

The 1996 annual meeting of Agreement State radiation control program directors was held September 17 through 19, 1996, at NRC headquarters in Rockville, Maryland. Panel discussions were held and individual presentations addressed the status of the following:

- adequacy and compatibility policy working group report;
- selected rulemaking actions;
- lessons learned from operational events;

- medical issues;
- the working group on training;
- IMPEP;
- control and accountability of license devices working group report;
- low-level radioactive waste issues; and
- contaminated sites and decommissioning.

OPERATIONAL EVENTS IN AGREEMENT STATES

Information on events that have occurred in Agreement States involving the use of radioactive byproduct material is routinely exchanged with the NRC. Safety-significant Agreement State and NRC operational events are discussed at periodic NRC staff meetings, with an emphasis on identifying the cause of each event. During the past year, Agreement State personnel investigated material events involving overexposures, unplanned contamination, leaking sources, industrial radiography, well logging, lost or stolen equipment and equipment failure, as well as incidents involving the administration of radioactive byproduct material to individuals for medical diagnosis and therapy. When these studies lead to effective generic remedies that reduce the likelihood of event recurrence, the information is disseminated to the appropriate regulatory agencies and users.

State, Local, and Indian Relations Program

One of NRC's priorities is to maintain open lines of communication and close liaison with State and local government officials and their organizational representatives, as well as with Native Americans and organizations representing American Indian Tribes. These relationships are developed in an effort to fully address concerns and to promote increased understanding of issues related to NRC regulation, inspection, and oversight activities to protect the public health and safety.

OUTREACH ACTIVITIES

The NRC continued to pursue cooperative activities with the States and their national organizations in 1996. In addition to routine interaction with State and local government and Indian Tribe officials, NRC representatives participated in a number of special State-related events, including the activities of the National Association of Regulatory Utility Commissioners, as they relate to nuclear issues and spent fuel disposal and storage. NRC staff met with State and local officials throughout the year to discuss the results of SALP reviews of nuclear power plants and outreach activities related to emergency response planning. The NRC also maintained cognizance of the activities of other State-related organizations, such as the National Governors' Association, the Western Governors' Association, and the National Conference of State Legislatures.

COOPERATION WITH STATES

The NRC staff continues to implement a policy allowing State officials' to observe or participate in NRC inspections at reactors, pursuant to the policy statement on "Cooperation With States at Nuclear Power Plants and Other Nuclear Production or Utilization Facilities" (57 FR 6462). In some cases, States may observe special inspections, as well. During the year, the NRC staff engaged in negotiations about a memorandum of understanding with officials from the State of New Jersey to conduct low-level radioactive waste storage inspections and responded to other State inquiries concerning implementation of the policy.

STATE LIAISON OFFICER PROGRAM

The NRC policy statement on Cooperation With States identifies the governor-appointed State Liaison Officer (SLO) as the primary State contact for all requests involving observation of NRC inspections of plants or facilities. The SLOs are also the NRC's primary point of contact with the States regarding all relevant NRC decisions and actions. The NRC hosts a National SLO meeting every three years and hosts Regional meetings on an as-needed basis in the off years.

THE CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS, INC.

The NRC, through the Office of State Programs, continues to be a Federal liaison to the Board of Directors of the Conference of Radiation Control Program Directors, Inc. (CRCPD) to help ensure that State and Commission programs for protection against the hazards of radiation are coordinated. The CRCPD was formed in 1968 to provide a forum where Federal, State, and local radiation control program officials could address governmental radiation protection issues, mainly through committees and task forces. At any given time, 50 or more groups may be working on specific projects. An example is the group working on Suggested State Regulations, seeking to promote consistency in radiation protection programs throughout the United States. NRC is participating in a parallel process for rulemaking with CRCPD that was initiated in May 1995. As many as 11 NRC resource persons are represented on approximately 24 committees and task forces that meet throughout the year. The NRC contributed \$110,000 in FY 1996 to the CRCPD.

LOW-LEVEL RADIOACTIVE WASTE

The NRC continued its support of disposal facility licensing activities in host Agreement States. For example, NRC staff commented on an oral presentation by Nebraska regulatory staff and consultants of Nebraska's low-level radioactive waste (LLW) performance assessment in May 1996. In related areas, technical information was disseminated to the States, including "Instructions for Completing NRC's LLW Manifest" (NUREG/BR-0204) and "Implementation of NRC's LLW Manifest Information and Tracking System." The NRC also reviewed State comments on the Commission paper, "Alternatives to Terminating the NRC LLW Program."

LIAISON WITH AMERICAN INDIAN TRIBES

The NRC continues to maintain communications with those American Indian Tribes, and with their national organizations, potentially affected by, or otherwise interested in, NRC regulatory activities. Tribal interest in nuclear-related activities, including those of the Navajo and Mescalero

Apache in New Mexico and the Prairie Island Dakota Indian Community in Minnesota, has provided for a number of government-to-government exchanges of information related to NRC's regulatory authority in the areas of high- and low-level radioactive waste storage, disposal, transportation, and reclamation. Tribal interests are also represented by the National Congress of American Indians' membership on the NRC's Licensing Support System Advisory Review Panel.

The NRC staff maintains liaison with the Department of the Interior/Bureau of Indian Affairs in an effort to keep their constituency abreast of nuclear-related issues affecting Indian interests. The staff participates in interagency meetings, sponsored by the Environmental Protection Agency, to exchange information of potential relevance and importance to Federal and Tribal activities.

Federal Liaison

The NRC's Federal Liaison program is responsible for establishing and maintaining effective communications at the policy level between NRC and other pertinent Federal agencies. Principal liaison tasks include keeping appropriate NRC officials apprised of activities at other Federal agencies that may affect the NRC and conveying to NRC management the salient views of other agencies regarding NRC policies, plans and activities.

The Federal Liaison serves as the point of contact regarding NRC activities for complying with the President's February 11, 1994, Executive Order No. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The NRC's internal Environmental Justice Group (EJG) is headed by the Deputy Executive Director for Regulatory Programs, and the Federal Liaison serves as the EJG executive officer. The EJG, which is responsible for the development of the NRC work products, as well as for the formulation of the NRC's environmental justice strategy, submitted the NRC's Final Environmental Justice Implementation Report on February 12, 1996. As called for in the Executive Order, the Federal

Liaison serves as NRC's Environmental Justice Coordinator and continues to represent the NRC in the interagency Environmental Justice Policy and Coordination Subcommittee.

The Federal Liaison is the NRC's contact with the Council on Environmental Quality (CEQ), as prescribed by the National Environmental Policy Act (NEPA). In this capacity, the Federal Liaison communicates NRC analysis and comment on matters related to NEPA procedures and implementation to the CEQ and provides coordination with the NRC on those matters. In 1996, the Federal Liaison coordinated NRC comments on the proposed CEQ guidance related to the NEPA process as it relates to environmental justice. A final CEQ report is expected in early 1997.

As the NRC's Federal Preservation Officer under the National Historic Preservation Act of 1992, as amended, the Federal Liaison maintains

communication with officials at the National Park Service and the Historic Preservation Advisory Council. In 1996, the Federal Liaison coordinated the NRC input to the Secretary of the Interior's Annual Report to Congress on Federal Archeological Activities. In addition, the Federal Liaison participated in discussions on the proposed streamlined revisions to the Section 106 process of the Nuclear Historic Preservation Act.

The Federal Liaison also serves as the NRC's point of contact with the National Science and Technology Center (NSTC), formerly the Federal Coordinating Council for Science, Engineering and Technology. The NSTC considers issues and developments in science and technology that affect multiple Federal agencies. The NSTC also provides a forum for coordinating those agencies' programs, sharing information, resolving conflicts, making policy recommendations, and identifying research needs.

THE AGREEMENT STATES

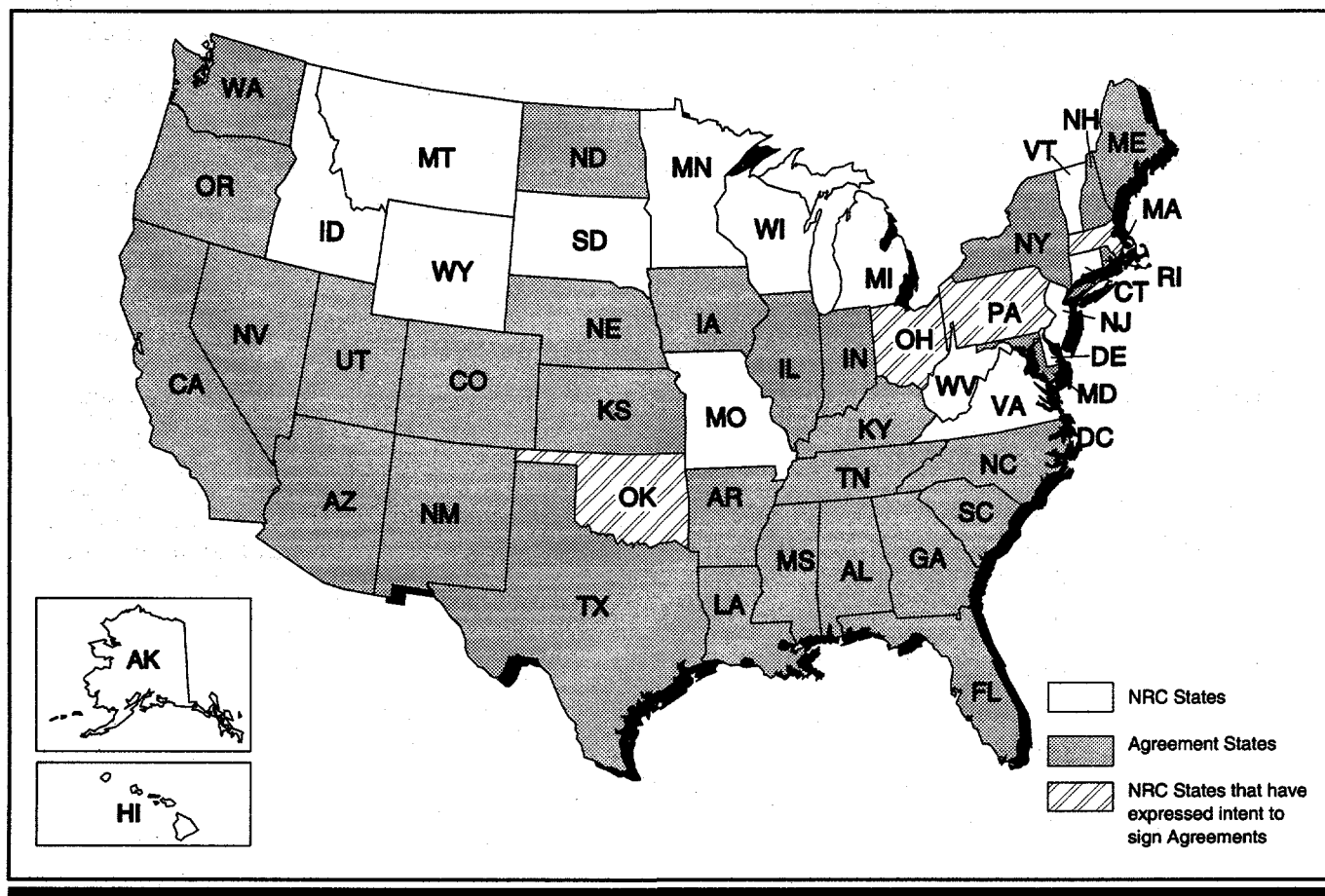
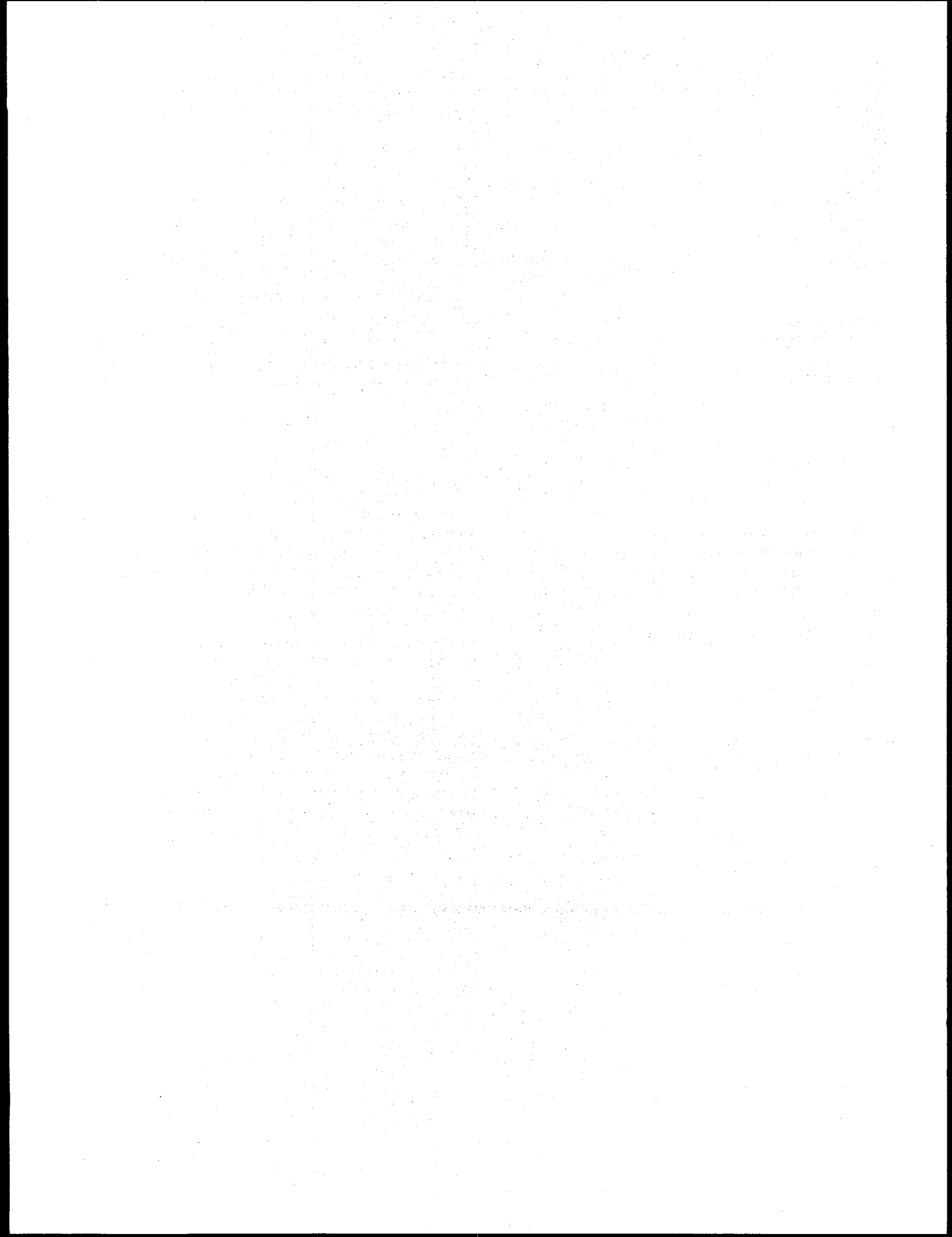


Figure 8.6 Agreement State Map



Chapter 9

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International Cooperation

Since 1974, the Nuclear Regulatory Commission (NRC) has developed and maintained a wide-ranging program of international cooperation to help ensure the peaceful, safe, and environmentally acceptable uses of nuclear energy. As the regulator of the world's largest civil nuclear program, the NRC has broad capabilities to contribute to international programs. These capabilities span such areas as nuclear power plant (NPP) safety, radiation protection, nuclear materials safeguarding and physical protection, waste management, and decommissioning of nuclear facilities. At the same time, the NRC and the regulated nuclear industry in the United States gain insights and useful technical information through these NRC international activities.

The NRC's international program is coordinated by the Office of International Programs (OIP), in conjunction with appropriate technical program offices. The program has three broad objectives:

1. Improving the safety of NRC-licensed facilities in the United States;
2. Helping to enhance U.S. national security; and
3. Supporting U.S. foreign policy objectives.

FISCAL YEAR 1996 ACTIVITIES

During Fiscal Year (FY) 1996, NRC's international program included the following noteworthy activities:

- Supporting meetings of the U.S.-Russia Joint Commission on Technological Cooperation in Energy and Space, chaired by Vice President Gore and Russian Prime Minister Chernomyrdin. NRC activities with Russia regarding nuclear safety and security issues continued to constitute an important element of this bilateral initiative.
- Participating actively in the policy and implementation aspects of nuclear safety initiatives under the Group of Seven (G-7) industrialized nations, the Group of 24 (G-24) Nuclear Safety Coordination mechanism, and the Nuclear Safety Account (NSA) administered by the European Bank for Reconstruction and Development (EBRD). These institutions have focused on coordinating international efforts to enhance nuclear safety in countries using Soviet-designed nuclear power reactors.
- Participating in the Sustainable Energy Committee of the Vice President Gore-Deputy President Mbeki Binational Commission, which focuses on achieving high-level dialogue on nuclear safety topics such as strengthening nuclear safety regulation and South African participation in international nuclear safety research, as well as implementing NRC's agency-to-agency nuclear safety

exchange arrangement with South Africa's regulatory organization.

- Continuing important nuclear safety cooperation with the New Independent States (NIS) of the former Soviet Union (FSU) and countries of Central and Eastern Europe (CEE). These activities included strengthening their regulatory organizations, training foreign inspectors, and working together in the areas of operational safety and risk reduction. NRC's regulatory assistance program to Armenia's Nuclear Regulatory Authority is a new part of this effort.
- Continuing NRC's efforts to help the FSU regulatory organizations—particularly in Russia, Ukraine, and Kazakhstan—to improve their regulatory programs and systems for protecting, controlling, and accounting for nuclear materials within the framework of agreements signed by the United States with these countries in the fall of 1993.
- Continuing efforts to work (in conjunction with other U.S. Government and related entities) with Russia, Ukraine, and Belarus to study the health effects of exposure to ionizing radiation resulting from the Chernobyl accident and from Russian defense-related activities.
- Enhancing regulatory cooperation with several Pacific Rim countries conducting, or considering, new or expanded nuclear power programs (specifically Indonesia, China, the Republic of Korea (ROK), and Taiwan).
- Maintaining active information exchanges with countries that have substantial nuclear programs and with multilateral organizations promoting international nuclear safety, as well as continuing activities in support of significant international initiatives in the interest of nuclear safety.
- Playing a leading role in resolving implementation issues for the international Convention on Nuclear Safety, which became effective in October 1996. Once the United States becomes a party, implementation of U.S. obligations will be carried out primarily by the NRC.
- Participating in efforts to develop a separate Convention on the Safety of Radioactive

Waste Management now being actively considered internationally.

- Continuing active, cooperative nuclear safety research with other nations having major nuclear power programs, including France, Germany, Japan, and the United Kingdom.

The following sections describe these highlights of the NRC's major international involvement in nuclear safety, along with other noteworthy activities during the reporting period.

BILATERAL SAFETY INFORMATION EXCHANGE

The NRC participates in a wide range of mutually beneficial programs involving information exchange and cooperative safety research with counterparts in the international community. This section discusses the NRC's arrangements for the exchange of information related to nuclear regulatory and licensing responsibilities.

Safety Cooperation Arrangements

Since 1974, most of NRC's safety cooperation has taken place under the aegis of formal bilateral information exchange and cooperation arrangements concluded for five-year periods. Originally intended to incorporate all countries operating NPPs of U.S. design, the arrangement program was first expanded to include those with such plants under construction and then broadened to encompass countries with plans for nuclear power development, including those based on technology that was not originated in the United States.

NRC currently implements cooperation with the regulatory authorities of the following 33 countries or areas (most of this cooperation is conducted pursuant to standard interagency arrangements; however, in certain circumstances—for example, with Russia and Ukraine—*ad hoc* arrangements are used pending more formal instruments): Argentina, Belgium, Brazil, Canada,

China, the Czech Republic, Egypt, Finland, France, Germany, Greece, Hungary, Indonesia, Israel, Italy, Japan, Kazakstan, the Republic of Korea, Lithuania, Mexico, The Netherlands, Peru, The Philippines, the Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, the United Kingdom, and Taiwan.

These arrangements authorize several kinds of activities. They provide communications channels that ensure the prompt reciprocal notification of power reactor safety problems that could affect both U.S. and foreign plants. They encourage the identification of possible precursor events warranting further investigation. They represent the building blocks for bilateral cooperation in nuclear safety, physical security, materials control and accounting (MC&A), waste management, environmental protection, and in other areas to which the parties agree. Finally, they establish the means through which NRC provides health and safety information and assistance to other countries attempting to develop or improve their regulatory organizations and their overall nuclear safety cultures.

During FY 1996, NRC renewed five information exchange and cooperation arrangements with Argentina, Canada, Germany, Hungary, and the United Kingdom. Three (Canada, Germany, and the United Kingdom) had been delayed for from two to five years over the incorporation of intellectual property rights (IPR) provisions. The U.S. Government's successful conclusion of country-specific IPR Annexes with the three countries cleared the way for NRC to renegotiate its agency-to-agency arrangements. However, IPR issues continued to delay the formal renewals of NRC's arrangements with France and Japan.

Foreign Assignees Working at the NRC

The NRC has an extensive on-the-job training program for assignees from other countries (usually from their regulatory organizations) operating under the aegis of the bilateral information exchange arrangements. During FY 1996, the Czech Republic, China, France, Indonesia, Italy, Japan, the Republic of Korea, the Slovak

Republic, Spain, and Turkey sent 20 people to participate in the program. Their assignments generally ranged from a few months to a year or more, during which assignees worked in many areas, including—

- U.S. probabilistic risk assessment (PRA) techniques for analyzing operational safety data and implications;
- U.S. technical tools for determining severe accident classification, core and containment conditions, consequences of radioactive releases, and appropriate protective actions;
- design certification reviews of advanced reactors and licensing procedures;
- emergency preparedness;
- storage and transport of spent fuel and licensing activities;
- scope and purpose of the medical use program, including nuclear material safety and safeguards and the NRC's organization, function, statutory authority, and responsibility;
- review of digital systems for operating nuclear plants and advanced light-water reactors; and
- experience with RELAP computer code that helped with licensing issues related to passive design features of the Westinghouse AP600 reactor design.

During their time at the NRC, foreign assignees often make significant contributions to the resolution of U.S. regulatory issues. At the same time, they learn the NRC's approach to nuclear safety, which helps them and their organizations understand Western safety practices. Assignees often become senior officials in their regulatory organizations during their careers.

The New Independent States of the Former Soviet Union

In FY 1996, the NRC continued to play an important role in U.S. assistance to the FSU in developing and improving their regulatory systems.

THE GORE-CHERNOMYRDIN COMMISSION

NRC continued to participate in nuclear safety and security activities under the U.S./Russian Joint Commission on Economic and Technological Cooperation, which is chaired by Vice President Gore and Russian Prime Minister Chernomyrdin and is known as the Gore-Chernomyrdin Commission (GCC). The GCC has met every six months since September 1993, alternating between the United States and Russia. Chairman Shirley Ann Jackson represents NRC in the GCC process. During FY 1996, the NRC actively participated in the sixth and seventh meetings of the GCC and their preparation. The meetings were held January 29 and 30, 1996, in Washington and July 15 and 16, 1996, in Moscow.

At both GCC-VI and -VII the United States and Russia reaffirmed their view that safe nuclear power is a key component of global nuclear safety and security. They stressed the importance of a strong, independent nuclear regulatory authority as a means to promote and maintain nuclear safety, including vesting the Russian regulator with appropriate resources to carry out its functions as defined by the new Russian nuclear law and previous State decrees. NRC-GAN (Gosatomnadzor) accomplishments acknowledged at GCC-VI included completion of a regulatory training center and development of regulatory standards.

Of particular nuclear safety and nonproliferation significance was the continuing bilateral effort to convert Russia's three operating plutonium production reactors at Tomsk (Seversk) and Krasnoyarsk (Zheleznogorsk) to electricity and heat uses in the district, using a design that would produce an insignificant amount of weapons-grade plutonium in the spent fuel. At GCC-VI, participants concluded that core conversion was technically feasible. In keeping with its concerns that safety remain at the heart of the project, NRC requested that the United States seek a commitment from Russia for an objective and rigorous safety assessment of the design's fundamental safety features. During this two-year project, the NRC will consult with its counterpart regulatory authority, Gosatomnadzor (the Russian Federal Nuclear and Radiation Safety Authority or GAN), to assist GAN in their regulatory review and approval process in such areas as the verification of design and accident analysis codes, quality

assurance (QA), design requirements for criticality control systems, and PRA.

Also at GCC-VI, note was taken of NRC-GAN work in the area of conducting reviews of regulatory documents developed by GAN to create an effective Russian national system of nuclear material control. Finally, NRC Chairman Jackson and GAN Chairman Yuri Vishnevsky signed a statement reaffirming the NRC-GAN joint program of work to be conducted over the next 12 to 18 months.

Chairman Jackson represented NRC in Moscow at GCC VII, held immediately following the Russian Presidential elections. The theme of the meeting highlighted successes achieved over the last four years of Commission activity. In the nuclear area, the highlights included plans for conversion of Russian plutonium production reactor cores; Russian commitment to perform full safety assessments at two more (unspecified) NPPs; and Russian agreement to provide design information on Soviet-era reactors to third countries. Consistent with NRC's commitments to assist GAN, NRC agreed to participate in the ongoing U.S.-Russia meetings to define work programs for all U.S. and Russian organizations, thereby avoiding duplication and ensuring regulatory consistency. NRC's longstanding and successful program with GAN in the area of materials protection, control and accounting (MPC&A) was noted, as well as NRC's request for detailed information on GAN's plans in regulation and guidance development, licensing and inspections, and MPC&A.

In addition, the United States and Russia agreed to extend the Memorandum of Cooperation on civilian nuclear reactor safety for the full term of five years. The two countries also agreed to extend the umbrella agreement on peaceful uses of atomic energy for 18 months, the length of time deemed necessary for renegotiation.

Finally, in conjunction with the need for Russia to comply with commitments of loan conditions under its project agreement with the EBRD/NSA, as well as to enhance their stature as a credible nuclear power vendor, Chairman Jackson stressed the need for full safety assessments at Russian plants. NRC is working with the Department of Energy (DOE), the Ministry for Atomic Energy of the Russian Federation (MINATOM), and GAN to identify the two additional plants that MINATOM and GAN agreed would have DOE-funded

plant-specific safety assessments, in addition to those being done at Leningrad, Kola, and Novovoronezh.

The NRC also has been participating in preparations for GCC-VIII, which will convene in Washington in February 1997.

GROUP OF SEVEN NUCLEAR SAFETY ACTIVITIES

The three nuclear safety institutions that emerged from the annual Group of Seven economic summits are the G-7 Nuclear Safety Working Group (NSWG), the G-24 Nuclear Safety Coordination group, and the NSA, administered by the EBRD. During FY 1996, NRC participated in all three.

G-7 Nuclear Safety Working Group. The NSWG provides the mechanism for policy development of nuclear issues for the annual G-7 heads of government summits. In FY 1996 the NSWG negotiated a Memorandum of Understanding with Ukraine, which provides for closure in the year 2000 of the four-unit Chornobyl NPP, conditioned on Western financial support for alternative energy sources and resolution of social problems and decommissioning issues. The NSWG's policy coordination function for nuclear safety assistance also continued to be an essential concomitant to the technical coordination function administered by the G-24 and the financing function implemented through the EBRD/NSA. NRC representatives on the U.S. delegation provided important advice in framing U.S. nuclear safety proposals and evaluating those of other governments, especially those touching upon regulatory assistance.

European Bank for Reconstruction and Development/Nuclear Safety Account. The NSA was established as a supplementary multilateral mechanism to address immediate operational safety and technical safety improvement measures at the least-safe Soviet-design reactors (namely VVER 440/230 and RBMK types) not covered by bilateral programs. The NSA is administered by a steering body of donors and is coordinated with and assisted by the G-24 and managed by the EBRD. Created for an initial period of three years (1993-1996), in FY 1996, NSA was extended for another three years, with total NSA contributions

in December 1995 of \$302.5 million. Ongoing NSA projects include—

- **Bulgaria:** \$30 million for safety upgrades and improvements at Kozloduy Units 1-4
- **Lithuania:** \$41.25 million for safety upgrades and improvements at the Ignalina RBMK plant, and \$9.14 million to conduct a safety assessment of Ignalina
- **Russia:** \$37.98 million for safety upgrades and improvements at Kola NPP; \$29.11 million for safety upgrades and improvements at Novovoronezh NPP; and \$1.13 million to support licensing of the safety upgrades and improvements by the Russian regulatory authority GAN
- **Ukraine:** Negotiation of a grant agreement for provision of approximately \$125 million in assistance to support the Chornobyl plant closure initiative.

Each of these projects has conditioned financing on commitments to close the least-safe plants, when certain circumstances are met, such as the availability of replacement power or determinations to be made by regulatory authorities. However, enforcing these conditions has been more difficult than expected. Key to most of these projects is the strengthening of the national nuclear regulators and other technical assistance in which NRC participates through this and other bilateral and multilateral projects.

G-24 Nuclear Safety Assistance Coordination Activities. NRC continued its active participation in the G-24 Nuclear Safety Assistance Coordination (NUSAC) process. Since 1992, the G-24 NUSAC has coordinated safety assistance programs worldwide for the countries of the FSU and CEE. In February and July 1996, NRC representatives attended G-24 NUSAC Steering and Plenary Committee meetings held in Brussels, Belgium. The Director of NRC's OIP chaired the G-24 Steering Committee during Calendar Years 1995 and 1996.

MOSCOW NUCLEAR SAFETY AND SECURITY SUMMIT

NRC actively participated in preparations for the U.S. delegation's activities at the Moscow Nuclear

Safety and Security Summit held April 19 and 20, 1996. The Summit was proposed by Russian President Yeltsin to coincide with the tenth anniversary of the accident at Chernobyl. Topics discussed by the heads of state included nuclear safety, nuclear liability, energy sector strategies, nuclear waste (including the international convention prohibiting ocean dumping), and nuclear material safety and security.

RUSSIA AND UKRAINE

The nuclear safety assistance program with Russia and Ukraine began in 1992 in response to the emergence of Russia and Ukraine as independent nations. The program is funded through an Interagency Agreement with USAID. NRC has assisted the nuclear safety regulatory bodies in these countries in developing and using regulatory tools. Since this program began, NRC senior managers have met annually with the head of the respective nuclear regulatory authorities to discuss the past year's progress and the next year's plans: GAN in December 1995 and the Ukrainian Nuclear Regulatory Administration (NRA) in early 1996.

In FY 1996, the regulatory infrastructures in both countries showed positive development as documentation for the infrastructures and their use were developed. The use of electronic mail has increased the speed and breadth of the transfer of knowledge.

A substantial portion of the assistance NRC provides is in training. NRC sponsored almost 40 training trips to the United States from Russia and Ukraine in 1996, involving about 120 people. NRC staff and its contractors took 50 training-related trips to these countries.

Meetings between the Commission and the Russian and Ukrainian policymakers occurred throughout the year to provide a link between technical matters at the agency level and foreign policy considerations at the national and international levels. In FY 1996, for example—

- Yuri Kostenko, Ukrainian Minister of Environmental Protection and Nuclear Safety led the delegation for the annual NRC-NRA meeting. NRC arranged for minister Kostenko to meet with top officials of other U.S.

Government agencies to discuss energy matters in Ukraine, in particular, the closure of the Chernobyl NPP.

- Mykhaylo Pavlovsky, Chairman of the Committee on Nuclear Policy and Safety of the Supreme Council of Ukraine and other Ukraine Rada (Parliament) Committee members, met with NRC. This visit to the United States, sponsored by the U.S. Information Agency, was suggested by Chairman Jackson during her September 1995 visit to Ukraine. Chairman Pavlovsky wanted to observe how nuclear power and related issues are handled by the executive and legislative branches of the U.S. Government.

Joint Coordination Committee on Civilian Nuclear Reactor Safety. The Joint Coordination Committee on Civilian Nuclear Reactor Safety was established in 1988 to provide a framework for conducting U.S.-Russian cooperative activities in nuclear safety research. Much of that work was replaced by the nuclear safety assistance program when the Soviet Union dissolved in late 1991. However, cooperation in several of the areas has continued. An area of interest to NRC is severe accident research. The joint effort has grown to include severe accident codes, hydrogen combustion experiments, and reactor vessel and reactor containment performance. The work on fuel behavior in reactor vessels (RASPLAV) has grown into a substantial program, supported by the international community. In FY 1996, the Russian team completed the first full-scale test of the behavior of melted fuel, the first such test ever performed. This work has been of very high quality and performed at a fraction of the cost that would have been incurred in the United States. It has also helped the Russian nuclear power community to become familiar with NRC methods.

Joint Coordinating Committee for Radiation Effects Research. NRC also continued its active participation in the Joint Coordinating Committee for Radiation Effects Research (JCCRER). This committee supports and facilitates joint cooperative research and exchange of information between the United States and the Russian Federation on the health and environmental effects of radiation. Commissioner Greta J. Dicus represents NRC on the JCCRER.

Cooperation with Ukraine. NRC continued its active involvement with the United States, G-7, and Ukrainian efforts to permanently close the reactors at Chernobyl. In support of this effort, NRC's work under the Ukrainian Nuclear Safety Assistance Program has supported NRA of the Ukrainian Ministry of Environmental Protection and Nuclear Safety in areas related to decommissioning of NPPs, radioactive waste management, and licensing of new NPPs.

ARMENIA

The NRC was active in U.S. and G-7 efforts to assess and respond to the Armenian nuclear authorities' November 1995 restart of Unit 2 of the Armenian NPP. This multilateral effort culminated in the United States and its G-7 partners extending offers of safety assistance to Armenia. The NRC gained important insights about safety from its ongoing activities with the Armenian regulators.

NRC also continued its bilateral efforts to strengthen the Armenian Nuclear Regulatory Authority (formerly called the Armenian State Atomic Supervision Authority), by providing training related to seismic issues associated with NPPs, site security radiation embrittlement of metals, and fire protection. NRC officials visited the Armenian NPP in March 1996, the first official U.S. Government delegation to visit the facility since its restart.

KAZAKSTAN

NRC continued its regulatory safety strengthening efforts for the Kazak Atomic Energy Agency (KAEA), which also complements ongoing NRC/KAEA regulatory safeguards activities. As part of these activities, NRC provided training on techniques and procedures for inspection of operating power and research reactors.

Central and Eastern Europe

Since 1992, the NRC has been conducting a comprehensive regulatory assistance program aimed at transferring to local regulators Western safety principles and NRC safety review and

licensing methodology. The pace has increased and the scope expanded to include a broad range of safety-related activities. These and other Western assistance activities have contributed significantly to enhance the capabilities of local regulatory authorities. For instance, as a result of extensive training delivered to the Czech State Office of Nuclear Safety (SONS), the Czech regulatory authority, in connection with the Temelin project, SONS staff are now well qualified to help other countries on issues related to the evaluation of fuel, design basis accidents, and instrumentation and control. In another instance, NRC was able to call upon the Slovak regulators who "graduated" from an NRC inspection training course to help familiarize Lithuanian regulatory inspectors with NRC's inspection methodology. The combined effort of Western countries has brought about a noticeable increase in safety culture and awareness in the CEE countries, to the point that many of them are now capable of nuclear safety assistance to other CEE countries.

NRC continued its regulatory assistance program to the CEE countries through 1996, drawing on funds provided by USAID. A large component of the assistance has been training courses, some of which have been conducted at NRC, and some at the Trnava Training Center in Slovakia. Subject areas addressed have included PRA, Inspecting for Performance (which outlined the concepts of performance-oriented inspection tools and how to apply them effectively), and Training the Trainer—explaining NRC's approach to developing training curricula for NRC staff. NRC also arranged numerous visits to U.S. plants for CEE personnel.

During FY 1996, NRC continued its support to the Association of State Nuclear Safety Authorities of the Countries Operating VVER Type Reactors. An NRC representative participated in the third association meeting, held in Prague in June 1996. NRC renewed its pledge to fund training for the association's working group on licensing procedures for dry spent fuel storage casks, scheduled for March 1997.

The NRC also continued its close cooperation with the International Atomic Energy Agency (IAEA) on a range of CEE activities. In one instance, two OIP staff members joined IAEA and CEE representatives in Prague (Czech Republic) in an IAEA-initiated Technical Cooperation Program review meeting to help review ongoing

assistance activities and help define future activities.

CZECH REPUBLIC

During the fiscal year, NRC continued its work of transferring NRC licensing review methodology to SONS. The objective of this multiyear program is to transfer to SONS the know-how to evaluate the safety of upgrades to the Temelin NPP in accordance with NRC methodology.

At the request of the SONS Chairman, two additional regulatory inspectors were offered extended inspection training in Region I. The visitors were briefed on NRC's resident inspector program, accompanied and observed NRC inspectors performing their regular inspections, and participated in a U.S. power plant site visit where they observed the replacement of a steam generator. Several Czech regulators also attended a software quality workshop in the United States.

SLOVAK REPUBLIC

The Vice Chairman of the Slovak Nuclear Regulatory Authority (SNRA) requested training for an inspector in licensing activities in the field of radiation sources. In response, the NRC arranged a two-week training program: one week at Headquarters and one week at Region I. The inspector participated in discussions on licenses, radiation safety requirements for irradiators, QA for the manufacture and distribution of radioactive sealed sources, and registry of radioactive sealed sources. A specialist from Slovakia, funded by an IAEA fellowship, spent the summer at the NRC working in the area of QA. The NRC arranged for his participation in a meeting dealing with QA activities and helped arrange a site visit to the Calvert Cliffs NPP. During November of this year, OIP responded to an offer by Dr. Jozef Misak, Chairman of SNRA, to brief interested U.S. Government officials from DOE and the Department of State (DOS) and the NRC on reactor pressure vessel (RPV) integrity and confinement upgrades to Bohunice NPP, Units 1 and 2, which are VVER 440/230 reactor models.

LITHUANIA

As the result of a two-week mission to survey Lithuanian regulatory assistance needs, it was recommended that the NRC help the Lithuanian regulatory agency VATESI:

1. Prepare and update a set of Lithuania-specific Norms and Standards on operational safety of NPPs.
2. Assist VATESI in preparing Ignalina-specific inspection guidelines and project milestones.
3. Assist VATESI in developing a formal regulatory philosophy policy statement.

The NRC, assisted by Sciencetech Corporation and other subcontractors, completed the first two tasks in late fall 1996. In addition to the third item, the next assistance phase will cover assistance with licensing review tasks and is scheduled to start after issuance of the EBRD/NSA-sponsored safety analysis report in early 1997.

At the request of the Lithuanian Energy Institute, the NRC conducted a four-day training session to assist the institute's Chief of Research in preparing regulations on the legal aspects of nuclear waste, spent nuclear fuel handling, and liability issues regarding the Ignalina NPP.

HUNGARY

The text of the renewal of the arrangement between the Hungarian Atomic Energy Commission (HAEC) and the NRC was completed and signed by the NRC Chairman during the IAEA General Conference in Vienna in September 1996. At the request of the HAEC, NRR staff held discussions on seismic issues with Professor Peter Lenkei of Janus Pannonius University at NRC Headquarters.

BULGARIA

The First Deputy Chairman of the Bulgarian Energy Committee met with the Commission to discuss the status of Kozloduy Units 1, 2, 3, and 4, to outline proposed upgrades for Kozloduy Units 5 and 6 and to explore whether NRC would be able to transfer licensing review methodology to its regulatory body along the lines of the Temelin project. NRC is now considering this issue. A senior researcher at the Institute of

Nuclear Research and Nuclear Energy at the Bulgarian Academy of Sciences presented two papers on Kozloduy RPV embrittlement at the 1996 Radiation Protection and Shielding Topical Meeting in Massachusetts.

Pacific Rim

This region includes well-established nuclear power programs, such as those of Japan, the Republic of Korea, and Taiwan, and is also the fastest growing energy market in the world. The energy demand in many Pacific Rim countries is expected to triple over the next 30 years, and nuclear power is expected to capture an increasing share of this demand. In response to the growing energy market and increased interest in nuclear power, the Commission has placed a high priority on safety cooperation with Pacific Rim countries.

JAPAN

Japan operates the world's most dynamic nuclear power program that includes a complete fuel cycle. Currently more than 30 percent of its electricity is generated by nuclear power, including the world's first advanced boiling water reactors (ABWRs). Japan's nuclear industry is regulated by both the Ministry of International Trade and Industry, which is responsible for the licensing and regulation of operating commercial power reactors, and the Science and Technology Agency, responsible for the licensing and regulation of Japan's fuel cycle and advanced reactors. NRC conducts a strong bilateral safety program with Japan.

In April 1996, Chairman Jackson visited Japan to present the keynote speech to the April 17 through 19 Japan Atomic Industrial Forum Annual (JAIF) Meeting in Nagoya. Her remarks, entitled "The Challenges of Change," focused on the three issues of the changing role of government, the changing role of the nuclear industry, and the need for transparency and public trust. Following the JAIF meeting, Chairman Jackson met with government, utility, and industry representatives in Tokyo to discuss nuclear safety issues and become more familiar with Japan's nuclear program. She also visited the Monju Fast Breeder Reactor, the Rokkasho-mura waste facilities and reprocessing

operation, the Kashiwazaki ABWR owned by the Tokyo Electric Power Company, and the laboratories of the Japan Atomic Energy Research Institute and the Power Reactor and Nuclear Fuels Development Corporation.

On May 20, 1996, a 13-member team from Tokyo visited the United States and toured the Yankee Rowe NPP to learn about its decommissioning activities. Following the technical tour, they traveled to Washington to meet with NRC for the Ninth Regular Regulatory Exchange Meeting. Both sides restated their commitment to continue to work together on nuclear safety matters.

CHINA

In August 1996, Chairman Jackson visited Beijing where she met with the National Nuclear Safety Administration (NNSA), the China National Nuclear Corporation, and the Ministry of Public Health. China is operating three pressurized-water reactors (PWRs) and in its ninth 5-year plan has approved the construction of at least eight more units. During FY 1996, the NRC and the NNSA actively exchanged safety information.

TAIWAN

On a trip to Washington in November 1995, Dr. Yin Yun Hsu, Chairman of Taiwan's Atomic Energy Council (AEC), met with Chairman Jackson. In March 1996, he again visited NRC and met with Commissioner Dicus. He provided the Commissioner with an overview on the Lungmen nuclear power project, awarded to General Electric in the fall of 1996, which will consist of two 1300-MWe ABWRs in Lungmen. Dr. Hsu spoke about the status of the project to identify and remove contaminated re-bar that has been found in buildings around Taipei. In summer 1996, the Taiwan Executive Branch announced several cabinet changes, naming Dr. Ching-Piao Hu as the new Chairman of its AEC.

Nuclear cooperation with Taiwan is coordinated through the American Institute in Taiwan and its Taiwan counterpart organization, the Taipei Economic and Cultural Representative Office. Under the Joint Commission on Civil Nuclear Cooperation, the NRC has an active program of bilateral cooperation. Specific work is being done in severe accident research, health physics,

containment integrity research, and mechanical engineering.

REPUBLIC OF KOREA

NRC continued its active program of nuclear safety and regulatory cooperation with the Ministry of Science and Technology (MOST), the ROK's designated regulatory and licensing authority. The Korea Institute of Nuclear Safety (KINS) serves as technical expert group to MOST, carrying out many of its day-to-day regulatory responsibilities, including interactions with NRC.

During FY 1996, formal discussions were scheduled in both the United States and the Republic of Korea covering such varied areas as—

- risk-informed, performance-based regulation;
- the new reactor accident source term;
- QA inspection programs for operating NPPs;
- the maintenance rule;
- the reliability data rule for safety systems;
- plant performance review;
- the technical specifications improvement program;
- the PRA implementation plan;
- structural and geological engineering;
- the Standard Review Plan update and development project; and
- legal aspects of regulation.

Some of the more significant exchanges during this reporting period include the following.

Region IV Administrator L. Joe Callan participated in the IAEA/ROK-sponsored Regional Cooperation Workshop on Nuclear Power Plant and Radiation Safety October 23 through 27, 1995, in Taejon, where he (1) presented a paper entitled "Regulatory Measures for Enhancing Safety Culture," (2) served on a panel discussion that focused on safety culture and local culture, and

(3) advanced NRC's bilateral contacts with several of the represented countries.

Chairman Jackson and an accompanying delegation spent April 11–16 in the Republic of Korea. She delivered a keynote address, "Nuclear Regulation in the United States: Policy Directions and Future Prospects," during the plenary session of the 11th Annual Conference of the Korea Atomic Industrial Forum/Korean Nuclear Society. Chairman Jackson also headed the U.S. interagency delegation to the closing session of the 17th Annual Meeting of the US-ROK Joint Standing Committee on Nuclear and Other Energy Technologies. She made site visits to both the Ulchin Nuclear Power Station (which has two operating 950-MWe Framatome PWRs, and two 1000-MWe Asea Brown Boveri-Combustion Engineering (ABB-CE) PWRs under construction. This type reactor will be the prototype Korean Standard NPP. Chairman Jackson also visited the Daeduk Science Center in Taejon.

NRC's Office of Nuclear Regulatory Research (RES) Director David Morrison visited the Republic of Korea in February and July 1996 to discuss with the Korea Atomic Energy Research Institute and with KINS current research activities in the code applications and maintenance and severe accident research programs, as well as other ongoing and possible future cooperative research activities.

In September 1996, at MOST invitation, NRC sent an expert to observe and help critique the full-scope emergency exercise conducted at the Ulchin Nuclear Power Station.

Two KINS staff members completed one-year, on-the-job training assignments at NRC Headquarters in February 1996.

Western Europe and Canada

The NRC has traditionally maintained strong ties with countries in this region, many with active and advanced nuclear programs. The NRC's relationships with these countries enable us to increase our knowledge of important new technical developments, both for operating facilities and advanced designs, and to harmonize regulatory approaches to the extent possible.

FRANCE

Chairman Jackson traveled to France in September 1996 to obtain firsthand knowledge of technical and regulatory aspects of fuel recycling, including reprocessing, vitrification, and mixed-oxide fuel (MOX) fabrication as conducted in France. She also visited the reprocessing and vitrification facilities at La Hague and the MOX fuel fabrication at the Melox plant. During the course of the visit, she had discussions with J. Syrota, Chairman of Cogema; C. Lewiner, Chairman, Societe General Nucleaire, the firm that designed both La Hague and Melox; P. Lederman, Managing Director of Reprocessing at La Hague, and Willy Fournier, Managing Director of Melox. Information obtained from these discussions and visits will be highly beneficial if NRC becomes involved in the regulation of fuel recycling or vitrification facilities in the United States.

In December 1995, Commissioner Rogers presented "The Impact of USNRC Requirements on Extended Operation" at the international Plant Life Extension Conference held in Nice, France. Following the conference, Commissioner Rogers held meetings with a number of high-level French safety officials.

A number of key French safety officials also visited NRC during the year for important safety discussions. In April 1996, Mr. Andre-Claude Lacoste, Director General of the Directorate for the Safety of Nuclear Installations, met with Commissioners Rogers and Dicus. Mr. Lacoste explained how important he considered the ongoing, regular interactions with NRC and discussed the DSIN approach to very low-level nuclear waste. Additionally, he visited the Yankee Rowe nuclear plant to discuss and observe decommissioning activities.

In September 1996, Dr. Claude Birraux, French Parliamentarian, visited the Commissioners and the NRC staff to discuss nuclear plant maintenance regulatory requirements. He visited the Region III office and the Waterford and Zion NPPs to obtain information for a study of French maintenance practices as directed by the French Parliament.

In July 1996, Mrs. Annie Sugier, Director of Radiation Protection for the Institute for Nuclear Safety and Protection, visited NRC for the first

time. While here, she met with the Chairman, Commissioner Rogers, and the Executive Director for Operations (EDO) and held extensive discussions with NRC staff to exchange information on current radiation protection activities in order to identify potential areas for future collaboration.

SPAIN

In September 1996, Chairman Jackson visited the Consejo de Seguridad Nuclear (CSN) in Madrid, Spain. During the visit, she signed a five-year renewal of the NRC/CSN Reactor Research Agreement. The ceremony was attended by Juan Manuel Kindelan, President of CSN, the other four CSN commissioners, the U.S. Ambassador, and other senior CSN officials.

The centerpiece of the Chairman's visit was a presentation on U.S. nuclear regulatory policy entitled "Nuclear Regulation in the United States: Challenges and Direction-Setting Actions." The speech was given to a capacity crowd of experts at the CSN and will be published in the Spanish magazine "Revista de Seguridad Nuclear" early in 1997.

Chairman Jackson held extensive discussions with CSN officials, the Secretary of Energy, and officials at the Spanish waste management company, Empresa Nacional de Residuos Radiactivos, S.A., and officials at the Spanish Center for Energy, Environment, and Technology Research. Among the topics discussed were the Spanish initiative "1995-2000 Strategic Guidance Plan," which is similar to NRC's ongoing Strategic Assessment and Rebaselining Project.

Following the visit in Madrid, Chairman Jackson toured the Almaraz NPP.

THE UNITED KINGDOM

The NRC has had an "Arrangement for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters" with the United Kingdom (U.K.) since 1975. A formal extension of the arrangement for another five years was signed on September 18, 1996, on the margins of the IAEA General Conference. Under our bilateral agreements, the NRC and the Nuclear Installations Inspectorate (NII) have cooperated closely in nuclear safety information exchanges, particularly

throughout the United Kingdom's development of PWR technology and in developing regulations and an inspection regime. NII has had numerous consultations with the NRC on regulatory issues associated with the United Kingdom's 1996 transition from a public nuclear power sector to a private one.

The NRC is also involved in an active program of bilateral and multilateral research cooperation with the United Kingdom, including work on severe accidents, modeling of loss-of-coolant accidents, reliability, and PRA. A new area of cooperation was agreed to between the U.K. Health and Safety Commission's Advisory Committee on the Safety of Nuclear Installations (ACSNI) and the NRC Advisory Committee on Reactor Safeguards; a joint meeting is being planned.

Dr. Samuel A. Harbison, Chief Inspector, British NII, met with the Chairman, the Commissioners, and senior NRC staff in April 1996 and attended the NRC Regulatory Information Conference. As the current Chairman of G-24, Dr. Harbison plays a central role in international nuclear safety assistance to NIS states; he also participated in the first meeting of the IAEA Advisory Commission on Safety Standards.

GERMANY

In October 1995, Chairman Jackson visited Germany to sign the renewal of the bilateral Arrangement with the Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) and to visit nuclear waste management facilities in Germany and Sweden. The Chairman met with BMU Minister Angela Merkel to discuss a number of safety issues, such as the improving safety situation in the former Soviet Union, closure of the Chornobyl NPP, and the situation in Germany regarding disposition of waste and the future for nuclear power. Following the meetings, Chairman Jackson visited the Interim Spent Fuel Storage Building, the Pilot Conditioning Plant, and the Exploratory Mine in the Gorleben area. She then visited the Morsleben Low/Intermediate Waste Repository located in an abandoned salt mine 1600 feet underground.

NORWAY

In August 1996, Commissioner Rogers visited the Halden Research Center in Norway. NRC is a member of the Halden international research project. During the visit, the Commissioner visited project facilities and was briefed on studies on crack formation in reactor materials, high burnup fuels, and man-machine interface issues in control rooms.

SWEDEN

In August 1996, Commissioner Rogers gave a keynote address at an Executive Meeting on Risk-Based Regulation and Inspection held in Sweden. Following the meeting, the Commissioner met with officials of the Nuclear Power Inspectorate and Sten Bjurström, President of SKB, the company responsible for waste disposal. Later the Commissioner visited the ASPO Hard Rock Laboratory near Oskarshamn. The laboratory is designed for research and development of technology related to deep geologic disposal of high-level radioactive waste.

In October 1995, Chairman Jackson travelled to Sweden to meet officials and visit facilities associated with Sweden's nuclear waste program. She met with Lars Hoegberg, Director General of the Swedish Nuclear Power Inspectorate, to exchange information on its regulatory organizations especially as it relates to waste disposal. Following the meetings in Stockholm, the Chairman travelled to Oskarshamn to visit the Central Interim Storage Facility for Spent Nuclear Fuel. The Chairman then travelled to Forsmark for discussions with Sten Bjurström, President of SKB, and to visit the Forsmark NPP and the nearby Sweden Final Repository for low and intermediate wastes.

FINLAND

Dr. Antti Vuorinen, Director General of the Finnish Center for Radiation Protection and Nuclear Safety (STUK), met with Chairman Jackson and Commissioner Rogers in April 1996 in Washington to discuss each country's experience regarding the upgrading of nuclear regulatory safety for Soviet-designed reactors operating in the former Soviet Union and the challenges of an aging fleet of power reactors. During this visit, Chairman Jackson and Dr. Vuorinen signed the third renewal of the NRC/STUK bilateral safety information exchange arrangement.

Commissioner Rogers traveled to Finland in August 1996 to meet with STUK officials for an extended discussion of assistance activities with the former Soviet Union. Following the discussions, the Commissioner traveled to the Loviisa power plant to observe the annealing of the Loviisa Unit 1 reactor vessel, a Soviet-designed VVER model 440 reactor.

CANADA

In August 1996, Chairman Jackson travelled to Canada to meet with senior government and industry officials at the Atomic Energy Control Board (AECB), the Canadian regulatory body, at Atomic Energy Limited (AECL), the Canadian nuclear developmental organization, and at Ontario Hydro, an electric utility.

During the visit, Chairman Jackson met with Dr. Agnes Bishop, President of the AECB, and signed a five-year renewal of the NRC/AECB Administrative Arrangement. One principal topic of discussion was the proposed update of Canada's 50-year-old law governing commercial nuclear power and nuclear materials. Dr. Bishop also discussed AECB's "Project '96 and Beyond," which is similar to NRC's Strategic Assessment and Rebaselining Project; comparisons of agency budgets; descriptions of deregulation of their respective electric utility industries; plans for plutonium burning in CANDU reactors, and Canada's international cooperative nuclear activities.

In Toronto, Chairman Jackson met with Mr. William Farlinger, Chairman of Ontario Hydro, and toured the Darlington Nuclear Power Station. She also met with Dr. William Hancox, Vice President for Strategic Development at AECL. Topics of discussion included shrinkage in nuclear services activity for AECL, reduction in its work force, and AECL's new agreement with Nordion for the construction of two research facilities to ensure the continued supply of medical isotopes. Chairman Jackson visited AECL's Sheridan Park Engineering Laboratory, which supports the development and testing of CANDU reactor systems and components.

South Africa

Similar to the U.S.-Russia Joint Commission on Technological Cooperation in Energy and Space, a U.S.-South Africa Binational Commission, co-chaired by Vice President Gore and South African Deputy President Thabo Mbeki, was formed in 1995 to provide U.S. expertise to the newly emerging democratic government of South Africa.

In FY 1996, NRC became a formal participant in the activities of the Sustainable Energy Committee of the Binational Commission, and Chairman Jackson attended the second meeting of the Sustainable Energy Committee in Washington in July 1996. She suggested that South Africa expand the high-level dialogue on nuclear safety topics as a followon to the NRC-South African Council for Nuclear Safety (CNS) information exchange arrangement that had been concluded in 1994. In particular, she suggested cooperation in three specific areas:

1. Help in the review of new nuclear legislation;
2. Strengthening of South African nuclear regulatory operations; and
3. Participation in international nuclear safety research programs.

Penuell Maduna, South African Minister of Mineral and Energy Affairs, welcomed these initiatives and agreed to add them to the Sustainable Energy Committee's formal list of cooperative activities.

Chairman Jackson visited South Africa from September 23 through 30, 1996, delivering the CNS annual safety lecture entitled "Perspectives on Nuclear Regulation" at a meeting widely attended by representatives of government, industry, media, and public interest groups. The Chairman also met with Minister Maduna, Deputy Foreign Affairs Minister Pahad, and Atomic Energy Corporation Chairman Stumpf, exchanging information on nuclear programs and exploring areas in which it might be possible to expand the nuclear safety dialogue. Chairman Jackson visited the Pelindaba nuclear research center, the Koeberg NPP, and the electrification activities in the Gugulethu township near Capetown.

MULTILATERAL NUCLEAR SAFETY COOPERATION

In addition to its extensive program of bilateral cooperation with other countries, NRC also works closely in the area of nuclear safety with international organizations such as the IAEA in Vienna, and the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD) in Paris. For example, the NRC uses reports of operational events received from the NEA/IAEA Incident Reporting System, from the IAEA, and from bilateral exchange programs with more than 30 countries participating to supplement domestic data. The NRC also uses these exchanges of information to provide U.S. incident reports to the international community. Chapter 4, "Operational Information and Investigations and Enforcement Actions," provides additional information on this program of incident report exchange.

International Atomic Energy Agency

As the primary multilateral organization in the nuclear field, the IAEA provides a forum for the efficient exchange of safety information on a worldwide scale. NRC typically participates in a wide range of IAEA activities, including periodic peer reviews of the IAEA safety program, and contributes to the drafting of the IAEA's Nuclear Safety Review and the IAEA's Safety Series documents. The staff also participates in IAEA missions, meetings, and conferences, averaging one person per week throughout the year. Highlights of this year's participation in these activities follow.

GENERAL CONFERENCE AND BOARD OF GOVERNORS MEETINGS

The IAEA General Conference has become the premier event on the international nuclear calendar and an important vehicle through which U.S. national interests are advanced in the peaceful uses of nuclear energy. In addition to attendance at the General Conference, the NRC delegation

also schedules bilateral meetings with top regulatory officials from other countries, enabling progress on key issues in an extremely efficient and economical manner.

Accordingly, in FY 1996, Chairman Jackson participated as the U.S. Alternate Representative to the Fortieth IAEA General Conference. She met with IAEA Director General Blix, and the Deputy Director Generals for Nuclear Safety and Nuclear Energy and Administration. Chairman Jackson held 18 bilateral meetings with senior regulators and renewed NRC bilateral information exchange agreements with Hungary, Argentina, and the United Kingdom. She also participated in a trilateral—U.S., Russian Federation, and the IAEA—meeting on the safeguarding of nuclear fissile material. Concurrently, NRC was represented by the EDO at the Senior Regulators' meeting; he presented two papers on the subjects of the application of probabilistic safety assessment in nuclear safety regulatory regimes and NPP safety-related issues: one was entitled "Risk Assessment Results and Policy Implications for NRC Regulatory Activities," and the other, "Recent Spent Fuel Pool Storage Concerns and Planned NRC Efforts."

This year, the General Conference focused on a range of topics about the IAEA's policies, programs, and budget. In the nuclear safety area, four documents were discussed in the whole Committee and approved by the Plenary Committee:

1. A note by the Secretariat on the state of negotiations in the Standing Committee on liability for nuclear damage;
2. A summary of the discussions on liability during the September Board;
3. An overview of IAEA activities in the reactor, radiation, and waste safety areas; and
4. A study of the radiological situation at the French nuclear test sites on the Atolls of Mururoa and Fangataufa.

Agenda items on the amendment of Article VI of the Statute concerning board expansion and composition of regional groups proved contentious and could not be resolved during the conference, thereby requiring further negotiations.

Carlton Stoiber, Director, OIP, participated in the U.S. delegation to the Board of Governors

meetings in FY 1996. The board was requested in its March meeting to approve the Overview of the Nuclear Safety Review 1996. The United States requested that the entire Nuclear Safety Review, not just an overview, be available during future March board meetings to allow Member States sufficient time to comment before its final publication in the IAEA Yearbook. During the June board meeting, the United States supported the Secretariat's work in convening the April 1996 international conference on the consequences of the Chernobyl accident. The United States joined consensus during the September board meeting in approving the Revised Safety Series No. 6, "Regulation for the Safe Transport of Radioactive Material," but urged that the revision process itself include consideration of research, risk analysis and assessment, and economic analysis in the future.

APRIL 1996 INTERNATIONAL CHORNOBYL CONFERENCE

Commissioner Dicus participated in the April 1996 IAEA-hosted International Conference, "One Decade After Chernobyl: Summing Up the Consequences," at which participants concluded that although the specific causes of the accident are known today, work remains to be done in such areas as calculating radiation dose and quantifying the psychological effect of the disaster on affected populations. In addition, although many have provided safety assistance to operators of Soviet-designed reactors, the international community needs to continue this support for countries and people who wish to foster a strong nuclear safety culture, particularly those affected by the Chernobyl accident. The Commissioner also met with IAEA Director General Blix and the Deputy Director Generals in the margins of the conference.

ADVISORY COMMISSION ON SAFETY STANDARDS

The IAEA is authorized by its statute to develop safety standards. In the past, various processes were used to prepare and review Safety Series publications in the different safety-related areas, resulting in a lack of compatibility between some Safety Series publications. To better organize the development of Safety Series documents, the Director General created the Advisory Com-

mission on Safety Standards (ACSS), a standing body of senior government officials with national responsibilities for establishing safety standards relevant to reactor, radiation, waste, and transportation safety. In practice, all Safety Series documents must be considered by the Commission. NRC's EDO, James Taylor, was the first U.S. Representative to the ACSS, which met for the first time in March 1996. The ACSS heard presentations on the activities of the Department of Nuclear Safety; discussed terms of reference, working procedures, and a future program of work; and explored how to handle topics of common interest to the four disciplines of reactor, radiation, waste, and transport safety, such as governmental organization, QA, emergency preparedness, and a glossary of terms.

INTERNATIONAL NUCLEAR SAFETY ADVISORY GROUP

The International Nuclear Safety Advisory Group (INSAG) was established in 1984 as an independent technical body that acts on a consensus basis to advise the IAEA on underlying nuclear reactor safety principles and generic safety matters. Its members are drawn from industry, research, academic institutions, and regulatory bodies for three-year terms. A new fourth term panel of Member States representatives, chaired by German Professor Adolf Birkhofer, met in June 1996. Dr. Salomon Levy, of Levy and Associates, represented the United States. The ACSS discussed proposals for future INSAG activities, including—

- emerging new nuclear safety philosophical ideas;
- a single safety fundamentals document that would bring some harmonization among the fields of reactor, radiation, and waste management safety;
- the health effects of low-level radiation and the linear dose model for setting regulatory practice;
- aging;
- human factors principles;
- backfitting;
- confirmation of computerized safety systems;

- establishment of safety goals and building a bridge between the concept of safety culture and its realization in the operating organization; and
- long-term analysis of waste disposal.

IAEA MEETINGS AND MISSIONS

Members of the NRC staff participated in 36 IAEA advisory group, technical committee, and consultant meetings on a range of safety topics in reactor safety, waste safety, radiation safety, and other areas, including the following three areas:

1. Reactor Safety Area

- power reactor information system improvements
- emergency response programs
- ageing of NPP safety-related components
- early stages of a severe reactor accident
- safety of NPPs in Eastern Europe and countries of the former Soviet Union
- regulatory aspects of the design and safety assessment of future plants
- emergency response for nuclear facilities
- safety practices for research reactor operators
- emergency planning for accidents at NPPs
- NPP safety
- environmental assessments for NPP accidents
- NPP safety code and safety series
- NPP accident data
- advanced alarm annunciation systems for NPPs

- steam generator repair

2. Radiation Safety and Other Areas

- industrial radiography safety practices
- radiological cleanup criteria for contaminated land areas
- industrial radiation sources safety
- radiation safety of industrial radiography
- radiation protection for the public
- application of basic safety standards to limit releases of radioactive discharges to the environment
- advance incident reporting system database
- reviewing and assessing the Joint Energy Power Alternatives Study completed by Russia and the United States in June 1995
- AIRS database
- computer codes for accident consequences analysis
- good practices in the field of safety culture
- International Nuclear Event Scale
- emergency planning workbook

3. Waste Safety Area

- safety assessment of near-surface radioactive waste disposal facilities
- transport models for geological repositories

NRC staff also participated in a Waste Management Assessment and Technical Review Program mission to France and an Operational Safety Review Team mission to the Daya Bay nuclear power station in China.

NRC STAFF AT THE U.S. MISSION IN VIENNA AND THE IAEA

In addition to the activities previously discussed, NRC funds a nuclear safety attache position at the U.S. Mission to International Organizations in Vienna, Austria. The incumbent serves as the Mission's expert on nuclear safety, radiation, and waste management issues that arise within the IAEA and provides programmatic and policy oversight to the U.S. Government on the IAEA's nuclear safety program. The nuclear safety attache is also essential in identifying potential duplication of effort among multilateral organizations and with NRC's bilateral efforts. Charles Serpan, formerly of the NRC's Office of Nuclear Regulatory Research, replaced James Richardson in 1996 in this position.

During FY 1996, seven NRC employees with NRC re-employment rights held positions at the IAEA. These positions were located in the Division of Scientific and Technical Information of the Department of Nuclear Energy; the Division of Nuclear Installation Safety and the Division of Radiation and Waste Safety of the Department of Nuclear Safety; the Field Accounts and Commercial Claims Unit of the Department of Administration; and in the Department of Safeguards.

IAEA VISITORS TO THE COMMISSION

Morris Rosen, Acting Director, Department of Nuclear Safety, visited NRC in April 1996 to discuss a possible IAEA plan to review existing information on the health effects of low-level radiation and the linear dose model for setting regulatory practice; restructuring the IAEA's advisory services; and the status of the Convention on Nuclear Safety. In June 1996, Deputy Director General for Technical Cooperation Qian visited NRC and focused his discussions on future plans to reorganize the Technical Cooperation Department and to improve its interaction with other IAEA Departments to avoid overlap, such as with the Department of Nuclear Safety.

IAEA STEERING COMMITTEE

During FY 1996, NRC participated in the U.S. Interagency Steering Committee for the IAEA

chaired by Ambassador Sievering, U.S. Representative to the IAEA of DOS. The responsibilities of the Steering Committee are to—

- formulate U.S. policy toward the IAEA,
- oversee policy development and implementation;
- coordinate and direct the work of four subcommittees in the areas of international safeguards monitoring, nuclear safety, technical cooperation, and budget;
- manage congressional and public relations; and
- coordinate intelligence community support to the IAEA.

Carlton Stoiber, Director of OIP, chairs the Steering Committee's Nuclear Safety Subcommittee, which held seven meetings during FY 1996.

INTERNATIONAL CONVENTIONS

In FY 1996, efforts to establish and enhance a global nuclear safety culture were aided by concrete developments on multilateral legal agreements, such as the CNS, which entered into force on October 24, 1996, and conventions on the safety of radioactive waste management and on nuclear liability, both still being negotiated.

Convention on Nuclear Safety. On October 24, 1996, the CNS entered into force. NRC was active in U.S. Government attempts to obtain Senate ratification in time for the United States to participate in the Preparatory Meeting of the Parties in April 1997. OIP Director Carlton R. Stoiber chaired two preparatory meetings of the signatories to the CNS during which the signatories developed options and alternatives for implementing the convention. At the June 1996 meeting, consensus was reached on three major documents:

1. Draft guidelines regarding the review process;
2. Draft guidelines regarding the nature and structure of national reports; and
3. Draft rules of procedure and financial rules.

The documents will be recommended for discussion at the Preparatory Meeting.

Waste Convention. NRC staff from the Office of Nuclear Material Safety and Safeguards and the Office of the General Counsel participated, as part of the U.S. delegation that was led by the Department of State, in three technical Group of Experts meetings to negotiate a text on the safety of radioactive waste management. As of the end of FY 1996, a number of issues were still being negotiated, including the treatment of spent fuel and military waste in the convention, trans-boundary movement of waste, and the overlapping reporting requirements of the CNS and a waste convention on the subject of spent fuel stored at reactor sites.

Liability Convention. During FY 1996, the staff of the NRC Office of the General Counsel participated in the U.S. delegation to the IAEA Standing Committee on Nuclear Liability. Negotiations continued on a supplemental funding convention and a protocol to amend the Vienna Convention on Liability. The supplemental funding convention will enable the United States to participate in an international liability response in the event of a nuclear accident.

Nuclear Energy Agency

The NRC is actively involved in the OECD/NEA budget formulation and the development of its Program of Work through such varied means as participation in technical Standing Committees, Working Groups, and the Senior Regulators' meeting, and serving as Deputy Head of the U.S. Delegation to two Steering Committee meetings. The NRC benefits greatly from representation on NEA committees and working groups and meetings, because a large share of the NEA's technical work is related to NRC domestic nuclear safety priorities, particularly operational safety. NEA activities also enable the NRC to exchange safety and regulatory knowledge with peers from developed nuclear power countries with plants of types similar to those in the United States.

Cooperative international research on high-priority safety areas under the auspices of the NEA com-

plements and expands NRC's research program cost effectively. In 1996, the NRC was a key participant in the RASPLAV and the Halden Projects. The NRC also participated in the Information System on Occupational Exposure (ISOE) Program and the Incident Reporting System (IRS).

The NRC staff plays an important role in contributing to international nuclear power safety and promoting good regulatory practices in foreign radiation protection and waste management programs by serving in two key positions on the NEA Secretariat staff and as officers of technical committees. In 1996, the Director, RES, was elected Chairman of the Committee on the Safety of Nuclear Installations, and the Director of the Office of NRR was elected Vice Chairman of the Committee on Nuclear Regulatory Activities (CNRA).

NRC's leadership role was further recognized through Chairman Jackson's participation in the September 1996 Senior Regulators' meeting, where she led a discussion, "International Cooperation Among Regulatory Bodies: Mechanisms to Meet Current and Future Needs." Other topics of discussion among the advanced nuclear power countries attending the meeting included: Regulatory Aspects of Waste Management, Aging Nuclear Installations and How to Maintain a Correct Safety Culture in the 1990s, and the Safety of Russian-Designed Reactors.

In 1996, congressional funding for all international organizations, including the OECD/NEA, was substantially reduced. During this period, the possibility of withdrawing from NEA membership was raised as a cost savings measure. Chairman Jackson took the lead in establishing a strong interagency stand in favor of the need to maintain U.S. influence in the NEA, emphasizing the value of the NEA's government-to-government role for nuclear technical and policy issues relevant to advanced nuclear power programs.

During FY 1996, the NEA Acting Director General Samuel Thompson visited the United States several times to discuss nuclear safety matters of mutual interests and the United States' reduction in funding for international organizations.

COOPERATIVE NUCLEAR SAFETY RESEARCH

The NRC conducts confirmatory regulatory research in partnership with nuclear safety agencies and institutes in more than 20 countries. Much of this activity is concentrated in three major subject areas:

1. Severe accident research,
2. Thermal/hydraulic code maintenance and assessment, and
3. Piping integrity and material research.

More than 60 agreements are currently in force covering the NRC's international research work. Such agreements provide for shared use of research facilities, joint funding arrangements, prompt exchange of experimental results, coordinated analyses, and other forms of cooperation to yield confirmatory safety data of mutual benefit in a timely and cost-effective manner.

Examples of activities conducted during FY 1996 under the NRC's international nuclear safety research program include the following:

- Using the ROSA Large-Scale Test Facility in Japan for confirmatory safety system testing to help provide technical bases for NRC licensing decisions on the AP600 advanced reactor design;
- Cooperating internationally to develop practical advanced analytic methods to improve predictions of pressure vessel (PV) fracture and assess integrity of PVs under various operating conditions; and
- Cooperating internationally on severe accident research related to molten fuel/coolant interactions.

Chapter 10 provides additional details on these activities.

EXPORT AND IMPORT LICENSING

Nonproliferation and Export Licensing

In 1996, after nearly two decades of discussions and negotiations, a major milestone was reached in the implementation of U.S. nuclear export controls. A new peaceful nuclear cooperation agreement was concluded between the United States and the European Atomic Energy Community (EURATOM). The agreement, containing provisions that meet requirements of the Nuclear Non-Proliferation Act of 1978, was submitted by President Clinton to the Congress in November 1995 and became effective in April 1996.

In an earlier letter to President Clinton, NRC Chairman Jackson had expressed the Commission's support of the new agreement as providing an adequate framework for continued commercial nuclear cooperation between the United States and its European partners.

Like the 1988 U.S.-Japan agreement, the new U.S.-EURATOM Agreement is reciprocal in its provisions and gives long-term programmatic consent to EURATOM countries to reprocess U.S.-origin spent nuclear fuel and to use the recovered plutonium for electricity production.

NRC's Export/Import Role

Under the Atomic Energy Act of 1954, as amended, the NRC is responsible for licensing the export and import of nuclear-related materials and equipment to ensure these items are used for peaceful purposes. This authority extends to nuclear reactors and other fuel cycle facilities and equipment, to source and special nuclear material, to byproduct materials, and to certain other commodities, including radioactive waste. The NRC obtains the views and recommendations of other governmental agencies and departments in its prelicensing reviews, and, in turn, provides its views and recommendations to the Departments

of Energy and Commerce on nuclear-related export authorizations under their jurisdiction.

NRC Export Licensing Summary

In FY 1996, the NRC completed 150 cases, about 50 percent more than usual. The increase was due largely to actions associated with the new U.S.-EURATOM Agreement for Cooperation, which became effective in April 1996, following the expiration of the earlier agreement on December 31, 1995. For example, 10 previously issued licenses for exports to Austria, Finland, Spain, or Sweden were no longer required under the new agreement and were terminated. In addition, about half of the 52 license amendments that were issued during the year re-authorized exports to EURATOM countries following receipt by the United States of assurances from EURATOM tied to the newly concluded agreement.

The majority of the new casework involved exports of nuclear fuel to Japan, South Korea, Taiwan, and Western Europe for use in nuclear reactors. Other notable actions included the first specific import license for a radioactive waste treatment purpose and export licenses to the DOE to carry out spent fuel pool cleanup work in North Korea and to convert a research reactor in Colombia from use of high-enriched to low-enriched uranium fuel. Twenty export license applications were returned without action or withdrawn by the applicants during the year because the legal and policy conditions for licensing had not been satisfied over the last several months and were unlikely to be met in coming months.

Nuclear Suppliers Group

As a founding member of both the Nuclear Non-proliferation Treaty (NPT) Exporters Committee (the "Zangger Committee") and the Nuclear Suppliers Group (NSG), whose guidelines set the international standard for nuclear cooperation and supply, the United States has consistently been at the forefront of efforts to preserve and enhance the effectiveness of nuclear supplier con-

trol systems. By virtue of its role in licensing exports of nuclear-related materials and equipment, the NRC plays an important role in the development and implementation of U.S. and international export control regimes.

NRC participated in interagency preparations for the April 1996 NSG in Argentina. At the plenary session, Brazil, the Republic of Korea and Ukraine were welcomed as new members, bringing the total NSG membership to 34 nations. The members of the NSG plenary session established a working group on steps to promote transparency in nuclear export controls, consistent with the "Principles and Objectives for Nuclear Non-Proliferation and Disarmament" accepted by the NPT Review and Extension Conference in May 1995.

The NRC published new regulations, effective August 7, 1996, to implement recommendations of the NSG guidelines for exports of uranium conversion equipment and to reflect U.S. nuclear nonproliferation policies. Cambodia and Vietnam were removed from the "embargoed list" to reflect President Clinton's lifting of trade embargoes against these countries, enabling U.S. companies to provide some assistance under general authorization and enabling the NRC to consider specific license applications. Brazil, New Zealand, Republic of Korea, South Africa, and Ukraine were added to the list of countries eligible to receive certain radioactive materials under general licenses in recognition of the nonproliferation steps taken by these countries reflected by their membership in the NSG.

The NRC participated in interagency consultations on clarifying the kinds of reactor components that are under NRC controls. At the May 1996 meeting of the Zangger Committee, it was agreed to upgrade the nuclear reactor, nonnuclear materials, and fuel fabrication sections of the "Trigger List" items. Zangger Committee members encouraged efforts of possible Chinese membership. The meeting also focused on the role of the Zangger Committee in the NPT Review process, particularly in relation to the NSG transparency efforts. In addition, the Zangger Committee considered formal adoption (in line with the NSG) of a policy for requiring full-scope safeguards as a condition of nuclear supply and discussed steps to promote transparency of the export control regime in coordination with the NSG.

Department Of Energy Technology Transfers

SUBSEQUENT ARRANGEMENTS

In FY 1996, NRC worked with DOE to process two subsequent arrangement cases. In the first, a protocol was signed by the United States, Argentina, Brazil, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) and the IAEA that suspended the application of IAEA safeguards under both the Safeguards Transfer Agreement between Argentina, the United States, and the IAEA, and the Safeguards Transfer Agreement between Brazil, the United States, and the IAEA. These agreements will be replaced by a Quadripartite Agreement between Argentina, Brazil, ABACC, and the IAEA, and by the Safeguards Voluntary Offer Agreement between the United States and the IAEA.

The second subsequent arrangement was a request to add five MOX fuel fabrication facilities located in EURATOM to Annex 1 of the Implementing Agreement of the U.S.-Japan Agreement for Peaceful Nuclear Cooperation. Placement of the facilities on Annex 1 would eliminate the need for case-by-case U.S. approvals to allow Japan to fabricate MOX fuel in Europe, using uranium and plutonium owned by Japan, but obligated in whole or in part to the United States under the terms of the U.S.-Japan Agreement.

A third NRC-reviewed subsequent arrangement was a request to authorize post-irradiation examination work on U.S. origin nuclear material at Korea Atomic Energy Research Institute (KAERI). KAERI proposed performing destructive analysis work on nuclear fuel irradiated in various reactors within the Republic of Korea to better understand the performance of the fuels.

DOE also requested NRC views on its proposal to implement its policy of May 17, 1996, to accept and manage in the United States, U.S.-origin uranium in spent fuel from foreign research reactors. DOE will accept both spent U.S.-origin high-enriched uranium and low-enriched uranium research reactor fuel.

PART 810 TECHNOLOGY TRANSFER AUTHORIZATIONS

NRC worked with DOE on a proposed transfer of technology to Russia related to the design and development of a plutonium-fueled, gas-turbine, modular-helium reactor that would use plutonium as fuel to generate electricity. This project is one approach that the Russian Ministry on Atomic Energy is studying for disposition of its weapons-grade plutonium stockpile.

In a second Part 810 technology transfer, DOE authorizations were granted to Duke Engineering and Services Inc., Sargent and Lundy, Stone and Webster Engineering Corporation, Combustion Engineering, and Raytheon Engineers and Constructors to participate in the Korean Peninsula Energy Development Organization's (KEDO's) reactor project in the Democratic People's Republic of Korea (DPRK). The authorizations are an integral part of the implementation of the U.S.-DPRK Agreed Framework and the DPRK-KEDO Supply Agreement. Although no NRC-controlled items would be authorized, Chairman Jackson sent letters regarding these authorizations to the Secretary of Energy and officials at the Department of State and the Arms Control and Disarmament Agency recommending early and continuing actions by the United States and other KEDO participants to—

- foster a sound safety culture for the project,
- underscore the fundamental importance of establishing the initial inventory of nuclear material in DPRK, and
- facilitate the negotiation and implementation of full-scope IAEA safeguards.

INTERNATIONAL SAFEGUARDS AND PHYSICAL PROTECTION ACTIVITIES

The NRC staff reviews pending export cases to confirm that appropriate IAEA safeguards and physical security arrangements will be applied to

exports by the receiving country. Reviews are performed in conformance with U.S. nonproliferation laws, which are intended to ensure that U.S. exports will be protected and safeguarded during transit and use in the importing country and that exports will be used only for peaceful purposes.

The NRC also participates in the U.S. Program of Technical Assistance to IAEA Safeguards, which provides the largest share of voluntary technical support of any IAEA member state.

Physical Protection Activities

In support of its review of physical protection arrangements for U.S.-controlled materials in other countries, the NRC participates jointly with other U.S. Government agencies in information exchange trips for the purpose of discussing national physical protection programs. During FY 1996, visits were made to Italy, Turkey, Mexico, Brazil, Argentina, Chile, Canada, and Colombia.

Assistance to the Former Soviet Union in Nuclear Materials Safeguards and Physical Protection

During FY 1996, NRC continued to assist the regulatory authorities in Russia, Ukraine, and Kazakstan to establish national regulatory systems for MC&A and physical protection, funded through the Cooperative Threat Reduction and Lisbon Initiative programs. Among other activities in this area in FY 1996, NRC—

- provided assistance in developing regulations, licensing and inspection programs, and implementing guidance in the three countries;
- conducted an MC&A workshop for Russian regulators at NRC Headquarters;
- arranged for Russian inspectors to visit an NRC region and accompany a regional inspector on a physical protection inspection at a reactor;

- arranged for Ukrainian regulators to observe an MC&A inspection;
- arranged for Kazak and Ukrainian regulatory and facility personnel to attend a seminar on Category I highly enriched uranium nuclear material physical protection licensing issues; and
- conducted a mock MC&A inspection at a Kazak nuclear facility.

Additional information on NRC international safeguards and physical protection activities and assistance in these areas to the countries of the FSU is in Chapter 6, "Fuel Cycle Safety and Safeguards".

NUCLEAR NONPROLIFERATION ACTIVITIES

U.S. Nonproliferation Policy

The United States continues to provide strong support for the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), for the IAEA and its safeguards role, and for multilateral export controls. In support of President Clinton's September 1993 Nonproliferation Initiative setting specific U.S. policy objectives, the NRC participated in a range of interagency and international nuclear nonproliferation activities, including priorities, such as—

- providing materials control and accounting technical support for fissile material and plutonium disposition activities in countries of the former Soviet Union;
- harmonizing domestic and multilateral export controls and maximizing the effectiveness of those controls;
- providing support to the IAEA for its safeguards and technical assistance activities;
- working within the extensive array of international programs to promote the safe opera-

tion of NPPs in the former Soviet Union and Central and East Europe; and

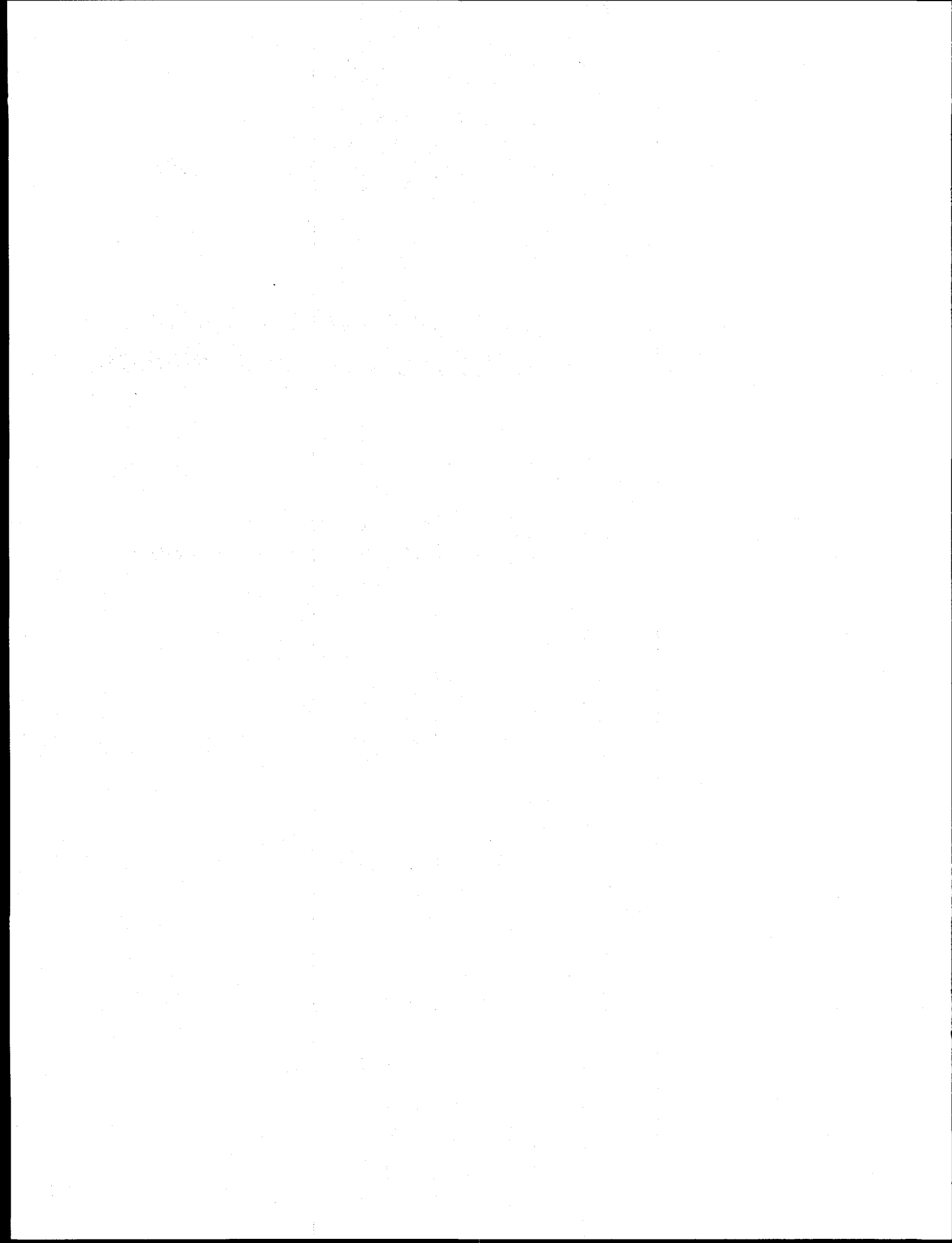
- in keeping with the U.S.'s obligations under Article IV of the NPT, providing support for bilateral and IAEA-sponsored exchanges of equipment, materials, and scientific and technological information on the peaceful uses of nuclear energy.

The Nuclear Nonproliferation Treaty

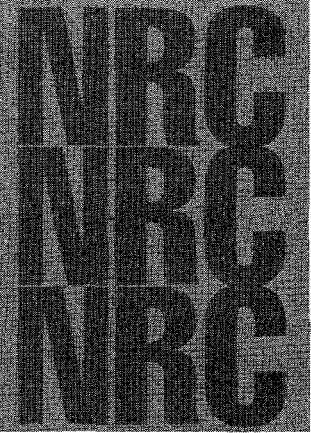
As a result of the successful 1995 NPT Extension and Review Conference, the parties agreed to

(1) strengthen the review process for the NPT and (2) develop principles and objectives for nuclear nonproliferation and disarmament. In FY 1996, Andorra, Angola, and Djibouti became parties to the NPT, leaving only six countries worldwide—Brazil, Cuba, India, Israel, Oman, and Pakistan—outside the treaty.

During the FY 1996 reporting period, NRC participated in U.S. internal efforts to prepare for the 2000 NPT Review Conference, including support for consultations with other NPT parties to determine priorities for and perspectives on the review process.



Chapter 10



Nuclear Regulatory Research

Activities of the NRC's Office of Nuclear Regulatory Research (RES) constitute an essential service to the regulatory process and are vital to implementing a number of the agency's programs. The goal of the office is to ensure the availability of sound technical bases for timely rulemaking and related decisions in support of NRC licensing and inspection activities. RES also has responsibilities related to implementing Commission policies on safety goals and severe accident regulation, resolving generic safety issues, and reviewing licensee submittals regarding individual plant examinations (IPEs). RES conducts the NRC's rulemaking process, including the issuance of regulatory guides and rules that govern NRC-licensed activities.

Appendix 5 lists regulations issued by the NRC during Fiscal Year (FY) 1996, while Appendix 6 describes and lists regulatory guides issued, revised, or withdrawn during FY 1996.

In 1996, the NRC staff continued its participation in national standards activities, particularly with respect to setting priorities. NRC participation derives from a need for national standards to define acceptable ways of implementing the NRC's basic safety regulations. Approximately 100 NRC staff members serve on working groups organized by technical and professional societies.

This chapter summarizes RES activities during FY 1996 under the following major headings: Reactor Regulation (composed of Reactor Aging and License Renewal and Reactor Safety Assessment and Regulation Development), Standard Reactor Designs, and Materials Users.

REACTOR REGULATION

Reactor Aging and License Renewal

PRESSURE VESSEL SAFETY

The NRC issued a final rule amending 10 CFR Part 50 to update the requirements on pressure vessel integrity in the pressurized thermal shock rule (10 CFR 50.61), the fracture toughness requirements in Appendix G, and the material surveillance program requirements in Appendix H. A new rule (10 CFR 50.66) and a supporting regulatory guide (RG) (RG 1.162) were issued addressing thermal annealing of reactor pressure vessels. The rule and regulatory guide provide a consistent set of requirements for the use of thermal annealing to mitigate the effects of neutron irradiation.

RES participated in the Department of Energy (DOE) Annealing Demonstration Project that was undertaken to successfully demonstrate the engineering feasibility of thermal annealing (Figs. 10.1, 10.2, and 10.3). The staff participation included—

- observation of the anneal at the cancelled Marble Hill plant in Indiana,
- development of an observation procedure,
- independent assessment of the thermal and stress distributions during the anneal, and

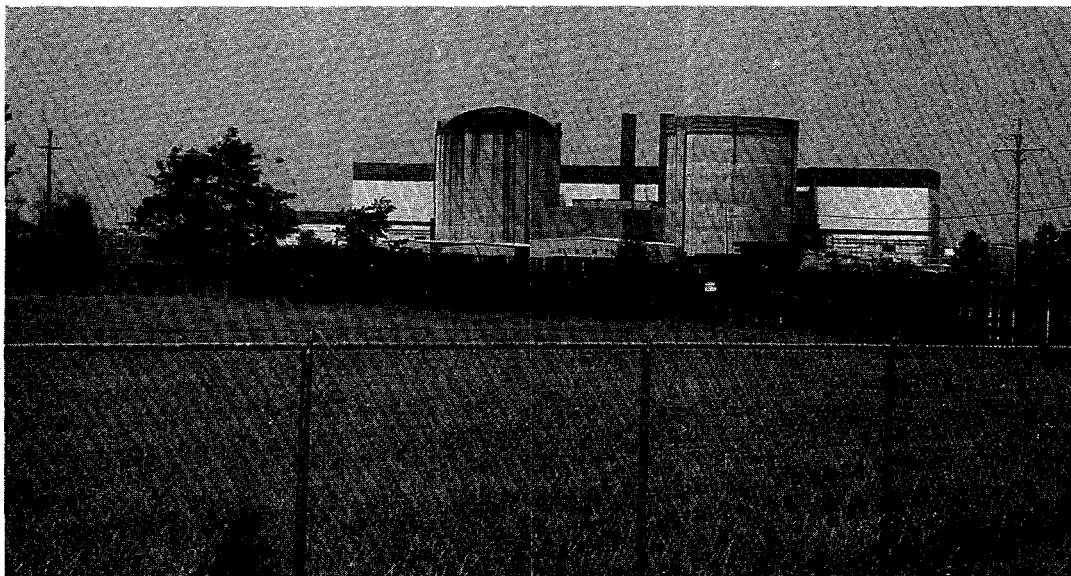


Figure 10.1 Marble Hill Facility Where the Thermal Annealing Took Place

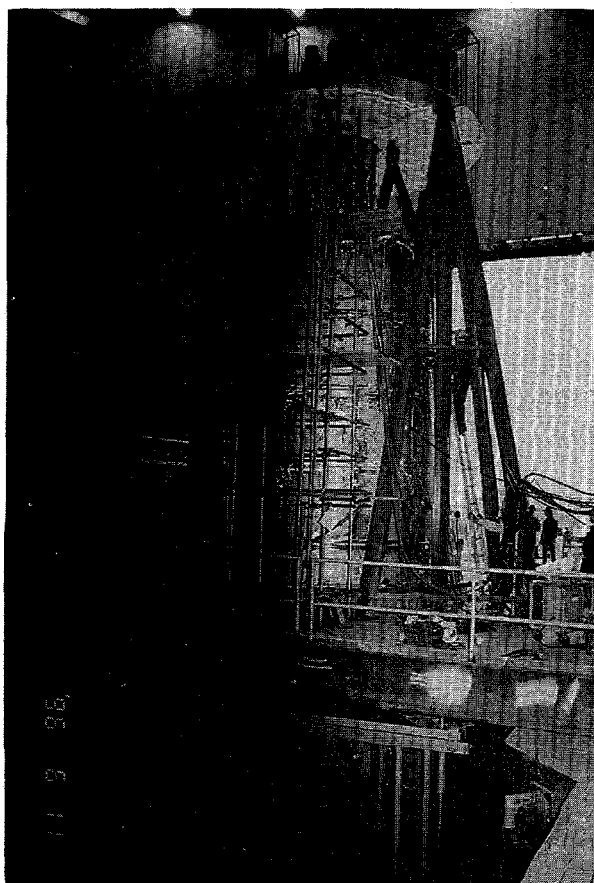


Figure 10.2 The Reactor Pressure Vessel at Marble Hill Before the Thermal Annealing



Figure 10.3 The Lower Portion of the Reactor Pressure Vessel at Marble Hill After the Thermal Annealing

- implementation of a confirmatory measurements program.

ELECTRICAL AND MECHANICAL COMPONENTS

Two RGs were published to endorse industry standards related to electrical equipment. Specifically—

- Revision 1 to RG 1.152, "Criteria for Digital Computers in Safety Systems of Nuclear Power Plants," was published in January 1996. This guide describes an acceptable method for promoting high functional reliability and design quality for the use of digital computers in nuclear power plant (NPP) safety systems. The guide generally endorses a national consensus standard, IEEE Std. 7-4.3.2-1993.

Instrumentation and control systems that use digital computers in safety systems make extensive use of advanced technology, that is, equipment and design practices that are significantly and functionally different from current designs. New designs include the use of microprocessors, digital systems and displays, fiber optics, multiplexing, and different isolation techniques to achieve the needed independence and redundancy. This regulatory guide on computers discusses numerous technical issues, such as system independence, defense in depth, reliability, and commercial dedication.

- Revision 1 to RG 1.153, "Criteria for Safety Systems," was published in June 1996. This guide describes an acceptable method for complying with the Commission's regulations with respect to the design, reliability, qualifications, and testability of the power, instrumentation, and control portions of safety systems of NPPs. The guide endorses a national consensus standard, IEEE Std. 603-1991, "Criteria for Safety Systems for Nuclear Power Generating Stations." The requirements in this regulatory guide will ensure that once initiated by a valid signal, the protection systems are reset only with the full cognizance of the operating personnel even after the initiating conditions return to normal. This guide also requires consideration of human

factors in the design of the safety systems. Although the scope of this guide is limited to safety systems, many of the principles have applicability to equipment provided for safe shutdown, accident monitoring display instrumentation, preventive interlock features, or any other systems, structures, or equipment related to safety.

ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT

In support of the NRC's environmental qualification research program, literature review and analysis were performed to identify past relevant work that could be used to resolve technical issues related to environmental qualification of low-voltage instrumentation and control cables. The two volumes of NUREG/CR-6384, "Literature Review of Environmental Qualification of Safety-Related Electric Cables," issued in April 1996, summarize the findings from a review of over 400 published documents dealing with research on the environmental qualification of instrumentation and control cables. In recent years, the development of methods to monitor the condition of cables has received special attention. The report concluded that there is no single method that can provide the necessary information about the condition of cables currently in service in NPPs.

MOTOR-OPERATED VALVES

A potential safety issue was identified by the NRC regarding the susceptibility of power-operated gate valves to pressure locking and thermal binding. Pressure locking can occur when the pressure in the bonnet of a closed gate valve is higher than pressure upstream and downstream of the valve. Thermal binding can occur when a hot valve is closed and allowed to cool. The NRC issued Generic Letter 95-07, "Pressure Locking and Thermal Binding of Power-Operated Gate Valves," requesting licensees to evaluate the susceptibility of safety-related gate valves to pressure locking and thermal binding.

The NRC developed the detailed technical background for evaluating licensees' gate valves and their susceptibility to pressure locking and thermal binding by conducting tests on two different gate valve designs typical of those in NPPs. The results showed that these two valves are susceptible to pressure locking. Pressure increases on the order

of 40 psi per degree (Fahrenheit) rise in temperature were measured in the bonnets of these two valves, showing that the bonnet pressure can increase rapidly with the temperature and result in pressure locking.

The results of these tests are being used by the NRC regulatory and regional staff for evaluating licensees' responses to Generic Letter 95-07 and for performing onsite inspections of the licensees' gate valves and their susceptibility to pressure locking and thermal binding.

ENGINEERING STANDARDS SUPPORT

The NRC staff actively participates in the development of IEEE nuclear consensus standards. During FY 1996, numerous IEEE standards were published. They reflect the state-of-the-art technologies and are responsive to the NRC's needs; for example, the IEEE standard for Qualification of Actuators for Power-Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants.

Reactor Safety Assessment and Regulation Development

PLANT PERFORMANCE

High-Burnup Fuel Behavior. Increases in fuel burnup in licensed power reactors have made it necessary to update analytical methods and review fuel damage criteria that are used in the regulatory process. Efforts to initiate such work were described in previous annual reports.

During FY 1996, work was completed on high-burnup updates to the steady-state fuel behavior code, FRAPCON, which is used to audit licensing submittals and for special studies. The updated version of the code, called FRAPCON3, was reviewed by a group of independent peer reviewers and additional adjustments to the code have been made. As a result of this review, it was concluded that the code will perform thermal calculations quite well but that the mechanical models require additional development. Most of the applications

of this code are limited to the thermal calculations. Further work on the mechanical models will be undertaken at a later time. At year's end, the peer review process was almost completed but the code had not yet been released.

Drawing on recent developments with the steady-state FRAPCON code, work was initiated to improve the transient code, FRAPTRAN, for high-burnup applications. This code is currently being used to interpret experimental data taken under transient conditions.

In the last few years, considerable attention has been given to the adequacy at high burnup of fuel damage licensing criteria used for the reactivity-initiated accidents that are analyzed in licensing safety analyses. An interim assessment was completed of international data on this subject, and a summary paper was prepared for publication in the *Nuclear Safety* journal. This paper provides the technical basis for revised interim licensing criteria should they be needed. The figure shows key data from test reactor programs in France, Japan, Russia, and the United States that supported this interim assessment (Fig. 10.4). Additional research would be needed to refine the current state of knowledge in this area, and such research is being considered in international programs. Using cooperative agreements with foreign laboratories, the NRC will obtain future results from these programs.

Fuel damage criteria are also used in licensing safety analyses for the postulated loss-of-coolant accidents. These criteria are also being reviewed for their adequacy at high burnup. A testing program was started recently in the hot cells at Argonne National Laboratory to study the high-burnup effects on these criteria. Cooperative efforts related to this program are being discussed with DOE and the Electric Power Research Institute (EPRI). This program will take 3 to 5 years for acquiring significant results.

Thermal-Hydraulic Research. In this area, efforts include—

- The beginning of a modernization effort of the TRAC-P code at Los Alamos National Laboratory. This effort will form the basis for the consolidation of the NRC thermal-hydraulic code capabilities.

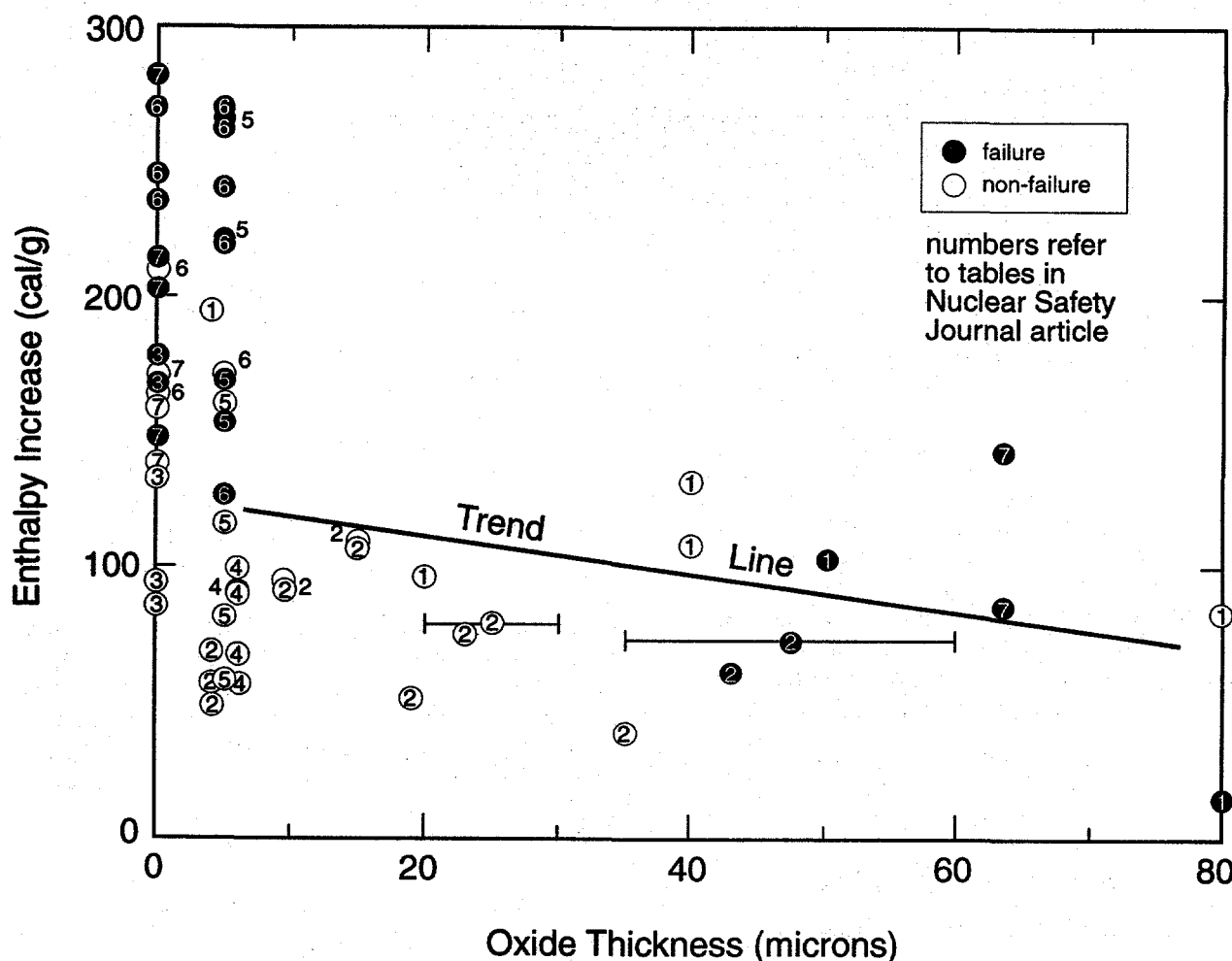


Figure 10.4 Full Enthalpy Increase Versus Thickness of Oxide on the Cladding for Fuel Rods Tested Under Conditions of Postulated Reactivity Accidents

- The preparation of a 5-year thermal-hydraulic research plan to improve and maintain NRC thermal-hydraulic analytical and experimental capabilities.

CONTROL, INSTRUMENTATION, AND HUMAN FACTORS ASSESSMENT

As computerized systems are introduced into existing NPPs and proposed for advanced reactors, new issues related to the human-system interface, software that drives the systems, and the effects of environmental conditions on the digital systems

are possible. RES is developing the technical basis for review of these systems.

Revision 1 to NUREG-0700, "Human-System Interface Design Review Guideline," was published as a 3-volume series for use in the review of advanced control room designs and for inspections in which the human-system interface is a contributing factor. The three volumes contain—

- the background and actual guidelines (Volume 1)
- a checklist version of the guidelines for field use (Volume 2)

- a disc version of the guidelines, with a user's manual, which allows for customized computerized reviews and includes report preparation (Volume 3)

The NRC intends that Volume 3 will eventually be available through the World Wide Web.

Proceedings of an international conference on "Experimental Analysis and Measurement of Situation Awareness" were published. This conference was co-sponsored by the NRC, the Federal Aviation Administration, Embry-Riddle Aeronautical University, and Texas Tech University. The objectives were to bring together researchers to critically evaluate situation awareness (SA) measurement, discuss benefits and inadequacies in the measurement of SA, and generate constructive recommendations for improving SA measurement. The NRC anticipates that SA will be a critical measure of operator performance when using advanced computer-based control station interfaces. The papers at this conference explicitly focused on the need for a rigorous examination of measurement techniques being used and proposed for work in this field. Ultimately, each class of measures have certain advantages and disadvantages in terms of the extent to which the measure provides an index of situation awareness, the objectives of the researcher, and the constraints of the testing situation.

Draft RG DG-1012 (Proposed Revision 3 to RG 1.8), "Qualification and Training of Personnel for Nuclear Power Plants," was published for public comment. This regulatory guide endorses, with several exceptions, ANS/ANSI-3.1-1993, "Selection, Qualifications, and Training of Personnel for Nuclear Power Plants." It will be used in the review of licensees' staffing practices with regard to their qualifications and training programs.

NUREG/CR-6463, "Review Guidelines for Software Languages Used in Nuclear Power Plants," was published. The guidelines address undesirable programming practices in software written for safety systems using high-level languages such as Ada, C/C++, and Pascal. The guidelines were derived from a framework of issues significant to software safety that was gathered from relevant standards and research literature. Since certain programming practices

can affect the safety of digital systems, guidelines are needed to enhance dependability in the development of safety-critical systems.

Six RGs on software quality assurance (QA) for digital instrumentation and control systems to be used in NPP safety systems were issued for public comment. These RGs endorse eight related industry standards.

NUREG/CR-6406, "Environmental Testing of an Experimental Digital Safety Channel," was published. The report presents the results of environmental stress tests performed on an experimental safety channel designed to support research on the qualification of advanced instrumentation and control systems. The environmental stressors tested included electromagnetic/radio-frequency interference, temperature, humidity, and smoke. The results from these tests, along with the results from other work, will serve as the technical basis for enhancing the qualification of digital systems in NPPs.

REACTOR RISK ANALYSIS

Drafts of five RGs supporting uses of probabilistic risk analysis (PRA) were completed. One guide dealt with general considerations of PRA uses, and the other four were specific guides on PRA uses in inservice inspection, inservice testing, graded QA, and technical specifications.

The supporting documentation for ATHEANA (A Technique for Human Error Analysis), which is an improved human reliability analysis method based on theoretical models and operating experience, was completed. These documents describe how the ATHEANA method can be implemented.

Technical support was provided to the Office of Nuclear Reactor Regulation (NRR) on the development of the steam generator rule. The support was in the form of quantification of event and fault trees and parameter data derived from IPE submittals.

RES provided technical and management support to the performance of the PRA for the Russian VVER-1000 Kalinin NPP by performing the first parts of the PRA. This support included technical and management review of contractual arrangements with five Russian organizations, development of procedures guides, and initial implementation of these guides.

Expert elicitation that will be used in formulating uncertainty distributions for parameters used in offsite consequence analysis was completed. These parameters relate to the modeling of atmospheric dispersion and deposition, ingestion pathways, internal and external dosimetry, and early and late health effects.

An investigation was started on alternative methods for incorporating the effects of equipment aging into an integrated PRA.

RES continued work on upgrading probabilistic methods for the analysis of operating events, including a formal QA review of the 75 existing Simplified Plant Analysis (SPAR) models and initiating development of a new improved set of SPAR models that include a more complete and detailed handling of system interdependencies. In addition, RES developed methods for evaluating external events such as fires and internally initiated flooding events. Work continued on developing models for evaluating events that occur during shutdown or modes of operation other than full power. Finally, work continued on the extension of these calculational models from conditional core damage frequency to public risk (i.e., PRA Level II and Level III analyses).

SEVERE ACCIDENT ANALYSIS

To ensure that existing regulations adequately protect the public from the consequences of severe accidents, the NRC conducts research in several areas. Specifically, these areas include direct containment heating, hydrogen combustion, melt-concrete interactions and debris coolability, source terms, core-melt progression, reactor vessel integrity, and fuel-coolant interaction.

High-Pressure Melt Ejection—Direct Containment Heating. In certain reactor accidents, the core can degrade while the reactor coolant system remains pressurized. If the reactor vessel fails, the core melt can be ejected into the containment in the form of fine particles. Thermal energy can be quickly transferred to the containment atmosphere, and the metallic components of the ejected core debris could oxidize in air or in steam, generating a large quantity of hydrogen and chemical energy that would pressurize the containment. This process is called direct containment heating (DCH).

In FY 1996, the staff completed a substantial program of testing and analysis that culminated in publishing in February 1996 NUREG/CR-6338, "Resolution of the Direct Containment Heating Issue for All Westinghouse Plants with Large Dry Containments or Subatmospheric Containments." This report presents the conclusion that DCH poses no tangible threat to containment integrity for those plants. In support of the resolution of DCH for Combustion Engineering and certain Babcock & Wilcox plants, integral testing in the SURTSEY test facility at Sandia National Laboratories was completed in FY 1996. Additional work is under way to resolve this issue for the remaining pressurized water reactor (PWR) and boiling water reactor (BWR) plants (Fig 10.5).

Hydrogen Combustion. Significant information exists on hydrogen combustion to assess the possible threat to containment and safety-related equipment. However, some ancillary issues remain that are related to a better understanding of the likelihood of various modes of combustion at high temperature and in the presence of large quantities of steam. Research is also necessary to assess the performance of new hydrogen control measures proposed for advanced reactor designs and operating NPPs.

Under an agreement between the NRC and the Ministry of International Trade and Industry (MITI) of Japan, managed by the Nuclear Power Engineering Corporation (NUPEC), a high-temperature hydrogen combustion program is under way at the Brookhaven National Laboratory. Intrinsic detonability and deflagration to detonation transition (DDT) experiments at high temperatures were completed in FY 1995, and detonation transmission experiments at high temperatures were started in FY 1996. Preliminary results indicate that higher temperatures make it easier for hydrogen mixtures to detonate.

A hydrogen research program is also under way to investigate deflagration limits, diffusion flame stability, and expansion of low-speed high-temperature jets in an environment with temperatures up to 100 °C. Preliminary results indicate that the deflagration limit depends on the strength of the ignition source.

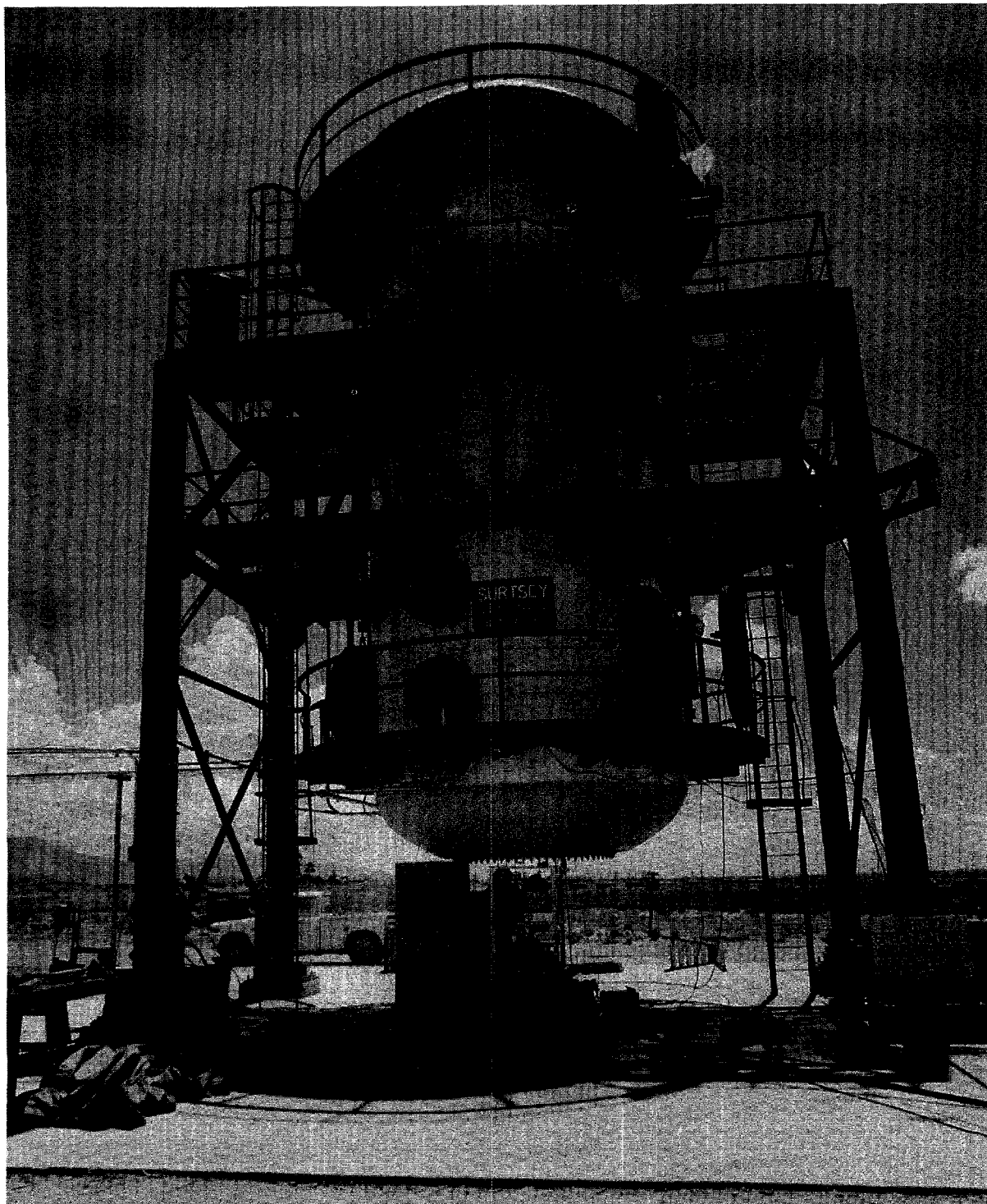


Figure 10.5. The SURTSEY Test Facility at Sandia National Laboratories Where Direct Containment Heating Tests Were Conducted

A joint hydrogen research program among the NRC, FZK of Germany, and IPSN of France is

under way at the Russian Research Center to study DDT at temperatures higher than ambient

temperature and in the presence of steam. The findings from these experiments are being used to develop a generalized methodology to predict the possibility of detonations caused by DDT in hydrogen/air/steam mixtures.

Melt-Concrete Interactions and Debris Coolability.

In those severe accident scenarios in which the reactor vessel fails, high-temperature core debris may fall into the reactor cavity where it can penetrate the basemat and containment liner.

The currently active experimental research on debris coolability, called the Melt Attack and Coolability Experiments (MACE) program, under the sponsorship of the NRC, DOE, EPRI, and other, mostly governmental, agencies in several countries, is intended to determine the ability of water to cool prototypic ex-vessel core debris of uranium-zirconia composition. Five tests, including a scoping test, were conducted under the MACE program during 1992 through 1995. A sixth test is planned for January 1997. This test, to be performed at a scale more than two times larger than earlier tests, is designed to provide information on the effect of scale on crust formation, stability, and debris coolability.

Source Terms. "Source Terms" refer to the magnitudes of the radioactive materials released from a nuclear reactor core to the containment atmosphere. The NRC's involvement in research in this area is primarily through participation in the PHEBUS-FP (fission product) program. This program is sponsored by the Commissariat à l'Energie Atomique of France (CEA) and the Commission of the European Communities. On July 26, 1996, the second PHEBUS-FP test was successfully conducted. This test was similar to the first test but differed in the use of pre-irradiated fuel. Ongoing activities include analysis of the test data and assessment of codes against the measurements of both tests. Planning continued for the next test—a rubble bed configuration of core material.

Core-Melt Progression. "In-vessel core-melt progression" describes the state of a light-water reactor (LWR) core from core uncover up to reactor vessel melt-through in unrecovered accidents or through stabilization of the temperatures and the core geometry in accidents recovered by core reflooding. The major accomplishment in FY 1996 was the successful conduct of an experiment to investigate material relocation processes

and relocation pathways in a dry BWR core following a severe accident, such as an unrecovered station blackout. One significant result was the initial formation of a blockage by the draining metallic melts and the subsequent failure of this blockage, resulting in the sudden drainage of melt to lower core regions. This experiment demonstrated the potential for molten metal to relocate during a severe accident to the lower plenum in a BWR core through existing pathways in the lower core structures. The final report on this experiment will be issued in FY 1997.

Reactor Vessel Integrity. During the late phase of a severe accident, a significant amount of core material may relocate downward into the lower head of the reactor vessel. The NRC, in cooperation with 14 countries and under the auspices of the Organization for Economic Cooperation and Development's Nuclear Energy Agency, undertook an investigation of melt-vessel interactions to provide data on the internal natural convection flow and local heat flux distribution inside the lower head of the reactor pressure vessel for various melt compositions. This program involves large-scale integral experiments, using molten UO_2 and ZrO_2 , in representative reactor lower head geometries, analytical studies, and a number of small-scale separate effects experiments. This program, named RASPLAV (Fig. 10.6), is being performed at the Russian Research Center. During FY 1996, the first successful large-scale experiment with 200 kg of corium was performed. During this test, the corium temperature reached 2700 °C, and natural convection in the corium was established.

An experimental program is also under way at the Pennsylvania State University to address ex-vessel flooding of the reactor cavity to prevent vessel failure. The program investigates boiling heat transfer on downward-facing surfaces in hemispherical and toroidal geometries. During FY 1996, transient and steady-state experiments to measure critical heat flux (CHF) on a downward-facing surface were completed. In addition, models were developed to predict CHF for the hemispherical surface.

An experimental program was developed at Sandia National Laboratories to determine the mode, mechanism, location, timing, and characteristics of the failure of a reactor pressure vessel lower head under the combined effects of thermal and pressure

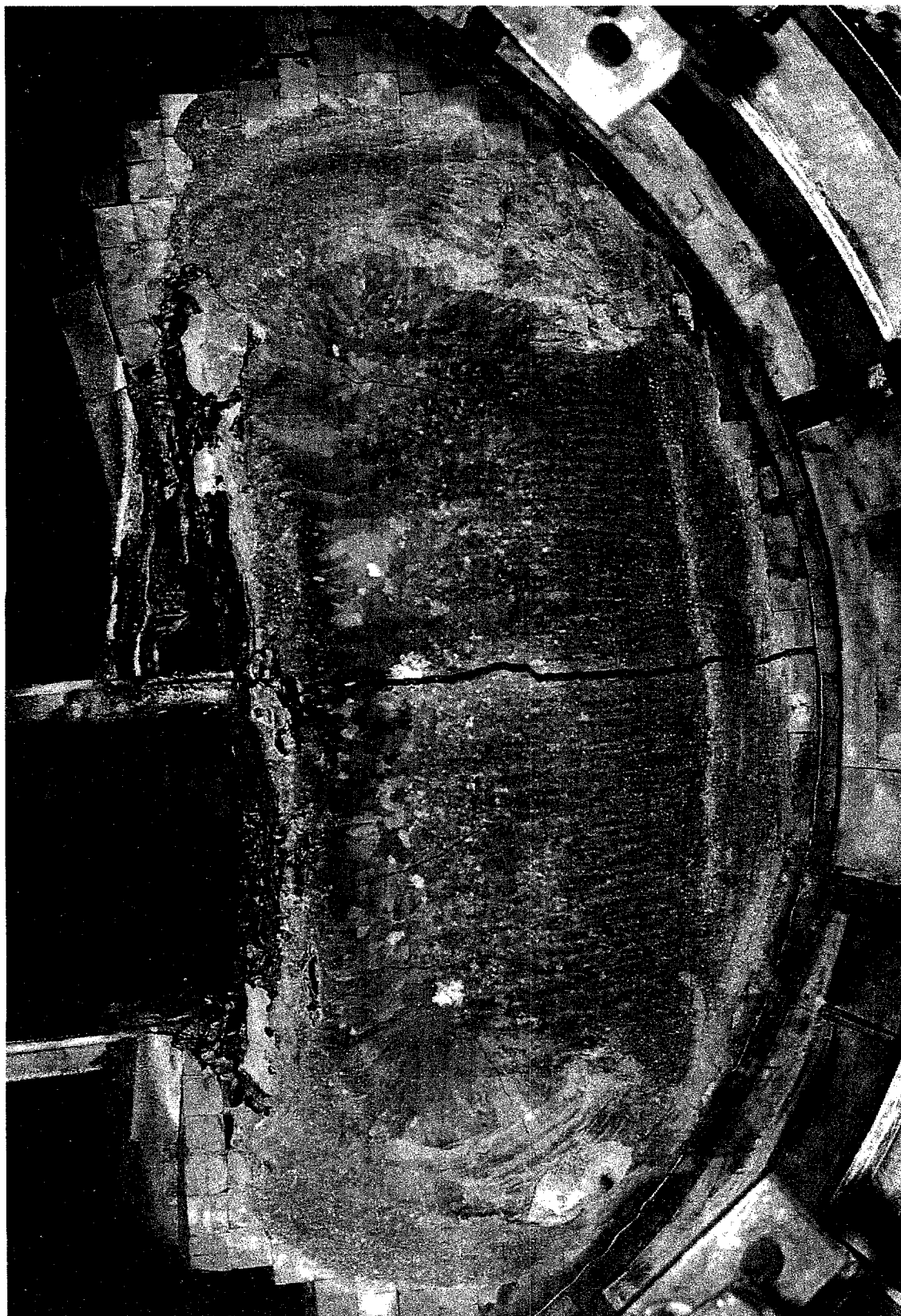


Figure 10.6 Post-Test Cross Section of the First Integral RASPLAV Experiment

loads as a result of a core meltdown accident. During FY 1996, four experiments were performed on the scaled lower head test section. Initial results from these experiments revealed (1) localized heating results in localized failure; (2) failure is substantially smaller than the heated region; (3) temperatures for the initiation of vessel creep and final vessel failure appear to be fairly constant; and (4) a vessel with penetrations fails prematurely as a result of weld failure owing to strain associated with the global deformation of the vessel.

In FY 1996, Phase I of a cooperative experimental program on in-vessel debris coolability was completed at Fauske and Associates, Inc. This project is jointly funded by the NRC, EPRI, and organizations in Japan, France, and Sweden. The objective of this project is to investigate in-vessel cooling phenomena that may prevent the reactor pressure vessel from failing during severe accidents. Four scaled experiments were completed during Phase I using simulant material. The results of these experiments demonstrated that with water present, molten material does not adhere to the vessel wall, and the vessel wall can strain away from the debris crust, thereby creating a gap that can enhance cooling of the debris and the vessel wall.

Fuel-Coolant Interaction. Fuel-coolant interaction (FCI) is a process by which molten fuel transfers energy to the surrounding coolant. Such energy transfer leads to either a non-explosive breakup and quenching of melt or energetic steam explosions. These explosions could challenge reactor vessel and containment integrity and create a leakage path for radiological releases.

NUREG-1529, "A Reassessment of the Potential for an Alpha-Mode Containment Failure and a Review of the Current Understanding of Broader Fuel-Coolant Interaction Issues," issued in August 1996, summarizes the deliberations of experts on the alpha-mode and other FCI issues. The general conclusion of the group was that in-vessel explosions pose no significant risk to containment integrity. However, FCIs may still impact in-vessel recovery actions, and ex-vessel FCIs may threaten containment structures.

The NRC has continued its cooperative research arrangement with the Safety Technology Institute of the Joint Research Center of the Commission

of the European Communities at Ispra, Italy. The cooperative arrangement will continue the melt quenching experiments at the FARO facility and the steam explosion experiments at the KROTOS facility, both at Ispra. Testing during the past year has focused on the use of reactor materials over a range of pressures.

An experimental program at the Argonne National Laboratory is under way to determine whether chemical augmentation of the energetics can occur in Zr-water and Zr-ZrO₂-water steam explosions. Such chemical augmentation was observed in the aluminum-water system in connection with the new production reactor safety research. Additional experiments were conducted in FY 1996 with larger melt masses. Results to date indicate little effect produced by chemical augmentation. In addition, the ongoing FCI experimental program at the University of Wisconsin is examining the effects of various fuel-coolant parameters on explosion energetics using simulant materials.

SEVERE ACCIDENT CODES

MELCOR is an integrated computer code that models the progression of accidents in LWR power plants. The code can be used to evaluate the progression of accidents from initiation through containment failure. It can also be used to estimate source terms, as well as their sensitivities and uncertainties in a variety of applications. The focus of the development efforts in FY 1996 has been to model fission product chemical reactions with surfaces, the behavior of hygroscopic aerosols, and core blockages by relocated core debris.

During FY 1996, the NRC continued the MELCOR Cooperative Assessment Program, an international forum with membership from 19 countries, for exchange of information on the applicability, limitations, and operational experiences of MELCOR.

SCDAP/RELAP5 is a computer code that has the capability to perform detailed analyses of the in-vessel progression of LWR severe accidents, as well as detailed experiment analyses. In FY 1996, a number of new models were implemented into SCDAP/RELAP5/MOD3.2. In addition, extensive assessments of improvements made to SCDAP/RELAP5 in support of AP600 analyses were completed. Also during FY 1996, the SCDAP/RELAP5 Cooperative Assessment Program

(SR5CAP) was officially established, having 12 international organizations as members.

CONTAIN is a detailed code for the integrated analysis of containment phenomena. During FY 1996, the **CONTAIN** 1.2 version was completed, and the associated documentation (i.e., a new code manual) is being developed. Also, the **CONTAIN** assessment of the AP600 passive cooling system in the Large-Scale Test Facility was completed and documented in a technical report.

VICTORIA is a mechanistic computer code designed to analyze fission product behavior within the reactor coolant system (RCS) during a severe accident. The majority of the effort in FY 1996 was directed toward performing an independent peer review of **VICTORIA**. Additionally, **VICTORIA** was used to assess the effect of fission products and nonradioactive materials released from the core on the thermal-hydraulic conditions in the RCS used to assess steam generator tube integrity and to perform pre-test analyses for the PHEBUS project to assist in experiment design and development.

REACTOR CONTAINMENT STRUCTURAL INTEGRITY

For the past few years, the major effort in this program has been a cooperative one with the MITI of Japan. Two areas of cooperative research are being pursued—one dealing with steel containments used in both the United States and Japan for BWR designs, the other relating to pre-stressed concrete containments.

In December 1996, a model, representative of the major elements of steel BWR containments, was tested to failure at Sandia National Laboratories (SNL) in Albuquerque, New Mexico. The model, fabricated at the Hitachi Works in Japan under the sponsorship of NUPEC of Japan, was shipped to SNL in March 1995, installed in the protective structure within which the test took place, and SNL personnel installed the model's instrumentation (Fig. 10.7).

The model, as expected, sustained pressure (provided by nitrogen gas) far beyond its design level. The pressure was continuously increased as the model deformed well into the inelastic regime.

Over 800 channels of instrumentation were recorded, and the test results will be compared with pre-test predictions of the response at 43 locations made by eight groups from five countries. Some of the pre-test predictions did suggest that a failure in the dry well near the equipment hatch was likely at approximately the observed pressure level. Post-test comparisons of predictions with actual measurements will show the ability of analytical methods to accurately predict the overall behavior of the test model. Results of this type, when combined with information about penetration capacity, can be used to calibrate predictions of capacity for actual containments.

Construction has begun at SNL on the prestressed concrete containment model that was designed in Japan by Mitsubishi Heavy Industries under NUPEC sponsorship. The model has a hemispherical dome, a cylindrical wall, and a basemat. Two buttresses are used to anchor the horizontal or "hoop" tendons. In the vertical direction, a "hairpin" tendon layout is employed. The vertical tendons extend from the basemat up through the cylinder wall, over the dome, and back to the basemat on the opposite side of the containment. They are anchored in a tendon gallery that is inside the basemat. A liner plate made of carbon steel is placed on the inner surface of the concrete wall, dome, and basemat and forms the containment pressure boundary in these areas (Fig. 10.8).

In September 1996, Mitsubishi Heavy Industries in Kobe, Japan, completed the fabrication of the liner. The liner segments were shipped to SNL in December 1996. Construction of the model will continue at SNL during 1997 and 1998. Instrumentation of the model will take place in 1998 and 1999, partly in parallel with the onsite model construction. Testing of the prestressed concrete containment model will then occur late in 1999.

The structural aging research program was completed in March 1996 with the publication of NUREG/CR-6424, "Report on Aging of Nuclear Power Plant Reinforced Concrete Structures," and NUREG/CR-6425, "Impact of Structural Aging on Seismic Risk Assessment of Reinforced Concrete Structures in Nuclear Power Plants." Program accomplishments include—

- development of a structural materials data base, and

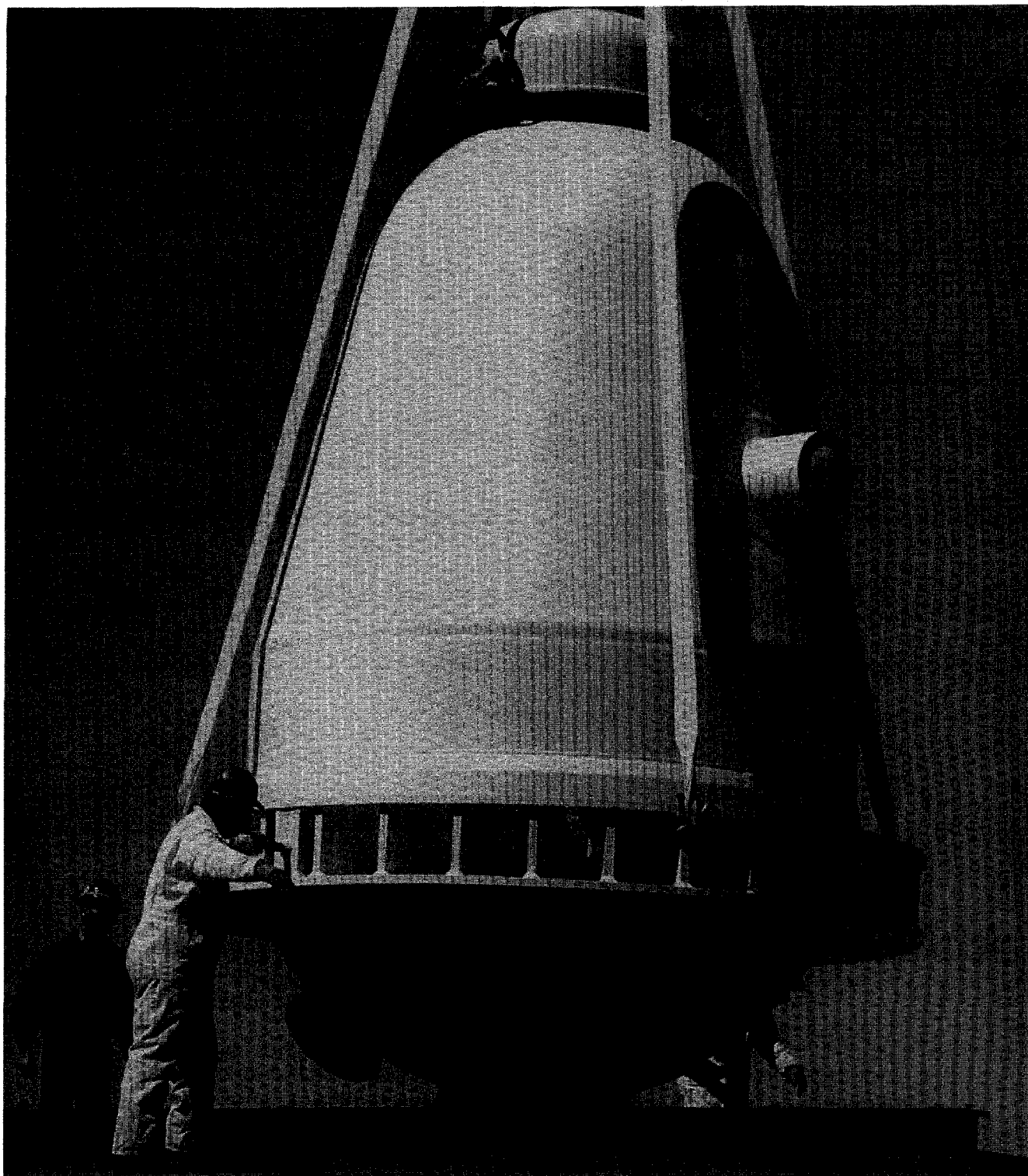


Figure 10.7 The Model Steel BWR Containment Vessel Before It Was Tested to Failure at Sandia National Laboratories

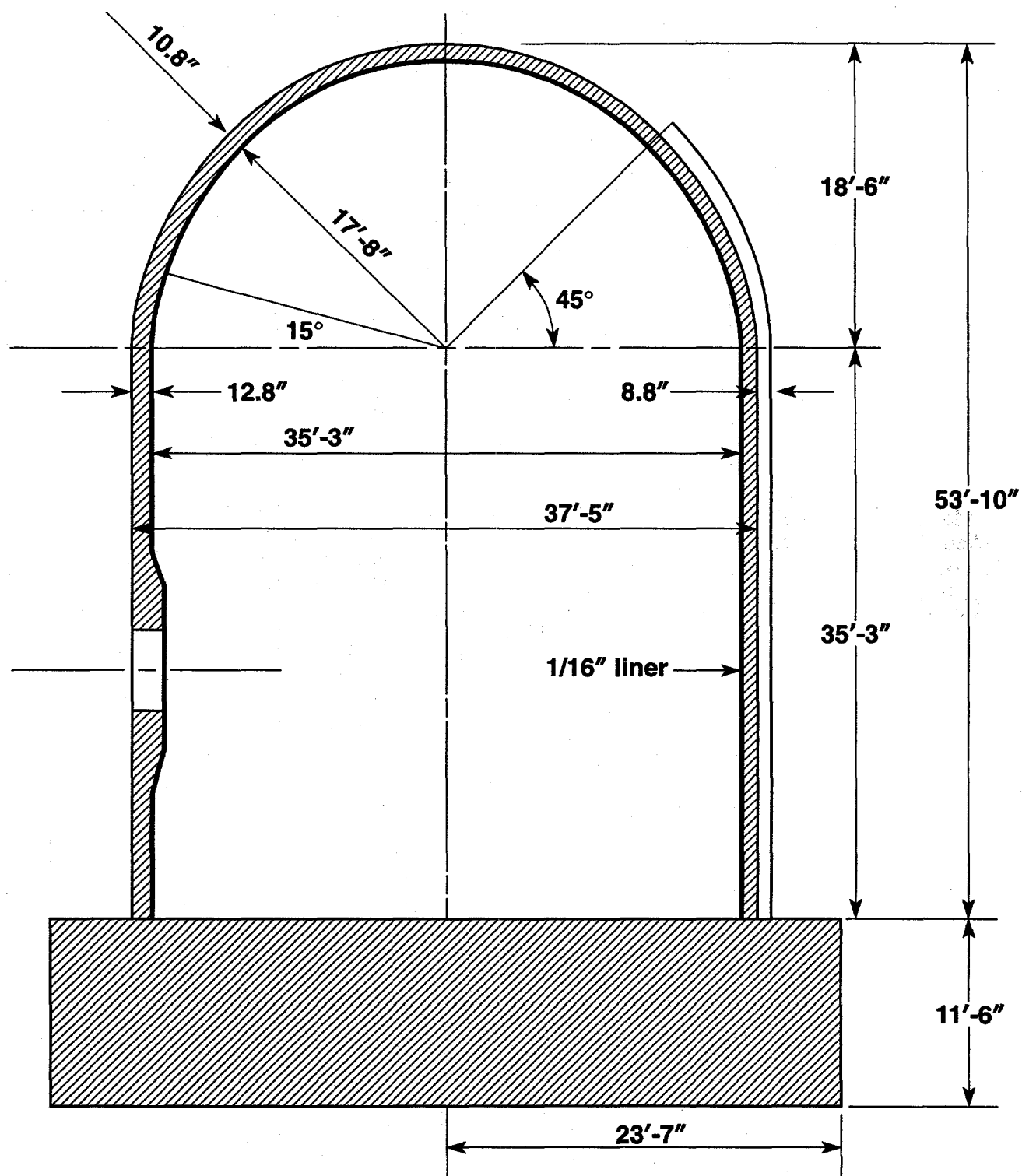


Figure 10.8 The Dimensions of the Prestressed Concrete Containment Vessel Under Construction at Sandia National Laboratories

- development of guidelines to evaluate structures for continued service.

In February 1996, the Oak Ridge National Laboratory under an NRC contract published ORNL/LTR-95/29, "Degradation Assessment Methodology for Application to Steel Containments and Liners of Reinforced Concrete Structures in Nuclear Power Plants." This report focuses on a degradation assessment methodology intended for use in characterizing the inservice condition of metal and concrete containment pressure boundary components and quantifying the amount of damage that may be present.

The NRC is sponsoring a multiyear research program at the University of Texas at Austin to assess the seismic performance of anchorages used to connect mechanical and electrical equipment to concrete structures. In October 1995, a Masters thesis, "Behavior of Anchors in Uncracked Concrete Under Static and Dynamic Tensile Loading," addressing one part of a four-part test program was published. This report is available at the University of Texas.

Phase I of a research program awarded under the Small Business Innovative Research program was completed by Construction Technology Laboratories, Inc. The research examined the feasibility of developing a passive surveillance system to identify ruptures in containment tendon wires. In December 1995, the findings were published in NUREG/CR-6420, "Self-Monitoring Surveillance System for Prestressing Tendons."

SEVERE ACCIDENT IMPLEMENTATION

All remaining IPEs have been reviewed for conformity with the intent of Generic Letter (GL) 88-20, and 11 IPEs were reviewed as a followup to the staff's initial negative conclusion on conformity with the intent of GL 88-20. The staff also issued 27 safety evaluation reports to NRR.

The regional inspection staff was briefed on the results of 20 IPEs as well as holding discussions on licensee results and staff review and interpretation.

A draft staff report (NUREG-1560) describing insights gained from reviews of all IPEs was published for public comment. A series of brief-

ings was provided to the regional inspection staff on this report.

EARTH SCIENCES

Seismic hazards and associated uncertainties rank high as factors in nuclear facility siting and design and in determinations of core damage frequency. The NRC is continuing research into the causes and distribution of seismicity with the purpose of reducing uncertainties, providing a background for improved regulations, and improving methods of estimating design ground motion levels.

Seismographic Networks. NRC's computer program for receiving and analyzing data from the National Seismographic Network (NSN) (see the 1995 NRC Annual Report, pp. 203-204) was augmented with a graphical user interface and with additional analysis capabilities. Five research contracts that use NSN data were continued and will end in FY 1997. This research serves to better define seismicity and crustal structure, mostly in the central and eastern United States, and to determine detection and location capabilities of the network.

Southeastern Tectonics. Investigations, using additional trenching and age dating of paleo-liquefaction features, continued in South Carolina to determine whether there is a second source for large earthquakes in the region of the coastal plain. Field work at one site this year was combined with that of the geochronological research project described below to confirm the carbon-14 method, which had previously been used exclusively, by dating the same materials with other state-of-the-art methods.

Geochronological Studies. All field and laboratory work and analyses were completed this year, and the researchers have almost completed the final report. The report that will describe state-of-the-art methods for determining the ages of geological materials will be published as a contractor report in the NUREG series. It will also be used to prepare a Geological Society of America special publication on the application of geochronology in paleoseismology.

Paleoseismicity of Southern Illinois. Paleoliquefaction studies in this region revealed evidence for three prehistoric earthquakes that occurred about 3,700, 6,200, and 12,000 years ago in southeastern Illinois and two prehistoric events that happened

in the vicinity of St. Louis, Missouri, approximately 6,000 and 12,000 years ago.

New Madrid Seismic Zone. Further investigation of paleoliquefaction features has resulted in more accurate dates for the occurrence of earthquakes that induce liquefaction. In this endeavor, archaeology proved to be a valuable complement to the usual geological methods of dating horizons. The new information suggests that the recurrence interval in the zone may be near the shorter end of the previously estimated range of 200 to 600 years. Late Quaternary faulting in southeastern Missouri, north of the New Madrid seismic zone, was investigated. Findings in FY 1996 indicated probable late Pleistocene or Holocene displacement on faults in the Benton Hills area of southeastern Missouri.

Geotechnical Indications of Paleoliquefaction. Researchers found that no single distinctive effect always characterizes seismically induced liquefaction. However, violent shaking does increase relative density, depending on strain levels, and soft zones can form atop liquefiable soil, but this occurrence is not ubiquitous. Another finding during soil tests is that the natural variability of the standard penetration test can be significant.

Fault Identification Criteria. RES initiated a project this year to develop criteria to identify faults and to distinguish between tectonic faults and nontectonic faults. A literature search was completed, and a 2-day workshop was held in San Francisco, California, in July 1996, with leading North American experts in fields associated with this subject participating so that a broad range of current information on fault characterization was gained. A preliminary report was submitted.

West-Central United States. FY 1996 investigations indicated that the Harlan County fault in Nebraska was most likely the result of a prehistoric landslide and not a tectonic fault. Investigations were started on another possible Late Quaternary fault in Meade County, Kansas, that has been associated with a 60-meter scarp near the Loop River. Although investigations are still under way, preliminary indications are that the scarp is an erosional feature and not fault related.

Fault Segmentation Studies. Trenches were excavated across the San Andreas Fault 8 km east-northeast of Watsonville, California, near the

southern limit of the 1906 surface rupture. Analysis revealed a previous event that occurred about 1650 A.D. This finding agrees with that of several other sites along the fault between this site and Point Arena. A second trip to the surface faulting associated with the 1957 Gobi Altai, Mongolia, earthquake was conducted this year. Detailed mapping of trenches suggested that strain partitioning is taking place within the crust; that is, fundamental strike slip motion that is occurring in the lower crust or upper mantle is being partitioned into strike slip and reverse faulting in the upper crust. The researchers see this region as possibly being analogous to the New Madrid seismic zone.

Strong Ground Motion Studies. The NRC continued to support six cost-sharing projects in ground motion studies conducted by the U.S. Geological Survey. In testing the consistency of several recent attenuation relationships in FY 1996, researchers found a good comparison between the Senior Seismic Hazard Assessment Committee (1995) and Atkinson and Boore (1990) relationships in analyzing ground motion characteristics at rock sites in the eastern United States from magnitudes 5.5 and 7.0 at distances of 20, 70, and 200 km. Likewise, there is a favorable comparison between the Frankel (1996) and EPRI A and B (1995) relationships at these magnitudes and distances. To study regional attenuation characteristics, National Seismographic Network earthquake recordings from northeastern United States and southeastern Canada, the midcontinent, the Basin and Range, and southern California were examined. The attenuation characteristics fell into two populations: (1) eastern United States and Canada and (2) Basin and Range and southern California. At high frequencies greater than 7.0 Hz, a good agreement exists between regional and teleseismic attenuation factors, but from 0.05 to 0.5 Hz variation is substantial.

Crustal Strain Measurements. Geodetic positions for the 45-station crustal strain network in the central and eastern United States were measured for the fourth time since 1987 in FY 1996, using the Global Positioning System (GPS). The network was greatly expanded through the availability of high-precision GPS networks operated by individual States and of stations continuously operated by the Coast Guard and the Corps of Engineers. Because very accurate orbits are now available for the GPS satellites and through the use of programs

simultaneously processing many stations, the accuracy of the measurements was much improved and is now reaching the subcentimeter level.

Probabilistic Seismic Hazard Analysis. In a continuation of the study to test and implement the new guidelines developed by the Senior Seismic Hazard Assessment Committee, started in FY 1995 (see the 1995 NRC Annual Report, p. 206), two workshops in seismic source characterization elicitation were held. The workshops led to new insights into expert elicitation procedures and showed that the technical facilitator/integrator (TFI) concept has great value. The new procedures, including extensive interaction between experts and the TFI, produced much greater agreement than was considered feasible. The experts were able to agree on a combined source zone map for the southeastern United States with some variation in boundaries to accommodate different views. In the future, this type of source map may replace the numerous and completely different source maps that were used for hazard analysis heretofore.

RULEMAKING

The final regulations on geologic and seismic siting criteria and earthquake engineering criteria for NPPs, Section 100.23 to Part 100 and Appendix S to 10 CFR Part 50, respectively, were published on December 11, 1996 (61 FR 65157), to be effective January 10, 1997. These regulations will replace the criteria in Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," to 10 CFR Part 100.

A final regulation (61 FR 41303) was published to incorporate by reference into 10 CFR 50.55a Subsections IWE, "Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Power Plants," and IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Power Plants," of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (see the 1995 NRC Annual Report, pp. 202–203). The regulation became effective on September 9, 1996.

Two additional rulemaking activities were completed in FY 1996. The first ensured the effectiveness of containment inspection practices and procedures; the second incorporated advancements in the earth sciences and earthquake engineering.

GENERIC SAFETY ISSUE RESOLUTION

In December 1983, the Commission approved a priority list of all generic safety issues (GSIs), including TMI-related issues. This list was prepared by the staff at the behest of the Commission and was based on the potential safety significance of each issue and the cost of implementation of a possible resolution.

Priorities of Generic Safety Issues. The NRC continued to use risk and cost data in implementing its methodology originally described in the 1982 NRC Annual Report for determining the priority of GSIs. In December 1983, a comprehensive list of the issues was published in "A Prioritization of Generic Safety Issues" (NUREG-0933). This list, which includes TMI Action Plan (NUREG-0660) items, has been generally updated semiannually, and supplements are issued in June and December. The results of the NRC's continuing effort to identify, prioritize, and resolve GSIs will be included in future supplements to NUREG-0933.

During FY 1996, the NRC identified 21 new generic issues, prioritized 17 issues (Table 10.1), and resolved 3 GSIs (Table 10.2). Table 10.3 contains the schedules for resolving the 17 GSIs that remained unresolved at the end of FY 1996.

Progress on GSI Resolution. None of the three GSIs resolved resulted in new requirements.

- **GSI 15**—The NRC found significant variability in the effect of radiation on reactor pressure vessel (RPV) support structures among plants because of the variety of RPV support designs, material properties, and fuel management procedures that affected the neutron flux and spectrum in the cavity. To encompass the uncertainties in the various analyses and provide an overall conservative assessment, RES conducted several structural analyses demonstrating that (1) postulating that one of four RPV supports was broken in a typical PWR, the remaining supports would carry the RPV load even under safe-shutdown earthquake loads and (2) if all supports were assumed to be totally removed (i.e., broken), the short span of piping between the RPV and the shield wall would support the load of the vessel. The results of the analyses virtually eliminated the concern for both radiation embrittlement and significant structural

Table 10.1 Issues Prioritized in FY 1996

Number	Title	Priority
172	Multiple System Responses Program	NEARLY RESOLVED
173.A	Spent Fuel Storage Pool: Operating Facilities	NEARLY RESOLVED
173.B	Spent Fuel Storage Pool: Permanently Shutdown Facilities	NEARLY RESOLVED
174.A	Fastener Gaging Practices: SONGS Employees' Concern	RESOLVED
174.B	Fastener Gaging Practices: Johnson Gage Company Concern	RESOLVED
175	Nuclear Power Plant Shift Staffing	RESOLVED
176	Loss of Fill Oil in Rosemount Transmitters	RESOLVED
177	Vehicle Intrusion at TMI	RESOLVED
178	Effect of Hurricane Andrew on Turkey Point	Licensing Issue
179	Core Performance	Licensing Issue
180	Notice of Enforcement Discretion	Licensing Issue
181	Fire Protection	Licensing Issue
182	General Electric Extended Power Update	Regulatory Impact
183	Cycle-Specific Parameter Limits in Technical Specifications	Regulatory Impact
184	Endangered Species	Environmental Issue
190	Fatigue Evaluation of Metal Components for 60-Year Plant Life	NEARLY RESOLVED
191	Assessment of Debris Accumulation on PWR Sump Performance	NEARLY RESOLVED

Table 10.2 Generic Safety Issues Resolved in FY 1996

Number	Title
15	Radiation Effects on Reactor Vessel Supports
24	Automatic Emergency Core Cooling System Switch to Recirculation
83	Control Room Habitability

Table 10.3 Generic Safety Issues Scheduled for Resolution

Number	Title	Priority	Scheduled Resolution Date
23	Reactor Coolant Pump Seal Failures	HIGH	04/97
165	Spring-Actuated Safety and Relief Valve Reliability	HIGH	06/98
171	Engineered Safety Features Failure from Loss of Offsite Power Subsequent to a LOCA	HIGH	06/97
78	Monitoring of Fatigue Transient Limits for Reactor Coolant System	MEDIUM	02/97
158	Performance of Safety-Related Power-Operated Valves Under Design Basis Conditions	MEDIUM	08/97
B-17	Criteria for Safety-Related Operator Actions	MEDIUM	06/97
B-55	Improve Reliability of Target Rock Safety Relief Valves	MEDIUM	08/97
B-61	Allowable ECCS Equipment Outage Periods	MEDIUM	01/97
145	Actions to Reduce Common Cause Failure	NEARLY RESOLVED	02/97
166	Adequacy of Fatigue Life of Metal Components	NEARLY RESOLVED	02/97
168	Environmental Qualification of Electrical Equipment	NEARLY RESOLVED	TBD
170	Reactivity Transients and Fuel Damage Criteria for High Burn-Up Fuel	NEARLY RESOLVED	TBD
172	Multiple System Responses Program	NEARLY RESOLVED	12/98
173.A	Spent Fuel Storage Pool: Operating Facilities	NEARLY RESOLVED	10/98
173.B	Spent Fuel Storage Pool: Permanently Shutdown Facilities	NEARLY RESOLVED	TBD
190	Fatigue Evaluation of Metal Components for 60-Year Plant Life	NEARLY RESOLVED	12/97
191	Assessment of Debris Accumulation on PWR Sump Performance	NEARLY RESOLVED	TBD

damage from a postulated RPV failure. A study of the neutron spectra at different HFIR pressure vessel surveillance locations was published in NUREG/CR-6117, "Neutron Spectra at Different High Flux Isotope Reactor (HFIR) Pressure Vessel Surveillance Locations," and the NRC's findings were

published in NUREG-1509, "Radiation Effects on Reactor Pressure Vessel Supports."

- GSI 24—An evaluation of the PRAs for four PWRs indicated that the conversion from manual to semi-automatic emergency core cooling system (ECCS) switchover to

recirculation would produce a small reduction in core damage frequency. This result was published in NUREG/CR-6432, "Estimated Net Value and Uncertainty for Automating ECCS Switchover at PWRs."

- GSI 83—A survey of the control rooms of operating plants was conducted with results published in NUREG/CR-4960, "Control Habitability Survey of Licensed Commercial Nuclear Power Generating Stations." As a result of this survey, NRC recognized that the methodology used to evaluate control room habitability system design needs improvement and activities were initiated to develop (1) improved methods for calculating control room dose and exposure levels; (2) improved meteorological models for use in control room habitability calculations; and (3) revised exposure limits to toxic gases for control room operators. The results of the improved methods were documented in NUREG/CR-5669, "Evaluation of Exposure Limits to Toxic Gases for Nuclear Reactor Control Room Operators," and NUREG/CR-6210, "Computer Codes for Evaluation of Control Room Habitability (HABIT)." The HABIT code was developed to provide an integrated code package for evaluating control room habitability. NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," provides updated source term information for the evaluation of control room designs.

Potential Loss of ECCS in BWRs Caused by LOCA-Generated Debris. As described in the 1995 NRC Annual Report, studies and experiments related to the potential for BWR emergency core cooling strainer blockage and loss of long-term core cooling capability have continued. The uncertainties associated with modeling the post-LOCA phenomena and the variability of U.S. BWR plant layouts and insulations employed have precluded arriving at a single generic solution to this safety issue. The staff and the U.S. BWR Owners Group (BWROG) have continued to exchange analytical and experimental findings to identify design options that are both appropriate and cost-effective. The NRC issued Revision 2 to Regulatory Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a

Loss-of-Coolant Accident," in May 1996. This regulatory guide was revised "to alter the debris blockage evaluation guidance for BWRs because operational events, analyses, and research results showed that the Revision 1 guidance was not comprehensive enough to evaluate a BWR plant's susceptibility to detrimental effects caused by debris blockage of suction strainers." Regulatory Guide 1.82, Revision 2, was a companion document to NRC Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors," issued in May 1996, which requested that licensees implement appropriate procedural measures and plant modifications to minimize the potential clogging of suppression pool suction strainers (Fig. 10.9). NUREG/CR-6224, "Parametric Study of the Potential for BWR ECCS Strainer Blockage Due to LOCA Generated Debris," issued in October 1995, documents the uncertainties introduced by postulated post-LOCA phenomena and plant design features. Research results reported in NUREG/CR-6368, "Experimental Investigation of Sedimentation of LOCA-Generated Fibrous Debris and Sludge in BWR Suppression Pools," issued in December 1995, and NUREG/CR-6367, "Experimental Study of Head Loss and Filtration of LOCA Debris," issued in February 1996, were also used to revise Regulatory Guide 1.82. Research in support of concluding the resolution of this issue is continuing.

REACTOR REGULATORY STANDARDS

Developing and Improving Regulations

The NRC over the last several years has focused on improving and streamlining both the body of NRC regulations and regulatory guidance, as well as the regulatory process. While a number of initiatives are continuing, a significant body of actions have been concluded or are nearing

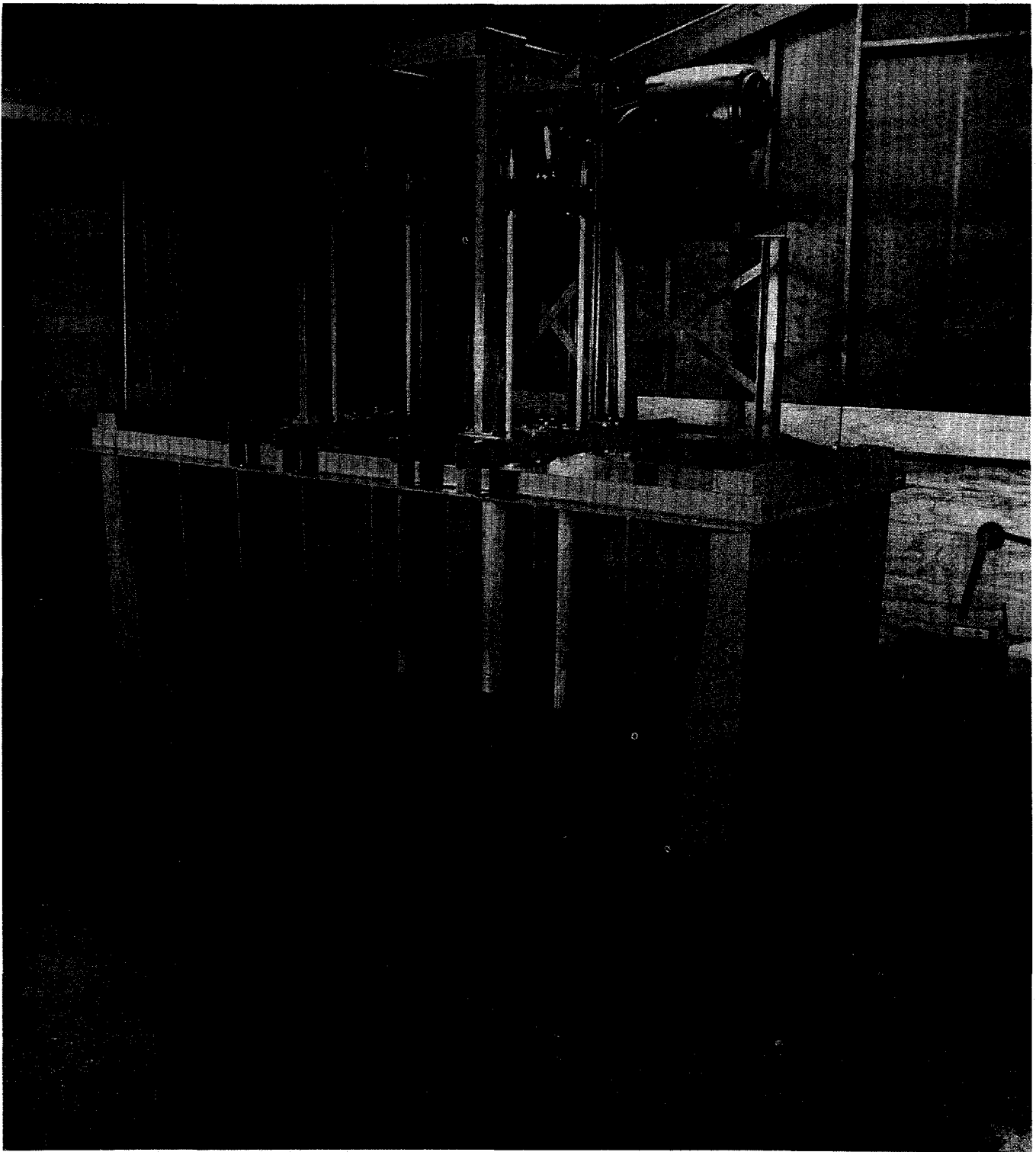


Figure 10.9 Suppression Pool Sedimentation Test Rig

completion, including updating the Rulemaking Activity Plan, revising the Regulatory Analysis Guidelines, and the Marginal-to-Safety Program.

Rulemaking Improvement Initiatives. The NRC has fully implemented Management Directive 6.3, which provides revised new procedures that make the rulemaking process more efficient. These procedures have been published for staff use. They include more rigorous up-front planning using rulemaking plans, an increased use and focus on management rulemaking database tracking systems, use of electronic bulletin boards in rulemaking, a revised concurrence process, procedures for early feedback from Agreement States on proposed rules, and increased use of management steering groups. In conjunction with use of this procedure, the Commission has approved continuing the NRC Rulemaking Activity Plan. This plan provides a mechanism to determine whether previously initiated rulemakings or rules being contemplated should be continued, be redirected, or be terminated based on safety benefit and cost. The plan also provides priorities for all ongoing and planned rules to allow effective allocation of resources consistent with Commission policy.

In addition to operating an electronic rulemaking bulletin board on FedWorld, the NRC is now providing INTERNET access to its rulemakings published for comment. Information about each rulemaking, copies of *Federal Register* notices, supporting documents, and comments received are all accessible for viewing and downloading from NRC's INTERNET Home Page.

The NRC, using existing NRC hardware and software, has developed an Internet-based, agencywide PC application to facilitate electronic tracking and review of, and concurrence in, RES rulemaking packages. Commission papers, *Federal Register* notices, and all supporting documentation normally comprising a rulemaking package are available for viewing and downloading onto the user's local WordPerfect system. In addition to allowing the reviewing offices to view, comment, and concur electronically, this application will provide an electronic record of the entire process.

RES believes this application can be a cost-effective means of providing simultaneous distribution of rulemakings for concurrence and comment. This application will save paper and will satisfy version control, work flow, concurrence

distribution, and concurrence tracking needs. However, this application is not yet available throughout the agency.

Researchers widely accept that leading-edge scientific and engineering expertise has a half-life of less than 10 years. As one of a number of initiatives to maintain and renew professional expertise in RES, the office has instituted a technical seminar series to inject new ideas and stimulate research-oriented thinking of RES staff. The topics are of scientific and engineering relevance to the agency's mission although not necessarily focused on any specific technical regulatory issue. These seminars will be conducted periodically, depending upon the availability of the selected lecturers.

Revising Regulations for Which Exemptions Are Granted to Current Regulations. The NRC has identified 11 rulemaking actions that will reduce the present and future need for granting recurring exemptions. Nine of these rulemaking actions are included in the NRC Rulemaking Activity Plan and are scheduled for future revision. Two of the rulemaking actions previously listed were dropped because (1) the rulemaking to minimize exemptions to 10 CFR 50.55a is not now considered necessary because it was subsumed into the PRA Implementation Plan and (2) the rulemaking to change various parts of the regulations to modify the definition of decommissioning has been subsumed into the rulemaking activity for license termination.

Marginal-to-Safety Program. This program was the agency's continuing effort to eliminate or modify regulations that are marginal to safety or impose a substantial regulatory burden on licensees. The last remaining effort under this program involves an industry petition for rulemaking (PRM) to revise the fire protection requirements in Appendix R to 10 CFR Part 50. A paper has been sent to the Commission proposing a performance-based rule supported by regulatory guidance to provide flexibility and opportunity to incorporate technological advances not readily afforded under the current framework.

Environmental Justice. The NRC developed a procedure for implementation of environmental justice in the NRC rulemaking process. To ensure consistency among the NRC offices, the procedure calls for a revision of the NRC Regulations Handbook (NUREG/BR-0053) to include recom-

mended language to be used in *Federal Register* notices and in new sections in environmental assessment documents and environmental impact statements. Implementation of the procedure has begun, and it was transmitted to the Environmental Justice Interagency Working Group on February 12, 1996.

Regulatory Analysis Guidelines. In FY 1996, the NRC published "Regulatory Analysis Guidelines of the U. S. Nuclear Regulatory Commission," NUREG/BR-0058, Revision 2. One of the more significant policy shifts in the new guidelines involves a revision in the dollar per person-rem conversion factor. The guidelines now recommend the use of a \$2000 per person-rem conversion factor, subject to present worth considerations, and limit its scope solely to health effects. Details on the basis and implications of the new conversion factor policy are provided in "Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy," NUREG-1530, issued in December 1995.

Reactor Rulemakings

On June 5, 1996 (61 FR 28467), the Commission issued a final rule and a supporting generic environmental impact statement (GEIS) concerning the environmental review for renewal of NPP operating licenses (10 CFR Part 51). The rule facilitates relicensing and saves resources by providing for generic resolution of a number of environmental impacts of relicensing, including a low-level waste confidence finding.

On June 14, 1996 (61 FR 30129), the Commission issued a final rule to provide greater flexibility in the licensee's activities associated with the annual "off-year" exercise, while continuing to enable States and local governments in plume pathways to participate in exercises and drills (10 CFR Part 50). This rule also responds to PRM-50-58.

On July 9, 1996 (61 FR 35935), the Commission issued a direct final rule to delete the procedure for making the determination that adequate spent nuclear fuel storage capacity cannot be adequately provided at a reactor site (10 CFR Part 53).

On February 22, 1996 (61 FR 6762), the Commission issued a final rule to update regulations regarding notices to workers and employee protection (10 CFR Parts 19, 30, 40, 60, 61, 70, and 72).

On August 22, 1996 (61 FR 43406), the Commission issued a direct final rule to provide two minor changes to remove requirements for licensee response to Notice of Violation in cases where the licensee has adequately addressed the issue and removed all references to 10 CFR Part 2, Appendix C, and Parts 2 and 51.

On January 31, 1996 (61 FR 3334), the Commission issued a proposed rulemaking for comment to add 10 CFR 20.2205, unauthorized use of licensed radioactive materials involving intentional acts resulting in exposure of individuals (10 CFR Part 20).

On September 30, 1996 (61 FR 51835), the Commission issued a proposed rulemaking for comment to put applicants for NRC licenses and other unlicensed persons doing work for applicants on notice that they may be subject to enforcement action under the Commission's existing regulations regarding deliberate misconduct (10 CFR 30.10, 40.10, 50.5, 60.11, 61.9b, 70.10, 72.12, 76.10, and 110.7b). The current regulations require that all information submitted to the Commission be complete and accurate. This proposed rulemaking would correct an apparent oversight from when the Deliberate Misconduct rule was adopted in 1991 and make that rule apply to applicants and to their employees, contractors, and subcontractors, including consultants.

REACTOR RADIATION PROTECTION AND HEALTH EFFECTS

The NRC maintains a program of research and standards development for both reactor and materials licensees and for radiation protection and health effects intended to ensure continued protection of workers and the public from radiation and radioactive materials in connection with NRC-licensed activities. The program includes radiation protection and health effects regulations, improving health physics measurements, identifying and disseminating cost-effective dose reduction techniques, assessing health effects consequences of postulated reactor accidents, and monitoring health effects research.

Brookhaven National Laboratory ALARA Center. Funded by the NRC, the Brookhaven National Laboratory (BNL) ALARA Center continued its surveillance and dissemination of DOE and industry dose reduction and as low as is reasonably achievable (ALARA) research. This work includes abstracting national and international publications that discuss dose reduction in areas such as plant chemistry, stress corrosion cracking, steam generator repair and replacement, robotics, and decontamination. BNL continued publishing the newsletter, "ALARA Notes," on about a quarterly schedule. In 1996, BNL focused on expanding the database, which now uses an easily accessible on-line fax system, and added information from overseas contacts as well as expanding U.S. participation.

In March 1996, BNL published the ALARA Center Handbook, a compilation of data and procedures intended to assist licensees, particularly at NPPs, with occupational dose radiation activities.

In a related effort, BNL published a fourth report on health physics aspects of using the new radio-labeled antibodies (NUREG/CR-6374, "Whole-Body Effective Half-Lives for Radiolabeled Antibodies and Related Issues"). The report looks at all the data on eliminating tagged monoclonal antibodies and provides useful guidance on the release of patients.

Occupational Exposure Data Systems. The NRC continued to collect and process data in the computerized data system called the Radiation Exposure Information Reporting System (REIRS), which provides a permanent record of worker exposures for reactors and several other categories of licensees. The database also includes exposure data on individuals who have terminated employment with certain licensees. Data on some 700,000 individuals are in the system, most of whom worked at NPPs. The NRC continued to respond to requests for individual exposure data from the system. The data also assist in examining the doses incurred by transient workers as they move from plant to plant. A report on 1995 exposures, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities—1995" (NUREG-0713, Volume 17), will be issued in January 1997. Compilation of the statistical reports indicated that approximately 143,684

individuals were monitored during 1995 and 77,737 received a measurable dose. The average measurable dose rise was 0.32 rem (cSv) for 1995. The collective dose obtained from summing all the individual doses was 24,884 person-rem (person-cSv).

Decontamination of Reactor Coolant Systems. NUREG/CR-6494, "Continuous Analysis for Vanadium in LOMI Decontamination," was published in December 1996. This work developed an on-line titrimeter for use during the LOMI decontamination of reactor coolant systems based on the ferric ion concentration in solution.

STANDARD REACTOR DESIGNS

Systems Performance of Advanced Designs

SUPPORT FOR AP600 DESIGN REVIEW

Confirmatory testing and analysis of the Westinghouse AP600 reactor and plant systems are being carried out to reinforce confidence in the NRC's evaluation of the safety of the AP600 design. The testing is taking place in two different scaled facilities—the 1/30-scale Rig of Safety Assessment (ROSA) facility in the Japan Atomic Energy Research Institute and the 1/200-scale Oregon State University (OSU) facility.

Phase II of the ROSA AP600 tests began in December 1996. Six tests will be conducted to understand the AP600 behavior during abnormal events involving multiple system failures. Testing continued at the OSU test facility. These tests are to examine the performance of passive safety features of the AP600 design during events more severe than design-basis accidents.

The results of both confirmatory testing programs suggested that the core would be effectively cooled for a variety of accident conditions and would always be covered with either a single-phase liquid or two-phase mixture.

A best-estimate computer code, RELAP5/MOD3.2, is being assessed against the test data for validation and the ultimate application to the AP600 plant.

A frozen version of RELAP5/MOD3.2.1 was transmitted to NRR for use in auditing AP600 vendor calculations. This version includes major changes and updates needed to perform AP600 analyses and to correct known deficiencies. Also provided to NRR was an updated version of the CONTAIN code and an input deck for analyzing the AP600 design.

RELAP5 input models were developed for long-term cooling analysis following small-break LOCAs in the AP600 design and in the OSU test loop. These models have been compared against OSU and AP600 transient tests, and the results show excellent agreement.

As reflected in ROSA and OSU facilities, the AP600 safety systems appear to perform as designed, showing no evidence of core heatup for a variety of accident conditions.

An experimental program was started in FY 1995 to examine the performance of passive autocatalytic recombiners (PARs), including their startup characteristics and the effect of steam on PAR performance. The first series of tests was conducted during FY 1996, and additional tests will continue in FY 1997. Preliminary results indicate that (1) PARs start recombining oxygen with hydrogen at concentrations below 1.0 volume percent hydrogen and (2) PARs can ignite hydrogen mixtures under certain conditions. The research on PARs is being conducted in support of the AP600 design certification, for which Westinghouse has proposed the use of PARs to control combustible gases in the containment following a design-basis LOCA.

SUPPORT FOR SIMPLIFIED BOILING WATER REACTOR DESIGN REVIEW

Following the cancellation of the Simplified Boiling Water Reactor (SBWR) certification, the support for the SBWR design review was terminated. However, the PUMA (Purdue University Multi-Dimensional Integral Test Assembly), an integral BWR test facility, will be used for investigating a broad spectrum of thermal-hydraulic phenomena in BWRs. It is a low-pressure (150-psi),

1/4-height facility. Scaling analysis and facility design were completed in 1994, and the facility construction was completed at Purdue University in September 1995. Shakedown tests were completed, and a total of approximately 30 tests will be performed.

The PUMA data will be used to (1) assess the capabilities of the thermal-hydraulic RELAP5 code for BWR analysis, (2) assess the integral performance of the BWR-unique safety systems that maintain core and containment cooling, and (3) identify and understand the important phenomena observed in the tests.

UPDATE OF SITING REGULATIONS

In FY 1996, the staff completed updating 10 CFR Part 100, "Reactor Site Criteria." A proposed final rule was provided to the Commission for its approval. This proposed final rule incorporates basic reactor site criteria and continues the use of source term and dose calculations for siting plants. This rule should be published in early FY 1997.

MATERIALS USERS

Nuclear Materials Research and Regulation Development

MATERIALS RESEARCH

Work continued on the development of methods to estimate the public risk associated with industrial sealed sources containing radioactive material (e.g., nuclear density, thickness, and moisture gauges) that are not individually licensed.

MATERIALS REGULATORY STANDARDS

On May 16, 1996 (61 FR 24669), the Commission issued a final rule to identify disposition of certain records when a licensee terminates licensed activities or licensed activities are transferred to another licensee (10 CFR Parts 20, 30, 40, 61, 70, and 72).

On December 13, 1995 (60 FR 63984), the Commission issued a proposed rulemaking for comment to provide a constraint level for air emission of radionuclides of 10 mrem per year, similar to the program developed pursuant to 10 CFR Part 50, Appendix I, for power reactors. The amendment would apply to NRC licensees other than power reactor licensees. This action is part of an ongoing effort to develop a basis for revision of the Environmental Protection Agency's regulations in 40 CFR Part 61.

On June 18, 1996 (61 FR 30893), the Commission issued a proposed rulemaking for comment to clarify reciprocity provisions for Agreement State licensees in areas of exclusive Federal jurisdiction (10 CFR 150.20).

On January 21, 1996 (61 FR 1857), a PRM from Measurex Corporation (PRM-150-3) was denied. The petitioner requested that the Commission amend its regulations governing Agreement State regulation of byproduct material to require that Agreement States notify the NRC of all proposed and completed regulatory actions and to require that the NRC publish Agreement State notices of proposed and completed rulemaking.

DECOMMISSIONING/RADIONUCLIDE TRANSPORT

Radiological Criteria for License Termination. During the past year, significant and continued progress has occurred in identifying and resolving issues concerning implementation guidance, cleanup costs, and technical feasibility that affect the final rule for radiological criteria for license termination. A series of three NUREG-series reports published for public comment on proposed measurement and evaluation methodologies formed the basis for a draft Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), published for public comment in December 1996. MARSSIM is expected to become a Department of Defense, DOE, Environmental Protection Agency (EPA), and NRC consensus document describing an acceptable measurement and evaluation methodology. The survey methodology was tested at real sites and was found to be adequate to determine that these sites would meet the dose criterion in the proposed rule. A tabletop exercise in January provided insights about the difficulty of determining background at a site with

thorium contamination. The survey methodology was then tested at a thorium site and found to be adequate for the conservative conditions and restraints required to be evaluated. Parameter analyses were performed to quantify the uncertainty associated with the selection of default parameters for the generic site modeling. An interim version of the pathway analysis software was released to the public in July 1996. Revised guidance and cost information was developed, including ground water, using data from real sites to support the final GEIS and the final rule. NRC coordinated with EPA regarding the EPA's proposed rule for radiological cleanup of radioactivity-contaminated sites and briefed the Office of Management and Budget (OMB) on the impact of the EPA rule. The EPA rule was withdrawn in December 1996.

DECOMMISSIONING RULEMAKINGS

On July 29, 1996 (61 FR 39278), the Commission issued a final rule to enhance efficiency and flexibility in the decommissioning process by allowing limited withdrawals from the decommissioning fund and to conduct decommissioning activities under 10 CFR 50.59 for permanently shutdown reactors.

On April 8, 1996 (61 FR 15427), the Commission issued an advance notice of proposed rulemaking for comment to modify the financial assurance requirements for decommissioning NPPs under certain circumstances (10 CFR 50.2 and 50.75).

RADIONUCLIDE TRANSPORT AND BEHAVIOR IN THE ENVIRONMENT

Planning was started for a radionuclide transport research program to address issues concerning exposure of the public resulting from planned or unplanned release of regulated radioactive materials to the environment. Initial focus will be on decommissioning of facilities, cleanup of contaminated sites, reclamation of uranium mill and tailings disposal sites, spent fuel storage, and disposal of nuclear waste. The field, laboratory, and analytical studies were identified as high-priority activities in the areas of source term, engineered barriers, transport process, pathways, and performance assessment. Much of the work is conducted, using a combination of (1) studies of existing models and data; (2) contracts with universities and national laboratories for appropriate field and

laboratory investigations; (3) partnership with other Federal agencies, research institutes, and universities; and (4) international cooperative agreements.

CRITICALITY AND FUEL CYCLE SAFETY

The Oak Ridge National Laboratory (ORNL), funded by the NRC, has completed its development of a slide rule for estimating nuclear criticality information. This slide rule may be used to provide useful information in the estimation of potential fission yields for homogeneous fissile material solutions. It also provides a readily available nuclear criticality accident emergency evacuation/response tool that addresses potential accidents at NRC-licensed fuel facilities.

The ORNL, funded by the NRC, continued its criticality software studies. The importance of software (methods and data) in establishing the criticality safety of systems with fissile material is increasing as licensees work to optimize facilities and storage/transport packages at the same time that access to experimental data is decreasing. The studies are intended to help ensure that adequate tools and guidance or criticality safety software is in place for licensing. Regulatory Guide 3.4, "Nuclear Criticality Safety in Operations with Fissionable Materials at Fuels and Materials Facilities," and ANSI Standard 8.1, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," require that analytical methods and nuclear data used to predict the subcritical margin of a system be validated against critical experiments in order to establish the calculational bias and uncertainty. As part of this research project with ORNL, the NRC is acquiring

critical experimental data from Russia as criticality benchmarking data in the United States in the area of interest are limited (Figs. 10.10 and 10.11). Acquisition of these data will permit the testing of U.S. code/data areas of applicability and sensitivity methods as they relate to very poorly moderated lattices of low-enriched uranium. Such configurations are similar to fuel fabrication environments of fuel pellets or rods, stacked and placed on horizontal storage racks, that are computationally evaluated for inadvertent water moderation.

Accurate cross-section data are crucial components of a criticality safety analysis. Currently, only one complete software package processes data from the Evaluated Nuclear Data File to a format for use by criticality safety codes. To help provide independence in this crucial area, this project will also upgrade the AMPX code system at ORNL to enable independent processing, using state-of-the-art procedures.

The Los Alamos National Laboratory, funded by the NRC, completed examination and revision of TID-7016, "Nuclear Safety Guide," Revision 2, for simplification of use, evaluation against new experimental data, and use of current computational codes. The document is a standard guide and reference used by industry and the Office of Nuclear Materials Safety and Safeguards (NMSS) staff for criticality safety evaluations. During the revision process the title was changed to "Nuclear Criticality Safety Guide" (LA 12808) to better reflect the scope of the document. This new document corrects all known errors in the previous TID 7016 series and incorporates many changes that have been suggested by the criticality safety community.



Figure 10.10 View Into the SK-Physical Critical Assembly Core and Control Rod Drive at the Russian Research Center Kurchatov Institute. Criticality studies of extremely tight critical lattices of UO_2 rods were performed at enrichments greater than 5' and less than about 10-weight percent U-235.

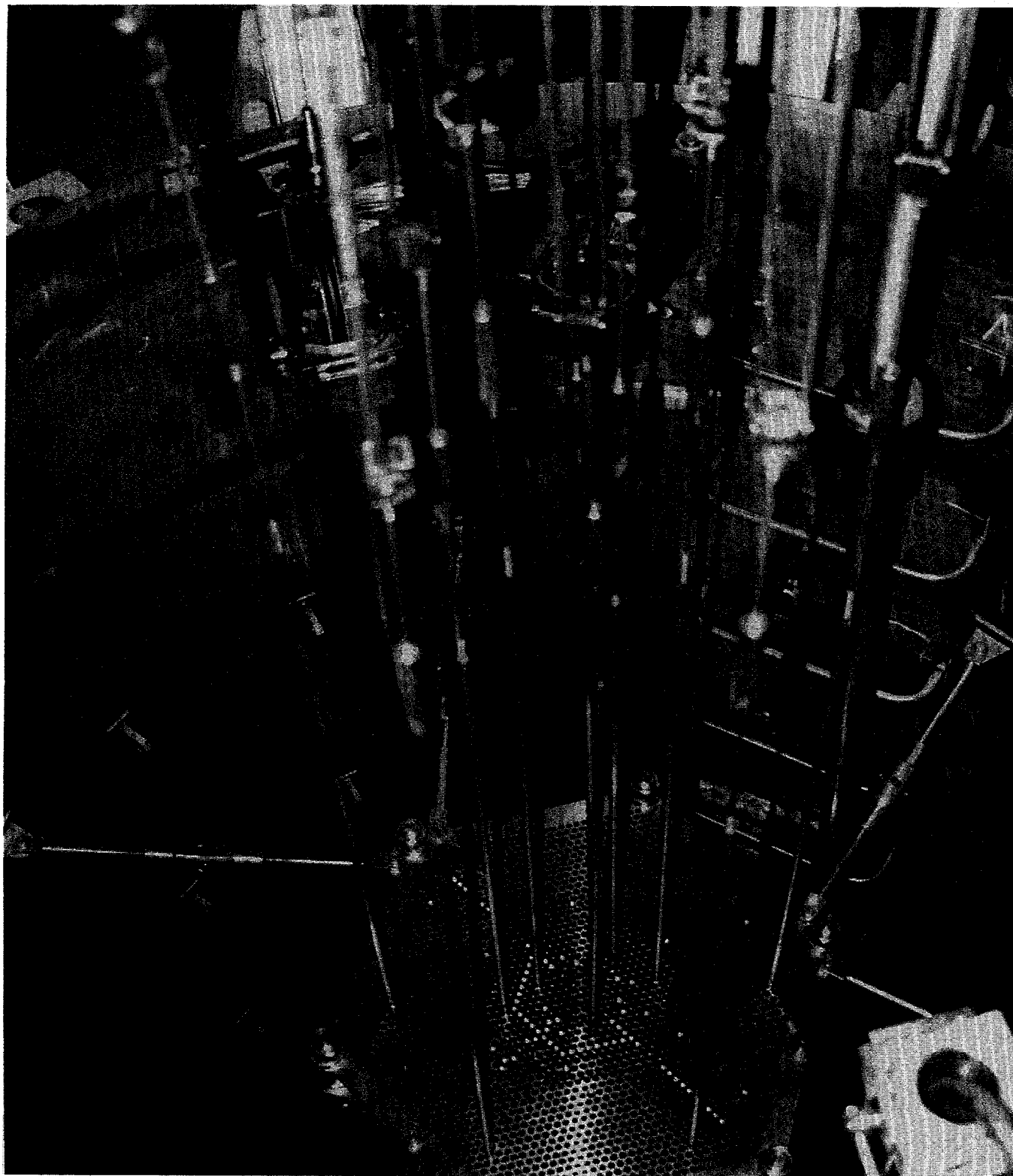


Figure 10.11 View Into Core of SK—Physical Critical Assembly With Top Grid Plate at Kurchatov Institute

Chapter 11

NRC
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Proceedings and Litigation

PROCEEDINGS AND LITIGATION

Chapter 10 covers significant activities, proceedings, and decisions of the NRC's Atomic Safety and Licensing Boards (ASLBs) and noteworthy decisions of the Commission in its appellate review of Atomic Safety and Licensing Board Panel (ASLBP) decisions. This chapter includes a judicial survey of important litigation involving the NRC during Fiscal Year (FY) 1996.

OFFICE OF THE SECRETARY

The Secretary of the Commission manages the official NRC adjudicatory dockets for the Commission. The adjudicatory dockets contain the filings of all parties to the Commission's licensing and enforcement proceedings, transcripts of the hearings held in each case, and all orders and decisions issued in such proceedings by the Commission or its ASLBs. The Secretary also serves Orders of the Commission and the ASLBs on the parties to proceedings and certifies docket indexes to the courts in agency litigation.

ATOMIC SAFETY AND LICENSING BOARDS

Adjudicatory hearings at the Nuclear Regulatory Commission are conducted by three-member licensing boards or single presiding officers drawn from the ASLBP. A total of 678 cases has been filed since the first licensing board case began on November 9, 1962.

The agency's regulations provide the opportunity for numerous types of hearings. Panel judges hear and decide a variety of cases. The most significant to the licensing process concern reactor licensing where, as provided by the Atomic Energy Act of 1954, as amended by the Energy Reorganization Act of 1974 and the Energy Policy Act of 1992, a hearing is required on every application for a combined construction permit and operating license for a nuclear facility that produces electric power; *reactor license amendments* that allow affected parties to challenge proposed license amendments for nuclear reactors; *materials licensing* that allows affected persons to contest NRC licensing actions involving the commercial use of nuclear materials; and *enforcement hearings* that allow individuals, employees, licensees, contractors, subcontractors, and vendors to contest penalties brought against them by the NRC staff for alleged infractions of NRC regulations. Other hearings concern *antitrust* cases that allow affected parties to challenge the licensing of nuclear reactors if the operation of such reactors would create or maintain a situation inconsistent with the antitrust laws; *special proceedings* that can be ordered by the

Commission for any nuclear-related matter; *personnel-related disputes* in which NRC employees are allowed to bring grievance cases and Equal Employment Opportunity cases before Panel judges or other forums; and *Program Fraud Civil Remedies hearings* that allow NRC employees and other individuals to contest NRC action against them for alleged fraudulent claims made to the NRC.

The Panel's judges are lawyers or technical members with expertise in a wide variety of disciplines. Their appointment to the Panel is based upon recognized experience, achievement, and independence in the appointee's field of expertise. During FY 1996, the Panel comprised 33 administrative judges (12 full-time and 21 part-time). By profession, they included 7 lawyers, 10 public health and environmental scientists, 13 engineers or physicists, and 3 medical doctors. (See Appendix 2 for a list of the names and the disciplines of Panel members.)

The Panel's licensing boards consist of three administrative judges, usually one legal member and two technical members. The Chief Administrative Judge assigns individual judges to particular hearings where their professional expertise will assist in resolving the technical and legal matters at issue in the proceeding. Some contested matters may be heard by a single administrative judge or administrative law judge from the Panel. The Panel's policy in one-judge proceedings is to assign a legal or technical administrative judge from the Panel as an assistant to the presiding administrative judge, thereby maintaining the vital level of expertise associated with the traditional three-member licensing boards.

Hearings at the NRC may be either formal or informal. The formal proceedings consist of procedures similar to those used in non-jury Federal court cases, including pretrial discovery between the parties and formal trial procedures at the hearing. Formal procedures traditionally have been used at the NRC in cases involving the licensing of reactors and for enforcement proceedings brought by the agency against individuals and licensees. Informal hearing procedures are authorized in matters affecting one of the agency's more than 6,000 materials licensees. While the deliberative process for judges remains the same under either type of

hearing, informal hearings involve significantly different procedures for developing the record upon which decisions must be based. The principal differences include the use of a single administrative judge (rather than a three-judge board) acting as presiding officer, written submittals by the parties instead of an oral evidentiary hearing on the record, and, if the presiding officer determines it to be necessary after considering the written submittals, oral presentation by the parties subject to questioning by the presiding officer.

Panel judges routinely actively encourage settlement of their cases. To this end, they remind parties of settlement opportunities throughout the proceedings, they foster a free exchange of ideas and information among the parties conducive to the amicable resolution of differences, and, when appropriate, they utilize dispute resolution techniques to encourage negotiated settlements.

Panel Caseload

In FY 1996, the Panel's caseload comprised 29 proceedings. Of these, 12 involved nuclear power plants or related facilities and 17 involved other Commission licensees. Additionally, 17 cases were closed and 9 new cases were docketed.

The Panel's 1996 caseload primarily involved enforcement actions against licensees, contested license amendment proceedings for power reactors, and nuclear materials licensing proceedings. Over the next several years, the Panel expects an infusion of new proceedings involving decommissioning, license extension of existing reactors, and interim storage for high-level waste.

During 1996, the particularly significant proceedings involved Georgia Power Company's Vogtle reactor, Gulf States Utilities Company's River Bend reactor, and Louisiana Energy Services' proposed enrichment facility to be built in Claiborne, Louisiana. *Vogtle* involved a contention by a former plant employee that new owners and individuals assuming operational control of the reactor lacked the necessary character and integrity to be relied upon for its proper operation. Following over 22 weeks of hearings, and on the eve of the board's issuance of

a lengthy Decision and Final Order, Georgia Power and the former employee agreed to a settlement. Because they settled, the board did not issue its Decision and Order. *Georgia Power Company* (Vogle Electric Generating Plant, Units 1 and 2), LBP-96-16, 44 NRC 59 (1996).

As in *Vogle*, the Panel's *River Bend* proceeding also involved an application to transfer ownership and operating control of the reactor to a new operator and owner. The facility's co-owner had claimed that the reactor's safety could be undermined because the new operators might be underfunded. The prehearing, discovery, and summary disposition phases of this highly contested proceeding were complex and lengthy, involving important financial qualifications and jurisdictional issues. The case was terminated in March 1996 after the co-owner went into bankruptcy and had to withdraw its intervention. *Gulf States Utilities Company* (River Bend Station, Unit 1), LBP-96-5, 43 NRC 135 (1996).

Louisiana Energy Services involved a construction permit application to build a gas centrifuge uranium enrichment facility. A public interest group opposing the facility raised contentions pertaining to emergency preparedness, unauthorized production of enriched uranium, financial qualifications, need for power, decommissioning, disposal of nuclear waste, and environmental justice. In FY 1996, the board issued a 114-page Partial Initial Decision on the emergency preparedness and unauthorized production contentions. A decision on the remaining contentions was pending at fiscal year's end. *Louisiana Energy Services* (Claiborne Enrichment Center), LBP-96-7, 43 NRC 142 (1996).

Several well-publicized, high-profile cases also were handled by boards in FY 1996. In the Panel's *Georgia Tech* proceeding, public interest was generated on the eve of the 1996 Olympic Games held in Atlanta, Georgia, after a local organization claimed that security at the university's research reactor was inadequate to prevent its sabotage during the games. Before the hearing, this contention became moot, following voluntary removal by the university of fuel from the reactor during the pendency of the games. *Georgia Institute of Technology* (Georgia Tech Research Reactor), LBP-95-19, 42 NRC 191 (1995).

Hearings were subsequently held concerning the adequacy of the reactor's management, for which a decision is now pending. A portion of the management contention involved alleged security infractions at the reactor filmed by a Fox TV camera crew and later aired on national television on the program titled *A Current Affair*.

The Panel's *Millstone* proceeding contained many of the same allegations as those that were presented in the controversial March 4, 1996, front page cover story in *Time Magazine* involving the NRC. That proceeding was terminated by the licensing board on April 15, 1996, after withdrawal by the petitioners. *Northeast Nuclear Power Company* (Millstone Nuclear Power Station Unit 1), LBP-96-6, 43 NRC 140 (1996).

The Panel's *Yankee Atomic* case also was high-profile. The Commission referred the proceeding to a licensing board with instructions for an expedited hearing after the United States Court of Appeals for the First Circuit found that the Commission had erred in not allowing hearing opportunities for challenging the decommissioning plan of the Yankee Atomic reactor. The board initially ruled that none of the groups' contentions were admissible, but subsequently allowed one contention for hearing that was later resolved by summary disposition after completion of the discovery phase of the proceeding. *Yankee Atomic Electric Company* (Yankee Nuclear Power Station), LBP-96-2, 43 NRC 61 (1996); LBP-96-15, 44 NRC 8 (1996); LBP-96-18, 44 NRC 86 (1996).

During the year, licensing boards and presiding officers also ruled on a number of important procedural issues involved in docketed Panel cases. These issues included the following:

STANDING TO INTERVENE IN NRC PROCEEDINGS

Several decisions involved the issue of "standing to intervene." Before allowing a petitioner to intervene as a party in an NRC adjudicatory proceeding, the petitioner must demonstrate that it will be adversely affected by the licensing action in question. In reactor construction permit and operating license proceedings, Commission case law establishes that persons who live, work, or otherwise have contact within the area around a nuclear plant have standing to intervene since they

are presumed, at least in some small way, to be adversely affected by an accident involving the plant. In the *Millstone* proceeding, the licensing board found a proximity presumption for an individual living within 20 miles of the plant even though the potential accident in question involved only an increase in heat load in the spent fuel pool rather than potential problems with the entire plant. The licensee claimed that there was no potential for offsite injury. In finding standing, the board reasoned that the petitioner's allegations must be construed in the petitioner's favor and that off-loading and storage of a full fuel core has some potential for offsite consequences. The board noted that it would not determine the essential validity of the asserted facts in ruling on intervention petitions. *Northeast Nuclear Energy Co. (Millstone Nuclear Power Plant, Unit No. 1)*, LBP-96-1, 43 NRC 19 (1996).

In this same *Millstone* decision, the board also ruled on an organization's attempt to gain standing through its individual members. An affidavit of one member stated that eleven other members had authorized the organization to represent them. Because the eleven others had not submitted individual affidavits authorizing this representation, the board found that the organization lacked authorization to represent them. According to the board, members who wished to be represented must themselves give "concrete indication" that representation of their interests is authorized. *Northeast Nuclear Energy Co. (Millstone Nuclear Power Plant, Unit No. 1)*, LBP-96-1, 43 NRC 19 (1996).

WITHDRAWAL OF INTERVENORS FROM NRC PROCEEDINGS

Gulf States Utilities Company (River Bend Station, Unit 1), LBP-96-5, 43 NRC 135 (1996), provided a first-impression analysis of an intervening electric cooperative's voluntary withdrawal from a hearing owing to financial duress. The board allowed the cooperative to withdraw without prejudice, thus granting the cooperative an opportunity to renew its claims at some later date. In so ruling, the board concluded that the public interest arguably might be served if the cooperative later could establish that additional financial assurances were needed for the River Bend reactor. The board also reasoned that it was unfair to impose a form of punishment,

such as a bar of future action, against an intervenor whose decisions were being directed by a person (the bankruptcy trustee for the cooperative) with legal responsibilities other than those that supported the original petition.

NRC AUTHORITY TO OVERSEE AGREEMENT STATE PROGRAMS

As part of its regulatory program over the nuclear industry, the NRC has entered into formal agreements with a number of States (referred to as Agreement States), allowing them to assume regulatory responsibility over byproduct, source, and small quantities of special nuclear materials. In *Georgia Institute of Technology* (Georgia Tech Research Reactor), LBP-95-19, 42 NRC 191 (1995), an important jurisdictional issue arose concerning whether the NRC can override an Agreement State's authority once it has turned control over to the State. A local public interest group in the proceeding had challenged the physical security of Georgia Tech's nuclear reactor during the 1996 Summer Olympic games, contending that it could be subject to terrorist attack. To alleviate this security concern, after the hearing began, Georgia Tech agreed to remove all nuclear fuel from the reactor during the games. However, the removal did not include evacuation of 250,000 curies of Cobalt-60 that were also present at the facility. The facility's nuclear fuel was regulated by the NRC while the Cobalt-60 was regulated by the State of Georgia. The intervenor wanted both removed. The board found that the NRC does not have dual or concurrent jurisdiction over materials that have become subject to Agreement State regulation, but it does have authority to override a State's nuclear regulatory authority when the State is not adequately protecting the health and safety. In this case, because no evidence was presented showing inadequate protection, the board refused to further consider the cobalt-60 contention.

CIVIL PENALTIES

In a civil penalty proceeding involving a medical center in New Jersey, a licensing board determined that it could consider the amount of penalties levied in other similar NRC civil penalty actions in determining the amount that could be levied against the medical center. The medical center alleged that the penalty assessed against it

was far greater than penalties assessed in similar cases. The staff claimed that it may exercise individual discretion in each case, and that it is not obliged to justify differences in other cases. Although recognizing the staff's broad discretionary authority, the board concluded that comparing results in other cases may be relevant in determining whether staff has abused its authority. The board noted that differing circumstances in other cases may sometimes explain seemingly disparate penalties. *Radiation Oncology Center At Marlton*, LBP-95-25, 42 NRC 237 (1995).

SUBMISSION OF CONTENTIONS OUT-OF-TIME

To participate as a party in an NRC proceeding, an intervenor must submit at least one acceptable contention for litigation. Out-of-time contentions will not be accepted without meeting certain criteria, principal among which is demonstrating good cause for being late. In *Yankee Atomic Electric Company* (Yankee Nuclear Power Station), LBP-96-15, 44 NRC 8 (1996), the board employed flexibility in administering the lateness criteria when it admitted a late contention even though most of the documents upon which the contention relied had been available for several years. The board found good cause for the untimeliness because, as a cumulative matter, the separate pieces of the information puzzle found in the earlier documents were not sufficiently in place to make the concerns espoused in the contention reasonably apparent until later information had become known.

DISCRETIONARY INTERVENTION

In the *Millstone* proceeding, a regional public interest group's attempt to amend its petition to intervene was three weeks out-of-time and failed to address the five lateness factors required by the Commission's Rules of Practice. Because the amendment was tardy, the board found that the organization had failed to establish standing as a matter of right. However, to ensure that the group's concerns would be heard and to expedite the proceeding, the board granted discretionary intervention and did not require that the lateness factors be addressed. The board found discretionary intervention to be merited because

the intervention would not broaden or delay the proceeding and because the public interest group was expected to assist in developing a sound record based on its previous involvement with Millstone safety issues and fuel pool off-loading practices. *Northeast Nuclear Energy Co.* (Millstone Nuclear Power Plant, Unit 1, LBP-96-1, 43 NRC 19 (1996).

ADMINISTRATIVE GUIDELINES IN PANEL HEARINGS

a. Television and Still-Camera Coverage of Hearings

A *Yankee Atomic* licensing board furnished detailed ground rules for the use of television and still-camera coverage at Panel hearings. The board allowed an intervenor to videotape (for later use on cable television) a prehearing conference held in the Panel's White Flint hearing room under the following conditions: (1) cameras had to remain stationary in a designated area of the room; and (2) no additional lighting was permitted. For hearings held in other facilities, such as Federal or State courtrooms, the board stated that Commission precedent required that existing camera policies at those facilities should be followed, although boards could impose additional restrictions when appropriate. The board further ruled that because a direct feed was available in the White Flint hearing room from the room's audio system, no additional microphones were permitted outside of the area where the hook-up for the audio system was available. *Yankee Atomic Electric Company* (Yankee Nuclear Power Station), LBP-96-14, 44 NRC 3 (1996).

b. The Use of Interpreters at Hearings

In the *Juan Guzman* proceeding, the board laid down specific guidelines for the conduct of interpreters at NRC hearings. To ensure complete and accurate records, the guidelines emphasized that an interpreter should never omit or add anything to what is stated or written. They also emphasized that an interpreter should be impartial and unbiased. *Juan Guzman*, August 26, 1996, Slip Opinion.

STAFF WITNESSES AT NRC HEARINGS

In the absence of exceptional circumstances, the Commission's Rules of Practice do not require the

attendance and testimony of named staff personnel at NRC hearings. In *Georgia Institute of Technology* (Georgia Tech Research Reactor), LBP-96-8, 43 NRC 178 (1996), the licensing board determined that where an NRC employee has taken positions at odds with those espoused by witnesses to be presented by staff, exceptional circumstances exist whereby testimony of that employee can be compelled. On that basis, the board required the attendance and testimony of a particular NRC staff inspector at the *Georgia Tech* proceeding whose attendance at the hearing was sought by the intervenor and opposed by the staff.

JUDICIAL REVIEW

The more significant litigation involving the Commission during FY 1996 is summarized in the following paragraphs.

Pending Cases

Reytblatt v. NRC, No. 95-1578 (D.C. Cir., filed November 17, 1995)

Petitioners, Dr. Zinovy Reytblatt and Ohio Citizens for Responsible Energy, brought this lawsuit to challenge the NRC's new Containment Leakage Testing Rule, issued in 1995. The new rule provides a performance-based option for leakage-rate testing of containments of light-water-cooled nuclear power plants. Petitioners do not challenge the substance of the rule, but argue that it improperly restricts public access to leakage rate test data, because that data is retained by licensees onsite rather than submitted to the NRC.

The case is fully briefed and was orally argued in September 1996. It awaits the Court's decision.

Thermal Science, Inc. v. NRC, No. 4:96CV02282-CAS (E.D. Mo., filed November 20, 1996)

This lawsuit seeks to halt further NRC consideration of a proposed \$900,000 civil penalty against Thermal Science, Incorporated (TSI), a

company that produces and sells to the nuclear industry a fire barrier product known as Thermo-Lag. The proposed penalty rests on the alleged misrepresentations about the testing of Thermo-Lag. The complaint points to TSI's 1995 acquittal on related criminal charges and argues that NRC pursuit of a civil penalty violates the Double Jeopardy Clause of the Fifth Amendment to the United States Constitution. The complaint also argues that the NRC lacks statutory jurisdiction to assess civil penalties against non-licensees like TSI. Finally, the complaint contends that the basis for the proposed penalty here, the "wrongdoer rule" (10 C.F.R. § 50.5), also lies outside the NRC's statutory authority.

TSI seeks a stay of the deadline (currently January 31, 1997) to respond to the proposed civil penalty and a preliminary injunction halting further NRC penalty proceedings. We have filed an opposition to the stay and injunction motions and are working with the United States Attorney's office in St. Louis in defending this case.

Significant Judicial Decisions

General Atomics v. NRC, 75 F.3d 536 (9th Cir. 1996)

In this case General Atomics (GA) tried to persuade the Federal courts to halt an ongoing NRC enforcement proceeding. A GA subsidiary, Sequoyah Fuels Corporation, owns a contaminated site in Gore, Oklahoma. The NRC enforcement staff alleged that, given prior GA commitments and given GA's relationship with Sequoyah Fuels, GA could be held jointly responsible for cleanup of the Gore site. GA participated in a Commission adjudicatory proceeding on this question, but also filed suit in federal court on the ground that the Commission lacked all regulatory jurisdiction over a non-licensee like GA. The federal district court dismissed GA's suit for lack of jurisdiction, and GA appealed to the United States Court of Appeals for the Ninth Circuit.

In January the court of appeals (*Hug, Alarcon & Leavy, JJ.*) issued a decision entirely favorable to the NRC. The court first held that NRC orders are reviewable only on petitions for review filed directly in the courts of appeals, not in lawsuits

filed in federal district courts. The court next held that litigants in NRC administrative adjudications may not go to court in the middle of administrative process to challenge the NRC's underlying enforcement jurisdiction. The court stated that "[j]udicial review of an agency's jurisdiction should rarely be exercised before a final decision from the agency." *General Atomics v. NRC*, 73 F.3d 536, 541 (9th Cir. 1996). This ruling allows the NRC adjudicatory process to run its course without premature judicial oversight.

United States v. Construction Products Research, Inc., 73 F.3d 464 (2d Cir. 1996), cert. denied, 117 S.Ct. 294 (1996)

This is a long-running subpoena enforcement dispute between the NRC and a Connecticut manufacturer of cement and grout used in NRC-licensed nuclear power reactors. The NRC sought employment records by subpoena to aid an investigation whether the grout manufacturer had retaliated against employees for raising safety concerns about the company's products. The manufacturer has vigorously contested enforcement of the subpoena for about two years, arguing at every turn that the NRC lacked jurisdiction over non-licensees and that many of its employment records were covered by the attorney-client privilege.

The district court rejected the manufacturer's arguments and issued an order enforcing the subpoena. The manufacturer took an appeal and unsuccessfully sought a stay pending appeal from the district court, from the court of appeals, and from the Supreme Court. Despite its failure to obtain a stay, the manufacturer did not comply in full with the subpoena, and continued to withhold documents it considered privileged.

In January 1996, the court of appeals (*McLaughlin*, Newman & Altimari) issued a thorough opinion upholding the NRC's position on all points. The court rejected the manufacturer's contention that the NRC lacked authority to subpoena the records of "mere suppliers," and concluded that "[i]n light of the historically expansive interpretation of an agency's power to investigate, ... this subpoena lay well within the NRC's authority because it is the primary body responsible for nuclear safety." *United States v. Construction Products Research,*

Inc., 73 F.3d 464, 469 (2nd Cir. 1996). The court held that the NRC's enforcement jurisdiction over suppliers could be decided later, "[i]f and when the NRC decides to use the information obtained by the subpoena" 73 F.3d at 473. Finally, the court rejected the manufacturer's attorney-client privilege claim as "not supported by the information provided" *Id* at 473.

The Supreme Court denied certiorari on October 16, 1996. 117 S.Ct. 294 (1996).

SIGNIFICANT COMMISSION ADJUDICATORY DECISIONS

The NRC exercises its appellate authority when a party to a Commission adjudicatory proceeding seeks Commission review of an ASLB decision or when the Commission on its own decides to review a Licensing Board decision. The Commission also resolves adjudicatory matters that are occasionally raised for the first time directly before the Commission or that the Commission prefers to address before assigning a matter to the Licensing Board. Finally, the Commission will occasionally, on its own motion, review orders of an office director concerning matters of enforcement discretion.

The Office of Commission Appellate Adjudication (OCAA) and the Office of the General Counsel (OGC) assist the Commission in exercising these adjudicatory responsibilities. In FY 1996, the Commission issued 15 decisions in adjudicatory or related matters. In the following paragraphs, each decision is described briefly, and each is published in its entirety in the "Nuclear Regulatory Commission Issuances."

Decommissioning Decisions

In response to a Federal appeals court decision (*Citizens Awareness Network v. NRC*, 59 F.3d 284 (1st Cir. 1995)), the Commission issued orders precluding two licensees from conducting "major dismantling" of their power plants before final

agency approval of their decommissioning plans. *Portland General Elec. Co.* (Trojan Nuclear Power Station), CLI-95-13, 42 NRC 125 (1995); *Yankee Atomic Elec. Co.* (Yankee Nuclear Power Station), CLI-95-14, 42 NRC 130 (1995). The Commission was not called upon to take any further adjudicatory action regarding the decommissioning of the Trojan facility. By contrast, the *Yankee* decommissioning proceeding was far more active. The Commission during FY 1996 issued four additional orders addressing various facets of the Yankee Rowe decommissioning and devoted more of its appellate adjudicatory resources to the *Yankee* case than to any other proceeding this fiscal year.

CLI-96-1

On January 16, 1996, the Commission issued CLI-96-01, referring the intervention petition and hearing request in *Yankee* to the Licensing Board, establishing an expedited schedule for the proceeding, and providing guidance to the Board regarding the following four issues presented in the proceeding.

First, the Commission addressed the relationship between standing and contentions. The Commission pointed out that, although a prospective intervenor cannot derive standing to participate in a proceeding from another person who is neither a party to the action nor a member of the prospective intervenor (if the latter is an organization), the prospective intervenor who becomes a party may nevertheless raise *any* contention that, if proven, will afford the party relief from the injury on which it relies for standing. This observation pertained to this case because petitioners, consisting of local citizens' groups, raised contentions related to *occupational* dose issues.

Second, the Commission emphasized that the as-low-as-reasonably-achievable (ALARA) standards are now "mandatory requirements" rather than merely "hortatory suggestions" and that "an ALARA challenge can properly be made against a licensee's decommissioning alternative choice, if an adequate basis for the challenge is offered." 43 NRC at 7 and n.4. However, the Commission also concluded that "under a fair reading of our decommissioning rules ..., it is for the Licensee in the first instance to choose the

decommissioning option and that neither DECON nor SAFSTOR [the two decommissioning approaches open to the licensee] can be deemed unacceptable *a priori*." 43 NRC at 7.

The Commission ruled out challenges to YAEC's DECON-SAFSTOR choice if those challenges rest solely on the estimated difference between the occupational doses underlying the Commission's decommissioning rule. 43 NRC at 8. The Commission reasoned that the generic environmental impact statement (GEIS) underlying the decommissioning rule found both options acceptable, "despite the acknowledged likelihood of reduced occupational dose under SAFSTOR." *Id.* The Commission therefore saw no point to case-by-case litigation over dose differentials "on the order of magnitude of the estimate in the GEIS"—barring some "extraordinary aspect to the case not apparent to us from the pleadings." 43 NRC at 8-9.

Third, the Commission rejected petitioners' argument that YAEC's updated cost estimate was not reasonable. The Commission found that the "essential purpose" of the estimate requirement "is to provide 'reasonable assurance' of adequate funding for decommissioning." 43 NRC at 9. It therefore concluded that, to receive relief, petitioners would need to demonstrate "not only that the estimate is in error but that there is not reasonable assurance that the amount will be paid." *Id.* "Thus, a contention that a licensee's estimate is not 'reasonable,' standing alone, would not be sufficient in and of itself because the potential relief would be the formalistic redraft of the plan with a new estimate." *Id.*

Fourth and finally, the Commission ruled that petitioners' allegations of "illegal" past conduct by YAEC were not relevant in a decommissioning proceeding where the "focus ... is prospective only." 43 NRC at 9. The Commission viewed petitioners' past conduct allegations as "more properly the subject of separate enforcement action." *Id.*

CLI-96-5

On the same day as the Commission issued CLI-96-1, it also issued a separate document, entitled "Notice of Appointment of Adjudicatory Employee and of Communication Covered by 10 C.F.R. § 2.781(c)" ("Notice"), which (among other

things) advised the parties that a communication had taken place in violation of the Commission's separation-of-functions restrictions contained in 10 C.F.R. § 2.781(a) and that this communication was being placed on the record in accordance with the requirements of 10 C.F.R. § 2.781(c). The Notice also indicated that the prohibited communication had not reached the Commission itself and had therefore not affected the Commission's guidance in CLI-96-1.

This Notice led to a motion by petitioners for reconsideration of the Commission's guidance and for disqualification of certain Commissioners and the NRC staff. Petitioners argued that the guidance was incorrect, that it resulted from an improper staff communication and that it rested on factual prejudgments. On March 7, 1996, the Commission issued CLI-96-05, 43 NRC 53, rejecting petitioners' motion except insofar as it challenged the substance of the Commission guidance—an issue which the Commission reserved for later discussion in CLI-96-7.

CLI-96-6

Concurrently with the Board's and Commission's consideration of the decommissioning adjudication, the Director of the Commission's Office of Nuclear Reactor Regulation had been considering two emergency motions submitted by the *Yankee* petitioners under 10 C.F.R. § 2.206. These motions challenged certain of the licensee's ongoing decommissioning activities as inconsistent with the Commission's earlier prohibition in CLI-95-14 against "major dismantling" activities. The Director denied these motions in DD-96-1, 43 NRC 29 (1996) and DD-96-2, 43 NRC 109 (1996).

The Commission in CLI-96-6 took *sua sponte* review of the Director's two orders. The Commission first found that the contested decommissioning activities did not pose a threat to public health and safety. The Commission next concluded that the Director's decisions were reasonable and not an abuse of discretion. The Commission based these latter conclusions on the nature of the challenged decommissioning activities, the need for the licensee to conduct at least some minor decommissioning and decontamination activities, and the Commission's past practice of allowing licensees to engage in

such minor activities. Finally, the Commission instructed YAEC to provide the NRC Staff at least two weeks' advance notice of any further decommissioning activities, so that the agency could determine whether those activities would, individually or collectively, be considered "major" enough to threaten the viability of the SAFSTOR option at the Yankee Rowe facility.

CLI-96-7

In LBP-96-02, 43 NRC 61 (1996), the Board applied the Commission's guidance from CLI-96-1 and granted standing to two petitioners in *Yankee*, but declined to admit any of their contentions, denied their request for a hearing, and terminated the proceeding. Petitioners appealed this decision to the Commission, seeking reversal of the Board's rejection of their contentions, and also challenging portions of the guidance in CLI-96-01. YAEC in turn challenged petitioners' standing to seek a hearing. In CLI-96-7, 43 NRC 235 (1996), the Commission rejected YAEC's arguments regarding standing and denied most of the petitioners' appeal. The Commission reaffirmed the "guidance" it had given in CLI-96-01.

The Commission recognized, however, that petitioners had, at the appeal stage, brought to the Commission's attention new information relevant to the level of radiation doses which could be expected from YAEC's decommissioning activities. The Commission concluded that this recently proffered information (and a related new argument), if substantiated, might well constitute the kind of "extraordinary circumstances" contemplated by the Commission in CLI-96-01 that would justify further litigation on whether YAEC's DECON approach meets the ALARA standard. The Commission therefore remanded the case to the Licensing Board for further proceedings on the ALARA contention.

On remand, the Board rejected the petitioners' ALARA arguments and granted the licensee's motion for summary disposition. LBP-96-18, 44 NRC 86 (1996). (In early FY 1997, the Commission rejected petitions for review of LBP-96-18. CLI-96-9, 44 NRC 112 (Oct. 18, 1996).)

University of Missouri Proceeding Concluded

The Commission denied a third petition for reconsideration in *Curators of the University of Missouri*, CLI-95-17, 42 NRC 229 (1995), and thereby concluded the proceeding. This case involved two materials license amendment applications filed by the University. The amendments at issue collectively authorized the University to possess and use certain specified quantities of neptunium-237, americium-241, plutonium-239/240, and depleted uranium. Scientists at the University's research reactor facility ("MURR") sought to use these materials in research known as the "TRUMP-S Project," the purpose of which was to develop an inexpensive means to reduce the volume of high-level radioactive waste.

The Commission in FY 1995 had affirmed in large part the Presiding Officer's order approving the two license amendments, and had subsequently denied two petitions for reconsideration filed by opponents of the amendments. In August 1995, the intervenors sought still further reconsideration of the Commission's orders on three grounds: the Commission's second reconsideration order (CLI-95-11) was *ultra vires* because it had been issued when the Commission lacked a quorum; the Commission's acknowledgement in CLI-95-11 that the MURR site was open to the public undermined the Commission's earlier determination that the TRUMP-S Project was safe; and the safety conditions that the Commission had *sua sponte* imposed in CLI-95-11 on the licensee were inadequate to protect the public. In CLI-95-17, the Commission finally put this case to rest by rejecting all three arguments and announcing that it would consider no further petitions for reconsideration.

Other Proceedings

Georgia Institute of Technology, CLI-95-12, 42 NRC 111 (1995), stemmed from Georgia Tech's application to renew its license for the Georgia Tech Research Reactor. In that order, the

Commission considered an appeal of a Licensing Board decision, LBP-95-6, 41 NRC 281 (1995), granting a request for intervention and hearing and admitting two contentions (concerning the security and management of the reactor facility). The Commission in a prior order, CLI-95-10, 42 NRC 1 (1995), had remanded the security contention to the Board. In CLI-95-12, the Commission affirmed all remaining rulings in LBP-95-6, granting intervenors standing and admitting their management contention.

In *Georgia Power Co.* (Vogtle Elec. Generating Plant, Units 1 & 2), CLI-95-15, 42 NRC 181 (1995), the Commission vacated a Licensing Board's ruling regarding discovery. The Board had required the licensee's attorney to produce written notes on communications with one of the licensee's employees. The Commission concluded that the notes were protected under the attorney-client privilege and therefore need not be produced on discovery.

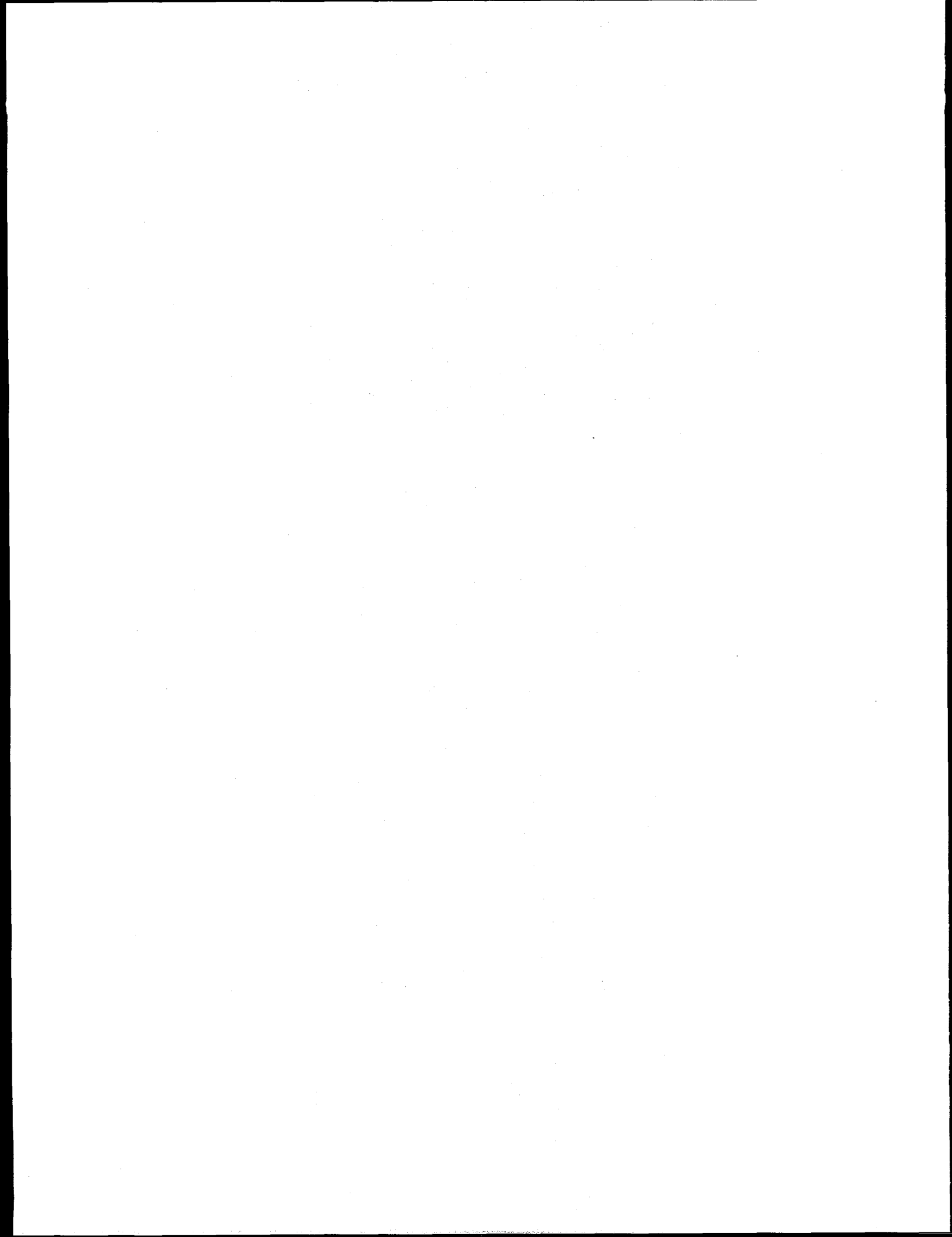
In *Sequoyah Fuels Corp.*, CLI-95-16, 42 NRC 221 (1995), the Commission reversed the portion of a Licensing Board order, LBP-95-5, 41 NRC 253 (1995), that required the NRC staff to obtain the Board's permission before referring to other NRC offices confidential information obtained through discovery. The Commission concluded that the Board is neither trained nor experienced in assessing the investigatory significance of raw evidence and, therefore, should not place itself in a position of deciding whether the NRC staff should be allowed to refer such information to other offices within the agency. In place of pre-screening by the Board, the Commission imposed a substitute protective order restricting dissemination of confidential discovery information within the NRC staff.

In *Kerr McGee Chemical Corp.* (West Chicago Rare Earths Facility), CLI-96-2, 43 NRC 13 (1996), the Commission terminated the proceeding on grounds of mootness, and also made a policy decision to vacate the three underlying decisions (ALAB-944, 33 NRC 81 (1991); LBP-90-9, 31 NRC 150 (1990); LBP-89-35, 30 NRC 677 (1989)), thereby eliminating them as precedent in any future proceedings.

Finally, in addition to the 13 decisions previously summarized, the Commission issued two orders

granting petitions for review. In the first, *Sequoyah Fuels Corp.*, CLI-96-3, 43 NRC 16 (1996), the Commission granted a petition for review of a Licensing Board order, LBP-95-18, 42 NRC 150 (1995), that had approved a settlement between Sequoyah Fuels and the NRC staff on the issue of the licensee's liability for the expense of cleaning up the licensee's site near Gore, Oklahoma. In the second, *Cleveland Elec. Illuminating Co.* (Perry Nuclear Power Plant, Unit 1), CLI-96-4, 43 NRC 51 (1996), the Commission granted a petition for review of a Licensing Board order,

LBP-95-17, 42 NRC 137 (1995), that had granted intervenors' motion for summary disposition and had concluded that all changes to the material specimen withdrawal schedule for reactor vessels should be treated as license amendments. Commission review in these two proceedings was still pending at the end of FY 1996. (The Commission decided the *Cleveland Electric* appeal and reversed the Licensing Board decision early in FY 1997. See CLI-96-13, 44 NRC 315 (Dec. 6, 1996).)



Chapter 12

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Management and Administrative Services

This chapter deals with internal events and activities of the Nuclear Regulatory Commission (NRC). These include initiatives in personnel management; developments in the agency's information technology and management program; activities in the facilities, security, and contracts management programs; audits and investigations of the Office of the Inspector General, and the activities and programs of the Office of Small Business and Civil Rights.

ADMINISTRATIVE SERVICES

Facilities Program

During Fiscal Year (FY) 1996, construction of an enclosed structure connecting One White Flint and Two White Flint headquarters buildings was completed. This structure provides a safe and comfortable walkway for employees travelling from one building to the other. In addition, construction commenced in late FY 1996 for a shower facility located on the P-1 level of One White Flint. This facility will be used by employees who exercise following or before their daily commute or as part of a lunchtime fitness program.

Paper recycling by employees generated revenues of approximately \$26,000, which were used to

support the Tuition Assistance Program at the NRC's Child Development Center.

A large number of headquarters employees continue to use public transportation and carpooling for commuting to work. Through onsite surveys, Montgomery County has confirmed that NRC is in compliance with its traffic mitigation agreement. This agreement was signed in 1991 by the NRC, the General Services Administration, Montgomery County, and the White Flint North Limited Partnership (developer of NRC's headquarters building), and establishes specific traffic reduction goals to be met and maintained over a 10-year period.

Property Management Program

Executive Order 12821, "Improving Mathematics and Science Education in Support of National Education Goals," directs Federal agencies to the maximum extent possible to identify and transfer excess education-related equipment to elementary and secondary schools. Under these guidelines, the NRC has established a program for donating used and obsolescent computer equipment to school systems nationwide. In FY 1996, the NRC donated more than 2,400 pieces of computer equipment, including color monitors, system units, and printers with an acquisition value of about \$2.6 million.

Contract Management

On July 26, 1996, the Administrator of the Office of Federal Procurement Policy granted NRC's request to extend NRC's Procurement Reinvention Laboratory (PRL) through August 1998. Under the PRL, the NRC has improved procurement lead time and conserved staff resources through a variety of streamlining initiatives, consistent with the objectives of the National Performance Review, in NRC's contracting with commercial firms, non-profit organizations, and universities.

During FY 1996, NRC continued to implement a wide range of procurement innovations under the PRL. NRC has expanded use of oral presentations, used fewer evaluators on source evaluation panels, increased delegations of contractual authority, reduced proposal-content requirements, waived pre-award audits, and waived the *Commerce Business Daily* synopsis requirements for certain technical assistance and research projects. As a result of these innovative streamlining techniques, the average lead time for competitive procurements has been reduced by over two months since FY 1994.

The NRC significantly expanded use of the BankCard during FY 1996. Transactions completed in FY 1996 more than doubled from the previous year. Since inception of the BankCard program, NRC has completed over 5,000 transactions totaling \$3.1 million, saving \$250,000 in administrative expenses.

In March 1996, the Director, Office of Administration (ADM), appointed an Advocate for Procurement Reform to ensure that NRC takes full advantage of procurement reform opportunities available as a result of the Federal Acquisition Streamlining Act, the Federal Acquisition Reform Act (FARA), and the Clinger-Cohen Act.

In April 1996, NRC acquired and installed software that has enabled its contract staff to solicit and receive vendor quotations, using the Federal Acquisition Network (FACNET). Demonstration of this capability allowed NRC to use simplified acquisition procedures for procurements up to \$100,000 before this threshold was raised governmentwide under the authority of the FARA.

NRC also established a "Contracting with NRC" home page on the World Wide Web to provide

information to the public on how to do business with the NRC. The home page includes a summary of information on contracting initiatives under the PRL, bidders mailing list application information, and NRC's forecast of contract opportunities for small and disadvantaged businesses.

Under pledges by the NRC's Senior Procurement Executive, NRC also participated in government-wide efforts to use past performance as a key criterion for selecting contractors, to increase the use of performance-based service contracting, and to use alternative dispute resolution procedures where appropriate.

During FY 1996, the Office of Administration obligated \$94 million in contract actions.

NRC Security Upgrade Efforts

In October 1995, following the Oklahoma City bombing in April 1995, the Department of Justice (DOJ) issued a report entitled, "Vulnerability Assessment of Federal Facilities," that established guidelines for Federal facilities to follow for enhancing security. Using this guidance, the NRC promptly conducted facility security surveys of NRC Headquarters, all regional offices, the Walnut Creek Field Office in California, and the Technical Training Center in Chattanooga, Tennessee, and identified security upgrades for each facility. In response, NRC enhanced its security by—

- installing x-ray package screening equipment at NRC facilities;
- installing walk-through metal detectors for use at certain meetings and hearings at its headquarters building;
- installing a security fence along a significant portion of NRC's headquarters property;
- increasing the frequency and number of guard patrols; and
- installing a guard booth to control vehicle access to NRC headquarters property, which is staffed 24 hours a day.

Additionally, NRC awarded a contract to increase perimeter exterior lighting at its headquarters

facility. Work under this contract has begun and is projected to be completed in March 1997. Once exterior lighting upgrades have been completed, NRC will determine whether upgrades are required for NRC's closed-circuit security cameras.

Secure Communications Center Upgrades. To accommodate a major increase in the electronic processing of classified information, the NRC completed an upgrade and expansion of the NRC's Secure Communication Center and its capabilities. The expansion more than doubled the size of the Center and now permits NRC to participate in several governmentwide initiatives to improve the security and the availability of classified information to NRC users. These initiatives include the Electronic Key Management System, the Multi-Level Systems Security Initiative (MISSI), and the application of MISSI infrastructure to the Defense Messaging System, which is used by the NRC for its world-wide messaging system.

Executive Order 12968. On August 2, 1995, President Clinton signed Executive Order 12968, "Access to Classified Information," that established a uniform Federal personnel security program by mandating uniform investigative, adjudicative, and due process requirements for all Executive Branch agencies that grant individuals access to classified information. The Executive Order will be implemented fully when governmentwide policies and procedures are issued. NRC's current Personnel Security Program meets most of the requirements of E.O. 12968; however, minor changes to 10 CFR Parts 10 and 25 will be required when governmentwide policies and procedures are issued.

Rulemaking and Directives

The Office of Administration continued to provide rulemaking review support by completing 234 reviews of NRC rulemaking actions. In FY 1996, 8 petitions for rulemaking were received and docketed, 64 rulemaking documents were published in the *Federal Register*, and 2,900 consultations with the NRC staff and the public were provided by rule review staff.

The rule review staff published two semiannual editions of the "NRC Regulatory Agenda" (NUREG-0936) and 12 monthly supplements to the "NRC Rules and Regulations" contained in Title 10 of the Code of Federal Regulations.

The NRC continued to submit 100 percent of general notices in electronic form to the Office of the Federal Register for publication, resulting in a savings of \$95,517 during FY 1996.

Small Business Regulatory Enforcement Fairness Act. On March 29, 1996, President Clinton signed into law the Small Business Regulatory Enforcement Fairness Act. The Act is intended to ensure that Congress is notified of "major actions" (as defined by the Act) by Federal agencies. In response to this statute, NRC-wide procedures were issued on June 25, 1996, that ensure compliance with the Congressional notification and OMB-review requirements of the Act.

Management Directives. On September 11, 1993, President Clinton signed Executive Order 12861, "Elimination of One-Half of Executive Branch Internal Regulations," that required agencies to reduce their internal regulations by 50 percent within three years. By September 11, 1996, NRC reduced the number of regulations contained in its management directives system by 61 percent.

PERSONNEL MANAGEMENT

1996 NRC Staff-Years Expended

During Fiscal Year 1996 (FY 1996), the NRC expended a total of 3,062 staff-years in carrying out its mission. Total staff-years included permanent full-time staff, permanent part-time staff, temporary workers, and consultants.

Recruitment

During the report period, the NRC hired 91 permanent full-time employees and lost 137 permanent

full-time employees, the latter figure representing an attrition rate of 4.6 percent. The NRC recruits new employees by conducting recruitment trips to educational institutions, participating in job fairs, and advertising in various news media (e.g., newspapers, trade journals, the Internet). Applications received by the agency are managed and controlled through an automated applicant tracking system.

Awards and Recognition

In FY 1996, the NRC continued to recognize and commend employees for excellent performance. At the May 16, 1996, Annual Awards Ceremony, the NRC presented one employee with the NRC Distinguished Service Award and 36 employees with the Meritorious Service Award. NRC employees also received 668 Performance Awards, 577 Special Act Awards, and 292 High Quality Performance Salary Increases. Six employees and three offices were nominated for awards sponsored by other Federal agencies and national organizations. Two NRC employees received Presidential Distinguished Executive Rank Awards, seven received Presidential Meritorious Executive Rank Awards, 87 received Senior Executive Service (SES) bonuses, and 16 received SES pay-level increases. Eleven senior level employees received performance-based cash awards, and five received performance-based pay level increases.

Benefits

Thrift Savings Plan open seasons were conducted from November 15, 1995, to January 31, 1996, and from May 15, 1996, to July 31, 1996. A Health Benefits open season was conducted from November 13, 1995, to December 11, 1995. A Health Insurance Fair was conducted on November 15, 1995, in conjunction with the open season. Approximately 300 NRC employees attended this Fair.

The Voluntary Leave Transfer Program provides income protection to employees affected by a medical condition through the voluntary donation of annual leave by other employees. Thirty em-

ployees qualified as leave recipients during this reporting period.

The NRC offered voluntary early retirement to 610 eligible employees during FY 1996. A total of 29 employees retired under the early-out authority. One delayed voluntary separation incentive payment was paid. During FY 1996, the NRC conducted 12 group pre-retirement seminars and a number of employees attended individual retirement counseling sessions.

Labor Relations

On October 1, 1993, the President signed Executive Order 12871 dealing with Labor-Management Partnerships in the Federal Government. The order calls for a more cooperative and less confrontational relationship between labor and management. In accordance with this order, the agency, together with the union, has established an agency partnership committee as well as office and regional partnership committees to foster a cooperative relationship and to identify problems and propose solutions. The agency has also provided training in methods of dispute-resolution, helping parties to a dispute to work together to frame possible resolutions.

Training and Development

During FY 1996, OP provided more than 100 different instructor-led, onsite courses and more than 200 self-study courses in executive, managerial, supervisory, and administrative skills as well as in computer applications. The NRC also sponsored a wide variety of training and other developmental programs conducted at colleges and universities, at other Government agencies, and in the private sector.

This year the agency offered a comprehensive curriculum about management and leadership as part of a continuous learning initiative for executives, managers, and supervisors. Included were a Skill-Building Series to help supervisors manage effectively in the NRC's changing environment as well as several Executive Forums and Leadership Seminars presented by leading executives in

government, business, legislative, and academic organizations.

The computer applications curriculum continued to be a significant part of the NRC's training program. The high demands for training were in Netscape, Hypertext Markup Language, UNIX systems, and advanced technology as well as database management instruction in relational databases and tracking systems.

The Individualized Learning Center provided employees with the latest audio/video, computer-based, and multi-media training in project management, communication, management and supervision, computer skills, secretarial skills, and employee assistance.

Televideo equipment was purchased in preparation for providing training to the Technical Training Center and the Regional Offices. While work continued this year to upgrade the NRC's wide area network for video telecommunications, training of instructors on the new learning technology began.

The agency also sponsored a number of programs to help employees develop the skills necessary to meet the NRC's future clerical, administrative, technical, and management needs. Developmental programs sponsored by the agency include—

- the Certified Professional Secretaries Program,
- the Administrative Skills Enhancement Program,
- the Computer Science Development Program,
- the Women's Executive Leadership Program,
- the Graduate Fellowship Program,
- the Intern Program, and
- the Senior Fellowship Program.

Employee Assistance, Health, and Fitness Programs

During FY 1996, the Employee Assistance Program (EAP) continued to give individual counseling and referral assistance to NRC personnel with such problems as chemical dependency, job stress, chronic illness, sexual harassment, and family issues; as well as guidance and training to supervisors. The agency continued to make EAP services readily accessible to regional and field personnel through contractors. The EAP, along with Labor Relations and the Division of Security staff, conducted a series of 3-hour classes on mandatory Drug-Free Workplace Training for Supervisors, training 185 managers and supervisors. Education and awareness programs on a variety of topics, including Domestic Violence and Smoking Cessation, were presented. NRC received an honorable mention citation at the 1996 OPM Director's Awards ceremony in June that recognized outstanding Work and Family Programs.

Likewise, at the presentation of the OPM Director's Awards for Outstanding Employee Health Services Programs in July, NRC received an honorable mention citation. Hummer Associates continued to operate the health center in the first of four option years under the contract awarded to the company in 1995. The staff, consisting of a full-time physician, two full-time nurses, and a medical receptionist, provided a variety of services to employees. Services included limited treatment for on-the-job illness and injury and referral to community resources; screening for diabetes, glaucoma, high blood pressure, and breast and prostate cancer; immunizations; and health awareness programs on topics such as coronary artery disease, breast cancer, prostate cancer, Lyme disease, and skin cancer. Employee visits to the health center average 30 per day. The EAP, health center, and fitness center jointly sponsored a health fair in September and began publishing a quarterly newsletter to provide information on health, fitness, substance abuse, and mental health issues.

During FY 1996, the NRC began offering a variety of health and fitness programs in its newly constructed fitness center located in Two White Flint North. About 500 NRC employees participated in

these programs offered by professionally trained exercise physiologists and health professionals.

INFORMATION TECHNOLOGY AND MANAGEMENT

Capital Planning and Investment Control

The Information Technology Management Reform Act (ITMRA) of 1996 requires each Federal agency head to design and implement a Capital Planning and Investment Control (CPIC) Process for maximizing the value and assessing and managing the risks of information technology investments. Provisions of the Act require that the CPIC process—

- provide for the selection, control, and evaluation of the results of IT investments;
- be integrated with the processes for making budget, financial, and program management decisions within the agency;
- include minimum criteria for considering whether to undertake a particular investment in information systems, including specific quantitative and qualitative criteria for comparing and prioritizing alternative information systems investment projects;
- identify information system investments that would result in shared benefits or costs for other Federal agencies or State or local governments;
- develop and apply quantifiable measurements for determining the net benefits and risks of proposed investments; and
- provide the means for senior management to obtain timely information regarding the progress of an investment in an information system, including a system of milestones for

measuring progress in terms of cost, capability of the system to meet specified requirements, timeliness, and quality.

Additionally, the ITMRA has requirements regarding work process redesign and performance and results-based management that must be integrated into the CPIC. Provisions of the ITMRA require that NRC—

- establish performance goals for improving the efficiency and effectiveness of agency operations through the use of information technology;
- establish performance measures to determine how well the information technology supports programs of the agency; and
- revise agency mission-related and administrative processes as appropriate before making significant investments in IT that support those processes.

The CPIC Process at NRC will involve three phases of investment management: selection, control, and evaluation.

The Selection Phase. During the selection phase of the CPIC process, NRC creates a portfolio of IT investments, using a standard set of criteria for consistent comparison of projects. The five steps in the selection phase are—

1. Screen the IT project proposals;
2. Analyze their risks, benefits, and costs;
3. Prioritize the proposals based on risk and return;
4. Determine the correct mix of projects; and
5. Make the final selection.

The CPIC must be integrated with the agency's overall planning and budgeting process. The CPIC portfolio should be selected and prioritized before the internal budget review so that tradeoffs and final decisions on funding of the portfolio can be made.

The Control Phase. During the control phase, the NRC periodically evaluates ongoing capital and major information technology (IT) projects on the basis of their projected costs, schedules, and

benefits and then continues, modifies, or cancels them, as appropriate. The steps in the control phase are to monitor projects actual versus projected costs, schedule, and performance and to correct deficiencies or significant deviations.

When a project is assigned to the CPIC portfolio during the selection phase, a milestone is set for the first project review. An Information Resources Management Business Council working group of senior executives, including the sponsor office director, is also established to review each CPIC project throughout its life cycle.

The sponsor of each CPIC project is required to identify two types of performance goals:

1. Mission-related performance goals and measures that link their project to the NRC Strategic Plan and
2. Project performance goals for cost, schedule, and quality, and capability to meet specified requirements.

Evaluation Phase. During the evaluation phase, the NRC compares actual versus projected costs and benefits of a completed capital or major project and adjusts them as necessary. Lessons learned are used to adapt the CPIC process. The steps in the evaluation phase are—

- conduct post implementation reviews,
- decide on adjustments for the project, and
- incorporate the lessons learned

Through the three phases of selection, control, and evaluation, comprehensive management of NRC's information technology investments is ensured.

Information Resources Management Architecture Initiatives

NRC has two major information resources management architecture initiatives. The Enterprise Model is the repository for the agency's systems

and data architecture. The Technical Reference Model is the repository for the technology architecture. Both the Enterprise Model and the Technical Reference Model will guide information system development tasks.

Systems and Data Architectures—the NRC Enterprise Model

Since 1995, NRC has been working to develop an Enterprise Model (EM) to improve information systems planning. The EM is a repository that maintains information about NRC applications systems and data and their relationships to NRC business functions. A key entity is the "business area." Eleven business areas are in the NRC EM: five programmatic areas, five support areas, and one managerial area:

Programmatic Business Areas

- Licensing/Approval
- Compliance (includes Investigation, Inspection, Enforcement)
- Rulemaking
- Safety Concerns (includes Event Assessment, Emergency Response, Issues, Research)
- External Affairs

Support Business Areas:

- Financial Management
- Human Resources Management
- Information Resources Management
- Acquisition Management
- Facilities and Property Management

Management Business Area

- Management Direction and Oversight

Business areas are decomposed into high-level functions and processes. The business areas, functions, and processes were developed to cover NRC's core business functions, independent of organizational boundaries. Since this model was developed before the recent Strategic Assessment and Rebaselining effort, it will need to be revalidated and revised based on the results of that effort to reflect any changes or different views of the agency's core functions.

Use of the EM can support the more structured approach to the investment planning and decision-making process required by the recently enacted ITMRA. Current efforts to enhance this model are focused on developing measures of the performance and importance of significant systems for each business area. Measures include effectiveness of systems in meeting business goals, ease of use, technical health of the system, and maintenance cost. These measures will be used to assess the present state of technology support for each business area and to decide where improvement strategies are needed. Business areas needing improvement may require process redesign or a new "target" systems and data architecture. Unlike current planning, this approach leads to integrated planning for an entire business area rather than a system-by-system approach.

Provisions of the ITMRA that will affect the systems planning process include requirements to—

- develop, maintain, and facilitate the implementation of a sound and integrated IT architecture;
- use capital planning and investment processes for reaching decisions about IT spending and measure performance outcomes of IT projects; and
- analyze and revise the agency's mission-related and administrative processes, as appropriate, before making significant investments in information technology used to support those processes.

Use of this model supports all of these requirements. First, it serves as the repository for information comprising the agency's current and target systems and data architecture.

Second, the EM provides an analytical framework for evaluating proposed system investments. Methods for measuring and evaluating the performance and importance of existing systems in the EM can be applied to proposed systems as part of investment decision-making and performance measurement. Furthermore, proposed systems can be reviewed in the context of the existing and target architectures for each business area.

Third, identification of the agency's core business processes and their automation status in the EM is a good starting point for identifying where business process redesign efforts may be necessary. Information on systems, core functions, processes, and data for each business area can simplify analysis efforts for those areas where redesign is needed.

In summary, the EM is an effective tool for systems planning that can be used to help NRC, and particularly the CIO, to meet the requirements of the ITMRA.

Technology Architecture—the Technical Reference Model

Technology (hardware and software) architecture is being addressed through the development of a standards-based Technical Reference Model (TRM). The TRM serves as the repository for all of the agency's technology standards. It is both a catalog of the "as-is" products and standards being used today and a framework for developing a "to-be" technology environment based on open standards. Standards are organized into nine service areas, including operating systems services, office automation services, and applications development. NRC has completed the "as-is" model and is beginning to work on the "to-be" model.

The NRC Technology Center

The new NRC Technology Center provides a highly visible forum for technology assessment and a versatile means for anticipating and preparing for the 21st Century. The Center, established in June 1996, through Commission involvement, is proving to be a vital agency resource as a focal point for staff to experience, share, coordinate, recommend, leverage resources, and to provide a transition between new information technology initiatives and agency business.

Having a convening place helps diminish local isolation and provides an agencywide and Federal perspective. The Center helps the staff use tools to improve work efficiencies and to examine new ways of working together. It also provides a participatory forum for the testing and exchange of current and emerging technology for common work solutions.

Organizations that contribute to the Technology Center include other Federal agencies, National Laboratories, academia, industry, technology practitioners, and the private sector. A primary center goal is to foster cooperation among all these participants for accelerating the transfer of information and technologies, particularly emphasizing high performance computing and communications information technologies as methods of enhancing our work processes.

The Center's Key Objectives are to—

- provide the basis for examining the strategic role technology will play in enhancing the work of the agency;
- create an environment that provides for exploration of technology and new ideas and serves as an agency focal point;
- support and encourage innovations that use appropriate technology to improve productivity, streamline operations, and enhance programmatic work, services, and public access;
- leverage the benefits of prototypes or pilot programs by a planned effort to transfer knowledge and successful technology applications throughout the agency;
- share results by demonstrating information technology innovations from teaming partnerships with other agencies, academia, industry, and the private sector;
- provide a forum for local public and private schools to facilitate the exploration and accelerated learning of information technology for the next generation work force; and
- provide a forum for academia to demonstrate new information and instructional technologies.

The Technology Center offers a state-of-the-art environment and an opportunity to keep pace with rapidly changing technology. NRC staff can draw on multidisciplinary expertise of all sectors to test, to learn, and to discover the strategic potential of new technologies in their work. The Technology Center is an agency resource open to all staff to use. It provides an in-house test bed environment for evaluating new ways of accomplishing work with innovative use of technology.

The Center's current emphasis is on Internet-based tools and applications, high performance computing resources, multimedia and video over the World Wide Web, Web security, Asymmetric Digital Subscriber Line, wide-area Asynchronous Transfer Mode, collaborative research testbeds with the National Center for Supercomputing Applications, and the application of emerging collaborative tools.

Activities in the Center typically include technology briefings, lectures, demonstrations, and working prototypes, pilots and assessments of promising tools, and potential NRC projects. Members of the NRC staff visit the center to see and learn about specific programs and new equipment that can help them with their job. Because of the rapidly changing nature of the computing and communications industries and their convergence, the Center will continue to dynamically evolve to meet agency programmatic requirements and demands.

The NRC Technology Center is located on the second floor of Two White Flint North. Hours of operation are Monday through Friday from 9 a.m. to 4 p.m.

OFFICE OF THE INSPECTOR GENERAL

The NRC's Office of the Inspector General (OIG) was established as a statutory entity on April 15, 1989, in accordance with the Inspector General Act of 1978, as amended in 1988. The OIG's primary mission is to assist the agency by identifying ways to improve NRC's programs and operations through the prevention and detection of fraud, waste, and abuse. The OIG accomplishes this mission by performing audits, special evalu-

ations, investigations, event inquiries, and regulatory reviews.

The OIG's audit staff conducts performance and financial audits, as well as special evaluations. Performance audits focus on NRC's administrative and programmatic operations. Through financial audits, OIG reviews NRC's internal control systems, transaction processing, and financial systems. Special evaluations are conducted by the OIG to examine the implications of NRC's programs that affect national issues.

The OIG's investigative staff conducts investigations and event inquiries. The staff investigates violations of law or misconduct by NRC employees and contractors and allegations of abuse or irregularities in NRC programs and operations. The event inquiry is an investigative product documenting the examination of events or agency actions that do not focus specifically on individual misconduct. These reports identify institutional weaknesses that led to or allowed a problem to occur.

In addition, the OIG shares in NRC's responsibility to provide adequate assurance for the protection of public health and safety in the commercial use of nuclear materials and in the operation of nuclear facilities. The OIG assists the agency by assessing and reporting on NRC's efforts to ensure that its safety-related programs are operating effectively.

Of particular importance is the NRC's responsibility for ensuring that individuals who identify nuclear safety concerns regarding the use of nuclear materials do not suffer adverse job actions as a result of reporting these concerns. The OIG continually evaluates NRC's efforts to combat this type of unlawful discrimination.

The OIG also performs reviews of existing and proposed legislation and regulations. These reviews are performed to provide the NRC with recommendations concerning their impact on the economy and efficiency of its programs and operations.

Toward the goal of helping the agency improve its effectiveness, the OIG completed 16 audits of NRC's programs and operations, analyzed 40 contract audit reports, and made 25 recommendations to NRC management. Also during Fiscal Year 1996, the OIG received 497 allegations, initiated 103 new investigations and event inquiries, and closed 105 cases. OIG also com-

pleted regulatory reviews of approximately 375 agency documents.

OIG Fiscal Year 1996 Audits

The following are representative of the results of our audit work for the year.

THE CHIEF FINANCIAL OFFICERS ACT AUDIT

OIG issued its audit report on the FY 1995 financial statements on March 1, 1996, and NRC issued the agency's Accountability Report on March 31, 1996. The results of each major audit area are described in the following paragraphs.

An unqualified opinion was issued on NRC's principal statements, including the statements of financial position, operations and changes in net position, cash flows, and budget and actual expenses for the fiscal year ending September 30, 1995. This is the fourth year that OIG has audited the agency's financial statements, and the second consecutive year that an unqualified opinion on the principal statements was issued.

For FY 1995, we also reported that NRC management fairly stated that their internal controls in place on September 30, 1995, provided reasonable assurance that losses, noncompliance, or material misstatements would be prevented or detected on a timely basis. Management made this assertion based upon criteria established under the Federal Manager's Financial Integrity Act of 1982 and OMB Circular A-123, Internal Control Systems. While our review did not disclose material weaknesses, we reported three reportable conditions. The conditions concerned NRC's fee recovery system, NRC funds spent at Department of Energy (DOE) laboratories, and NRC's payroll system.

Our report on compliance with laws and regulations addressed NRC's reimbursable expenses with DOE, and billing licensees for direct benefits. NRC's principal financial statements for the fiscal year ending September 30, 1995, includes about \$110 million of reimbursable expenses incurred by the DOE. OIG's assessment of compliance with laws and regulations did not provide for a review of DOE's extent of compliance with laws and

regulations for the NRC funds they expended. Our assessment was limited to testing the controls maintained at NRC over the disbursing and recording of these funds.

FACTORS CONTRIBUTING TO INCONSISTENCY IN THE OPERATING REACTOR INSPECTION PROGRAM

There has been considerable debate within the agency and utility industry in recent years regarding the consistency of the NRC's reactor inspection program. During its review, the OIG identified several factors that may contribute to the industry perception that NRC has not implemented the inspection program consistently.

First, NRC's on-the-job training (OJT) program for inspectors is not well structured or closely monitored. In addition, agency training did not provide adequate guidance for certain "how to" aspects of conducting inspections. Second, NRC management had not clearly communicated its expectations to the inspection staff about the relationship between conducting "performance-based" inspections and the need to cite violations. Finally, NRC's decentralized program management responsibility allows regional offices to implement the program and administer enforcement actions differently, which can create program inconsistencies.

We recognized that NRC has and continues to take steps to improve the inspection program, but recommended that NRC minimize the potential for program inconsistency by (1) evaluating the content and mix between formal classroom training and OJT, (2) clearly communicating to inspectors and supervisors management's expectations in crucial inspection areas, and (3) considering streamlining the inspection program by shifting responsibility for implementing the inspection program from regional offices to headquarters.

REVIEW OF NRC'S IMPLEMENTATION OF THE FEDERAL MANAGER'S FINANCIAL INTEGRITY ACT FOR 1995

The Federal Manager's Financial Integrity Act (FMFIA) required Federal Managers to establish a continuous process for evaluating, improving, and reporting on the internal controls and accounting systems for which they are responsible.

NRC recently redesigned and streamlined its management control program in accordance with the National Performance Review recommendations and the Office of Management and Budget's (OMB's) 1995 revision to OMB Circular A-123. The redesigned program required offices designated as the highest risk offices to submit management control plans and reasonable assurance letters to an Executive Committee for Management Controls.

To assist NRC in evaluating its management control program, OIG annually reviews this program. Because the new program is in its infancy, we reduced the scope of this year's audit and confined our review to (1) an overall assessment of NRC's compliance with FMFIA and OMB Circular A-123, and (2) a review of management control plans and reasonable assurance letters for conformance with the criteria established for those documents. We did not assess the significance or accuracy of the issues reported.

Overall, we found that NRC has complied with the requirements of the FMFIA during FY 1995 and that the redesigned management control program meets the intent of the 1995 revision to OMB Circular A-123. No material weaknesses were identified during 1995. However, to enhance the agency's management control program, we recommended that NRC ensure that (1) required management control plans are submitted and reviewed for completeness, (2) office managers understand reporting criteria, and (3) managers receive appropriate and timely feedback on reviews of their management control plans.

NRC'S DECOMMISSIONING FINANCIAL ASSURANCE REQUIREMENTS FOR FEDERAL LICENSEES MAY NOT BE SUFFICIENT

Given the high costs associated with decommissioning power plants—estimated to range from \$200 to \$700 million per unit—OIG reviewed NRC's basis for allowing Federal licensees who operate nuclear power plants to rely on a statement of intent to meet their financial assurance requirements for decommissioning.

NRC requires all commercial nuclear power plants to undergo "decommissioning" after they are no longer in service. To ensure that licensees will have sufficient funding to decommission their power plants, the NRC requires licensees to

provide some form of financial assurance. While most commercial nuclear power plants must either prepay decommissioning costs, provide a surety guarantee, or establish an external sinking fund, NRC allows Federal Government licensees to use a statement of intent to meet these requirements.

We questioned NRC's assumption that the Federal Government would pay the financial obligations of Federal licensees, should the licensee be unable to do so. Therefore, OIG recommended that NRC re-evaluate its basis for allowing Federal licensees to use a statement of intent to meet their decommissioning funding assurance requirements.

SELECTING, MANAGING, AND UTILIZING THE M-CUBED CONTRACT

This special evaluation, which NRC requested, assessed the agency's performance in selecting, managing, and utilizing a systems development contract with M-Cubed Information Systems.

The evaluation identified several lessons the agency can learn to more effectively develop systems and oversee contracts in the future. It also identified what can happen when control processes do not work as intended. More specifically, our work disclosed that during the contractor selection process, the NRC did not pay sufficient attention to potential warning signs of problems and made hasty decisions that were due to organizational pressures. OIG also identified instances of communication breakdowns in the processes for overseeing work specifications and contracts.

IMPROVEMENTS NEEDED IN AGENCY OVERSIGHT OF INFORMATION RESOURCES MANAGEMENT ACTIVITIES

NRC information technology activities represent significant agency investments amounting to several million dollars annually for computer hardware, software, and communications equipment and services. Because several key projects were behind schedule and over budget, OIG reviewed selected projects to determine the causes for these conditions and to assess NRC's oversight of information resources management projects.

Our review disclosed that NRC lacked adequate management controls to systematically provide NRC management with information to assess the status of IRM projects. OIG found that (1) the agency does not manage significant systems development activities from an agency-wide approach, and (2) for selected projects, ineffective communication between NRC offices and added requirements during development delayed system implementation and drove costs up.

OIG also found that NRC needs to address certain aspects of its planned implementation of the Information Technology Management Reform Act of 1996. OIG made six recommendations to improve NRC's management of IRM projects.

OPPORTUNITIES FOR SAVINGS AVAILABLE THROUGH IMPROVED MANAGEMENT OF WAREHOUSE OPERATIONS

The OIG reviewed the efficiency and economy of NRC's warehouse operations, including the adequacy of management controls.

OIG found that opportunities exist for NRC to achieve economies and efficiencies in its warehouse operations through eliminating (1) unneeded inventories of supplies and property, and (2) unnecessary warehouse space. We also found that management controls over the agency's supplies inventory needed strengthening. OIG made two recommendations to ensure that NRC minimizes the cost of warehouse operations and strengthens controls for safeguarding warehouse assets.

REVIEW OF NRC'S PROGRESS IN DEVELOPING AND IMPLEMENTING AN INTEGRATED PAYROLL/PERSONNEL SYSTEM

NRC has been planning and developing an integrated payroll/personnel system since early 1992. OIG reviewed the agency's development and implementation of this system to determine whether user needs were being met; whether implementation schedules and cost ceilings were being adhered to, and whether the system internal controls for time and attendance were adequate.

OIG found that (1) the Office of Personnel believes that its needs will not be met when the system

becomes operational, (2) the current March 1997 planned implementation date may be optimistic, (3) one module has been indefinitely deferred and total system costs are unknown, and (4) the system testing process needs improvement. We also found that the coordination and communication was inadequate between the user office and the developing office. OIG made two recommendations to address these issues.

REVIEW OF NRC'S PART 170 LICENSE FEE BILLING SYSTEM

OIG audits of NRC's financial statements for fiscal years 1992 through 1995 disclosed problems with the agency's Part 170 (of Title 10 of the Code of Federal Regulations) license fee billing system. For example, inspection hours and contractor costs were not always properly billed. This OIG review determined the accuracy and reliability of recent billings, the effectiveness of related management controls, and the causes for certain past inspections not being identified and billed timely.

We found that inadequate guidance and training were the primary "root" causes for past unbilled NRC inspections amounting to \$8.1 million. Although OIG found that recent billings were generally accurate, some of the same conditions that led to unbilled inspections in the past continue and may result in future billing problems if not corrected. OIG made three recommendations to address these issues.

OIG Fiscal Year 1996 Investigations

NRC HANDLING OF ISSUES RELATED TO REFUELING OPERATIONS AT MILLSTONE UNIT 1

The OIG initiated an Event Inquiry after receiving information from a Northeast Utilities (NU) employee regarding the manner in which the NRC and NU were addressing problems with refueling practices at Millstone Unit 1. In 1993, NU notified the NRC of problems associated with performing full core offloads during refueling outages at Millstone Unit 1. In April 1994, the NU employee

contacted the NRC with his allegations related to NU's operation of the spent fuel pool at Millstone Unit 1.

The OIG determined that the NRC's initial technical reviews did not thoroughly address the problems with performing full core offloads that NU reported to the NRC in 1993. Also, the OIG determined that the Region I technical staff did not interview the NU employee regarding his allegations. The only interview of the NU employee, involving a member of the NRC technical staff, took place in May 1995 when the staff participated in an NRC Office of Investigations interview of the allegor.

In addition, the OIG determined that NRC Region I would have closed the NU employee's technical concerns had the employee not pursued his allegations by filing a 10 CFR Part 2.206 petition with the NRC in August 1995.

NRC STAFF'S ACTIONS ASSOCIATED WITH REGULATION AT MAINE YANKEE NUCLEAR POWER PLANT

OIG conducted an Event Inquiry in which OIG evaluated NRC staff actions associated with Maine Yankee Nuclear Power Plant. The inquiry stemmed from allegations contained in an anonymous letter sent to the Union of Concerned Scientists which claimed that the Maine Yankee Atomic Power Company (MYAPCo) intentionally submitted inadequate analyses to the NRC in support of two license amendments to increase the power at which the plant could operate. Additionally, the anonymous complainant alleged that the utility applied for one of the power increases during a holiday period when the NRC was least vigilant.

The OIG inquiry disclosed weaknesses in the NRC staff's review of computer codes submitted by MYAPCo. Additionally, OIG uncovered several irregularities in the manner in which the staff closed out a long-standing licensee action item. The OIG inquiry also disclosed that the NRC staff did not have a formal system for tracking commitments made by licensees and, as a result, the staff relied on the licensee to follow up on the commitments. Staff documentation of conversations and commitments by the licensee was also lacking.

PAYROLL PADDING BY AN NRC CONTRACTOR

The OIG initiated an investigation after receiving information that an NRC contractor "padded" the number of overtime hours charged to a contract. The NRC contract was a time and materials contract for full technical support services of the data and voice telecommunications cable distribution system at NRC. When interviewed by OIG, several contract employees admitted that they padded the amount of overtime hours they claimed under the NRC contract. These technicians told OIG that they padded their overtime hours at the direction of the contractor onsite manager.

In August 1995, the OIG referred the investigation to the NRC's Office of the General Counsel for consideration under the provisions of the Program Fraud Civil Remedies Act (PFCRA). In July 1996, the OGC and the contractor entered into an agreement that resulted in a settlement of \$36,000, which is the largest single PFCRA case settlement for the agency to date.

THEFT OF GOVERNMENT PROPERTY

An OIG investigation revealed that a former employee of an NRC contractor stole government property and sold it to a Northern Virginia pawn shop. The stolen property included an answering machine, a facsimile machine, and a video cassette recorder that was valued at more than \$1,700. The individual was charged with three counts of theft of government property by the U.S. Attorney's Office for the District of Maryland. The property was recovered and the individual plead guilty to the theft of government property.

FALSE CERTIFICATION OF LICENSEE SMALL ENTITY STATUS

OIG received information that the president of an NRC byproduct materials licensee firm falsely claimed small entity status to receive a lower annual license fee. OIG investigated whether the president of the corporation falsified his certification to the NRC that his company qualified for small entity status. OIG determined that the president submitted three certifications of small entity status to the NRC and avoided \$4,200 in annual license fees. The case was subsequently referred to the NRC's Office of General Counsel

for consideration of civil action under the Program Fraud Civil Remedies Act.

OFFICE OF SMALL BUSINESS AND CIVIL RIGHTS

Small and Disadvantaged Business Utilization Program

The Small and Disadvantaged Business Utilization Program annually establishes procurement preference goals, in conformance with provisions of Public Law 95-507, amending the Small Business Investment Act of 1957. The following is a summary of estimated and actual contract awards during FY 1996.

- The NRC estimated that \$68 million in total prime contracts would be awarded during FY 1996. The actual total for prime contract awards was \$79,705,908.
- The NRC estimated that small business prime contract awards would total \$32 million or 47 percent of the estimated total prime contract awards. The actual achievement for small business prime contract awards was \$35,410,957 or 44 percent of the actual dollar amount awarded.
- The NRC estimated that awards to "8(a) firms" would total \$17 million, or 25 percent of FY 1996 prime contracts. Awards to "8(a) firms" actually totalled \$20,377,194, or 26 percent of the actual dollar amount of all prime contract awards.
- The NRC goal for prime contract awards to small, disadvantaged business firms other than "8(a) firms" was \$231,000, or 0.34 percent. The actual achievement was \$145,753, or 0.18 percent of the actual awarded amount.
- The estimate for NRC prime contract awards to small business concerns owned and operated by women was \$875,000, or 1.29 percent.

Awards to such firms came to \$5,769,709, or 7.24 percent of the total dollar amount of all prime contract awards.

- The NRC's total subcontract goal in FY 1996 was \$2 million. The NRC's actual subcontract dollar awards were \$1,753,263.
- The NRC goal for small business subcontract awards was \$1,240,000, or 62 percent of the total estimated subcontract awards. Subcontract awards to small businesses actually totalled \$1,043,869, or 60 percent of the total subcontract dollars awarded.
- The NRC goal for subcontract awards to small, disadvantaged businesses was \$220,000, or 11 percent of the total estimated subcontract awards. Subcontract awards to small, disadvantaged businesses actually totalled \$191,013, or nearly 11 percent of the total subcontract dollars awarded.
- The NRC goal for the total dollar amount of subcontracts awarded by prime contractors to small business concerns owned and controlled by women was \$80,000, or 4 percent of the total estimated subcontract dollars. Women-owned businesses actually received subcontracts in the amount of \$91,433, or 5 percent of the total subcontract dollars awarded.

During FY 1996, 100 interviews were conducted with firms wanting to do business with the NRC, and 15 followup meetings were arranged with NRC technical personnel. The staff of The Office of Small Business and Civil Rights (SBCR) also participated in five major small business conferences. Most noteworthy among these were the High Technology Conference in March 1996, Small Business Week in May 1996, and the Minority Enterprise Development Week in October 1996.

Civil Rights Program

On February 6, 1996, the Chairman signed and forwarded to the Equal Employment Opportunity Commission (EEOC) the FY 1995 Program Plan Update and Accomplishment Report on the Affirmative Action Program Plan for Hiring, Placement, and Advancement of Individuals with

Handicaps for the Nuclear Regulatory Commission. Of the 3,161 employees in the total workforce, 172 reported handicaps, 21 of which were targeted disabilities. The targeted disabilities include those who are deaf, blind, missing extremities, mentally retarded, and those who have partial paralysis, complete paralysis, convulsive disorders, mental illness, and distortion of limb/spine.

On February 27, 1996, the Chairman signed and forwarded to the EEOC the NRC's Annual Multi-Year Affirmative Employment Program Accomplishment Report for FY 1995. This report reflects the accomplishments of the NRC in providing equal opportunities for its minority and women employees. As with all Federal agencies, downsizing has impacted our external recruitment and hiring. However, we continue to concentrate our efforts in the areas of training and internal upward mobility of women and minorities. Of particular note during this reporting period was our success in increasing the number of Asian Pacific Americans in grades 13 and above.

On October 30, 1996, the Acting Director for SBCR signed and sent to the EEOC the NRC's Annual Federal Employment Opportunity Statistical Report of Discrimination Complaints. This report stated that approximately 122 individuals were counseled during the reporting period and that 11 formal complaints were filed. Eighteen formal complaints were closed and sixteen complaints were carried forward from the end of the prior reporting period. Reprisal was the dominant basis on which complaints were filed, with assignment of duties dominating the issues.

The SBCR staff has continued to hold the monthly meetings with members of the Office of Personnel staff, and representatives from the Equal Employment Opportunity (EEO) Advisory Committees. These meetings continue to be very productive in bringing about better communication and understanding between the attendees and in planning for the annual EEO briefings for the Commission.

The Commission was briefed by the NRC staff and representatives of each of the EEO advisory committees on the status of the EEO programs and goals on December 14, 1995, and again on July 31, 1996. For the December 14 briefing, the EEO Advisory Committees reached consensus regarding the following "common goals:"

1. Issue yellow announcement to all NRC staff stating the Six EEO Initiatives and the Agency's EEO Policy Statement.
2. Monitor and evaluate Affirmative Action Program.
3. Incorporate the EEO program in the NRC's strategic assessment and planning process.
4. Include measurable standards for management accountability regarding NRC's EEO/AA policies and programs.
5. Enhance representation of minorities and women in technical, supervisory, management, and executive positions.
6. Follow up on the Agency's Focus Group study that was completed the past year.
7. Support a family-friendly workplace.
8. Support one comprehensive and one followup EEO Commission briefing.
9. Examine and report on specific concerns and root causes regarding EEO formal and informal complaints.

The EDO's Staff Requirements Memorandum of December 29, 1995, resulting from the December 14 briefing required the staff to—

1. Report progress on the nine goals addressed in the Joint Statement from the advisory committees in future EEO briefings.
2. Consider feasible methods to provide constructive feedback to non-selected job candidates to enhance their potential to compete for future positions.
3. Consider a means to monitor whether training is resulting in the promotion of employees.
4. Obtain a more accurate accounting for the category of "disabled" employees.

For the July 31, 1996, EEO Commission briefing, the EEO Advisory Committees and the staff reached agreement on issues 1, 7, and 8 of the nine "common goals" and, therefore, consider those issues closed. They agreed to work toward

reaching agreement on the remaining six goals during the next several months.

SBCR conducted the annual advanced training course for headquarters and regional EEO Counselors in Baltimore, Maryland, on June 18–21, 1996. The training was conducted by the Assignment Group of Rockville, Maryland. Participants engaged in activities designed to—

- explore the basis for enhanced discharge of EEO collateral duties;
- practice the skills needed for increased proficiency in resolving complaints informally;
- apply principles of conflict resolution to ADR methods;
- identify and explain applicable case law, policies and principles involved in EEO counseling.

During the last day of training, Mr. Gary Gilbert, the Chief Administrative Judge from the Baltimore District Office, EEOC, provided an overview of the Baltimore District Office responsibilities. We also had presentations from Mr. Karl Farrar of the NRC Office of General Counsel and Mr. Michael Fox, Chief of Labor Relations of the NRC Office of Personnel.

Affirmative Action Initiatives

During FY 1996, SBCR implemented or supported several affirmative action initiatives in support of the NRC's EEO objectives. Some of these initiatives were conducted in conjunction with the various EEO Advisory Committees and the Office of Personnel. The summaries below highlight the activities completed in FY 1996.

The Affirmative Action Manager served as the SBCR liaison with the seven EEO Advisory Committees: Affirmative Action Advisory Committee (AAAC), Advisory Committee for African Americans (ACAA), Hispanic Employment Program Advisory Committee (HEPAC), Asian Pacific American Advisory Committee (APAAC), Committee on Age Discrimination (CAD), Federal Women's Program Advisory Committee

(FWPAC), and Joint Labor Management Equal Employment Opportunity Committee (JLMEEOC). The cooperative goal of these committees is to identify and address EEO-related issues that impact equal opportunity for employees and provide advice and recommendations to improve the EEO program. SBCR facilitated a training session for advisory committee members that covered the roles and responsibilities of advisory committees, the history of EEO, identification of barriers to affirmative action, and program planning. This year the committees formed three subcommittees to focus their efforts on monitoring affirmative actions, reviewing the merit selection process, and evaluating options for implementing a "Managing Diversity" process. The committees are working closely with SBCR and OP to ensure that relevant information is shared and recommendations are coordinated.

The Affirmative Action Manager initiated an outreach to Office Directors and Regional Administrators to assist them in identifying ways to enhance career development, to resolve human relations conflicts, and to encourage continued support of the Agency's EEO Program. Offices are provided statistical data reflecting 3-year trends in promotions, awards, hires, training, rotations, and number of employees in specific occupations. This information provides executives with a broad-scope view of their accomplishments in these areas.

During October 1995, SBCR and the APAAC sponsored a Brown Bag session designed to inform Asian Pacific American employees about committee responsibilities, to introduce the committee members, and to discuss issues or concerns related to EEO.

Seminars and workshops in FY 1996 included "Strive and Survive" conducted by Ms. Daisy M. Saunders on July 18, 1996. This seminar highlighted ways to create and enhance career opportunities, established networking strategies, and analyzed work styles; and "How To Manage Multiple Priorities" conducted by Ms. Cristina Samuels. This latter seminar discussed ways to achieve maximum efficiency in project planning and results. On the basis of popular request by employees, both Ms. Samuels and Ms. Saunders are scheduled to return in FY 1997.

In conjunction with the FWPAC, SBCR sponsored a women's luncheon titled "Seat At the Table." Guest speakers to facilitate group discussions on Risk and Change, Health and Wealth, Network to Success, and Invest in Yourself included Ms. Lucy Antone, FWP Manager—OPM, Ms. Carol Fields, FWP Manager—USDA, Ms. Ann Ambler, FWP Manager—HHS, and Ms. Denise Wilson Taylor, Vice Chairperson—Friends of DC Commission for Women. Additionally, the FWPAC and SBCR co-sponsored the Annual Women's History Month Program in March. The theme was "See History In A New Way—A New Vision For Leadership." The keynote speaker was Ms. Greta J. Dicus, NRC Commissioner. Featured guests included Ms. Kashaka R. Newman, jazz soloist, along with a dance presentation by NRC's own, Ms. Veronica Williams.

In conjunction with the AAAC, the SBCR sponsored the Annual Black History Program in February. The keynote speaker was Dr. Shirley Ann Jackson, NRC Chairman. The theme was, "A Celebration Of African American Contributions To The Arts, Industry, and Science." The featured artists were Ms. Brenda Shelton who sang Precious Lord, Take My Hand, Ms. Ira Radden who recited one of her original works titled, "I Am Somebody—I, Too, Am American," and Mr. Samuel Leatherberry, international guitarist and an NRC contractor, who performed two instrumentals. A luncheon was held at Bish Thompson's Restaurant in Bethesda. The featured guest was Ms. Shirleta Settles, an African American Storyteller with her story, "The Lion in the Well." Mr. Kenneth Godfrey, an NRC employee and aspiring poet, recited two of his original works titled, "Essence of A Woman," and "Love For The Elderly."

The FWPAC and the HEPAC teamed up with OP and SBCR to co-sponsor a Career Strategies Seminar designed to provide NRC employees information on the Agency's developmental programs. These programs include the NRR Intern Program, Graduate Fellowship Program, Administrative Skills Enhancement Program, Certified Professional Secretary Program, Computer Science Program, the Women's Executive Leadership Program, Senior and Resident Inspector Programs, the Mentoring Program, Individual Development Plan, Career Counseling, and others.

The FWPAC worked with the SBCR to sponsor "Bring The Children To The Workplace." This is a

national campaign to allow children the opportunity to visit the worksite and teach them about the organization's business, day-to-day functions, and careers of employees carrying out those functions. Children attending this event participated in tours of the Operations Center, the Day Care Center, the Computer Room, and the Fitness Center. Mr. Paul Bird, Director of Personnel, opened the program and highlighted characteristics of rock formation. Other presenters included Mr. Jose Ibarra who conducted an electrical experiment, and Mr. Rick Hasselberg who discussed problem solving with math and science. Mr. Louis Grossman discussed computer ethics and presented a rap video on the subject and Ms. Rita Albright led the children in playing The Birthday Game. Special guest was Dr. Irene Eckstrand, then Acting Director, Office of Science Education, National Institutes of Health, who discussed "Science Is a Verb."

The NRC participated as one of nine federal agency members of the Historically Black Colleges and Universities (HBCU) Science and Technology Cluster. The Cluster held a Conference for HBCUs at Tennessee State University, Nashville, Tennessee. This conference provided HBCU staffs an opportunity to obtain information regarding the agencies' HBCU Programs and the application process. The HBCU Program provides funds for HBCU faculty and students to engage in research in conjunction with the agencies' own research program.

Women's Equality Day was commemorated in August with a poster exhibit that highlighted the Women's Suffrage Movement from 1848-1920, Women Who Have Changed the World, and a special Celebrate Women Calendar. Paper place-mats depicting scenes from the Suffrage Movement were placed on dining tables in both the NUREG Cafe and the Two White Flint North Cafeteria.

The APAAC teamed up with the SBCR to sponsor the Annual Asian Pacific American Heritage

Month Program in May. The theme was "One Vision, One Mission, One Voice." The guest speaker was Mr. Edward Chow, Jr., Deputy Assistant Secretary for Policy, Department of Veterans Affairs. The keynote speaker was Dr. Shirley Ann Jackson, NRC Chairman. Ms. Cheryl Nagel performed the National Anthem and "America The Beautiful."

The HEPAC teamed up with SBCR to sponsor a poster exhibit that featured "Women of Hope: Latinas Abriendo Camino." This exhibit highlighted the achievements of Miram Colon, Helen Rodriguez-Trias, Adrian Ocampo, Ana Sol Gutierrez, Amalia Mess Bains, Delores Huerta, Julia Alvarez, Sandra Cisneros, Antonia Hernandez, Nydia Valazquez, and Tania Leon.

The Affirmative Action Manager offered career development counseling to employees upon request. These sessions, conducted for approximately 1-hour with each employee, included a review of experiences and skills, identification of goals and objectives, development of career strategy to achieve goals and objectives, and the identification of potential contacts needed. This information formed the basis of the employee's Individual Development Plan.

The Affirmative Action Manager updated and revised the Agency's Mentoring Program. The new consulting team includes Ms. Margo Murray, President and Chief Operating Officer of MMHA, Inc., and her associate, Mr. Mike McCrary. The program is designed to pair a more experienced employee who volunteers to assist a less experienced employee with his or her career goals and aspirations. The objectives are to improve staff productivity and potential for advancement, to support upward mobility and human resource development, to improve staff morale, and to help meet EEO goals. Approximately 35 pairs have completed the Mentoring Orientation.

Appendix 1

NRC Organization

(Current)

COMMISSIONERS

Shirley Ann Jackson, Chairman
Greta Joy Dicus
Nils J. Diaz
Edward McGaffigan

The Commission Staff

Office of Commission Appellate Adjudication—John F. Cordes, Jr., Acting Director
Office of Congressional Affairs—Dennis K. Rathbun, Director
Office of the General Counsel—Karen D. Cyr, General Counsel
Office of the Inspector General—Hubert Bell, Inspector General
Office of International Programs—Carlton R. Stoiber, Director
Office of Public Affairs—William M. Beecher, Director
Secretary of the Commission—John C. Hoyle, Secretary

Other Offices

Advisory Committee on Nuclear Waste—Paul W. Pomeroy, Chairman
Advisory Committee on Reactor Safeguards—Robert L. Seale, Chairman
Atomic Safety and Licensing Board Panel—B. Paul Cotter, Jr., Chief Administrative Judge

CHIEF FINANCIAL OFFICER

Chief Financial Officer—Jesse L. Funches

CHIEF INFORMATION OFFICER

Chief Information Officer—Anthony J. Galante

EXECUTIVE DIRECTOR FOR OPERATIONS

Executive Director for Operations—L. Joseph Callan
Deputy Executive Director for Regulatory Effectiveness—Edward J. Jordan
Deputy Executive Director for Regulatory Programs—Hugh L. Thompson, Jr.
Deputy Executive Director for Management Services—Patricia G. Norry
Assistant for Operations, James L. Blaha

NRC Organization (continued)

EXECUTIVE DIRECTOR FOR OPERATIONS

(continued)

Program Offices

Office of Nuclear Material Safety and Safeguards—Carl J. Paperiello, Director
Office of Nuclear Reactor Regulation—Samuel J. Collins, Director
Office of Nuclear Regulatory Research—Ashok C. Thadani, Director

Staff Offices

Office of Administration—Edward L. Halman, Director
Office for Analysis and Evaluation of Operational Data—Denwood F. Ross, Jr., Director
Office of Enforcement—James Lieberman, Director
Office of Investigations—Guy P. Caputo, Director
Office of Personnel—Paul E. Bird, Director
Office of Small Business and Civil Rights—Irene P. Little, Director
Office of State Programs—Richard L. Bangart, Director

Regional Offices

Region I, Philadelphia, Pennsylvania—Hubert J. Miller, Regional Administrator
Region II, Atlanta, Georgia—Luis J. Reyes, Regional Administrator
Region III, Chicago, Illinois—Arthur B. Beach, Regional Administrator
Region IV, Dallas, Texas—Ellis W. Merscoff, Regional Administrator

The Chief Financial Officer (CFO) oversees the financial management of NRC's programs and operations and provides advice to the Chairman on financial management matters. The CFO establishes financial management policy for the agency and provides policy guidance to senior managers on the budget and all other financial management activities, including systems, personnel, structure and functions, performed by component financial management organizations; oversees the development and maintenance of financial management and accounting systems to provide reliable information for internal and external financial management reporting; establishes agency-wide financial data and reporting format requirements, and provides an agency-wide management control program for financial and program managers that provides for timely corrective actions regarding material weaknesses disclosed through audit findings and reports provided under the Federal Managers' Financial Integrity Act.

The Chief Information Officer (CIO) plans, directs, and oversees the NRC's information resources, including information technology infrastructure and delivery of information management services, to meet the mission and goals of the agency. The CIO provides principal advice to the Chairman to ensure that Information Technology (IT) is acquired and information resources across the agency are managed in a manner consistent with Federal Information Resources Management (IRM) laws and regulations. Assists senior management in recognizing where information technology can add value while improving NRC operations and services delivery. Directs the implementation of a sound and integrated IT architecture to achieve NRC's strategic and IRM goals. Monitors and evaluates the performance of information technology and information management programs based on applicable performance measures and assesses the adequacy of IRM skills of the agency. Provides guidance and oversight for the selection, control, and evaluation of information technology investments.

The Executive Director for Operations (EDO) is the chief operational and administrative officer of the Commission and is authorized and directed to discharge licensing, regulatory, and administrative functions of the NRC and to take actions as are

necessary for day-to-day operations of the agency. The EDO supervises and coordinates policy development and operational activities of EDO staff and program offices and implements Commission policy directives pertaining to these offices.

The Office of Nuclear Material Safety and Safeguards licenses, inspects, and regulates facilities and materials associated with processing, transporting, and handling nuclear materials, as well as disposing of nuclear waste and regulating uranium recovery facilities. The Office also regulates related facility decommissioning. The safeguards staff of the office reviews and assesses protection against potential threats, thefts, and sabotage for licensed facilities, working closely with other NRC offices in coordinating safety and safeguards programs and in recommending research, standards, and policy options necessary for their successful operation.

The Office of Nuclear Reactor Regulation ensures the public health and safety through licensing and inspection activities at all nuclear power reactor facilities in the United States. The Office oversees all aspects of licensing and inspection of manufacturing, production, and utilization facilities (except for facilities reprocessing fuel and performing isotopic fuel enrichment), and receipt, possession, and ownership of source, byproduct, and special nuclear material used or produced at facilities licensed under 10 CFR Part 50. The Office develops policy and inspection guidance for programs assigned to the Regional Offices and assesses the effectiveness and uniformity of the Regions' implementation of those programs. The Office identifies and takes action in coordination with the Regional Offices regarding conditions and licensee performance at such facilities that may adversely affect public health and safety, the environment, or the safeguarding of nuclear facilities and assesses and recommends or takes action in response to incidents or accidents. The Office is responsible for licensing issues and regulatory policy concerning reactor operators, including the initial licensing examination and requalification examinations; emergency preparedness, including participation in emergency drills with Federal, State, and local agencies; radiation protection; security and safeguards at such facilities, including fitness for duty; and the inspection of nuclear supplier facilities. The Office also conducts

technical review, certification, and licensing of advanced nuclear reactor facilities and renews current power reactor operating licenses.

The Office of Nuclear Regulatory Research plans, recommends, and implements programs of nuclear regulatory research, standards development, and resolution of safety issues for nuclear power plants and other facilities regulated by the NRC. It develops and promulgates all technical regulations; coordinates research activities within and outside the NRC, including appointment of staff to committees and conferences; and coordinates national volunteer standards efforts, including appointment of staff to committees.

The Regional Offices are under the supervision and direction of the Executive Director for Operations and carry out NRC regulatory programs originating in the various Headquarters Offices.

The Commission Staff

The Office of the Secretary of the Commission (SECY) provides executive management services to support the Commission by planning and scheduling Commission business, preparing the Commission's meeting agenda, and codifying Commission decisions in memoranda directing staff action. The SECY also processes and controls Commission correspondence, maintains the Commission's official records and adjudicatory and rulemaking dockets, and directs and administers the NRC Historical Program. In addition, SECY functions as the Federal Advisory Committee Management Officer.

The Office of Commission Appellate Adjudication is responsible for monitoring cases pending before presiding officers; for providing the Commission with an analysis of any adjudicatory matter requiring a Commission decision (e.g., petitions for review of Initial Licensing Board decisions, certified questions, interlocutory referrals, stay requests), including available options; for the drafting of any necessary decisions, pursuant to the Commission's guidance, after presentation of options; and for consulting with the Office of the General Counsel in identifying options to be

presented to the Commission and in drafting the final decision to be presented to the Commission.

The Office of Congressional Affairs provides advice and assistance to the Chairman, the Commission, and the NRC staff on all NRC relations with Congress and views of Congress toward NRC policies, plans, and activities; maintains liaison with Congressional committees and members of Congress on matters of interest to the NRC; serves as primary contact for all NRC communications with Congress, reviewing and concurring in all outgoing correspondence to members of Congress; coordinates NRC internal activities with Congress; plans and develops NRC's legislative program; and monitors legislative proposals, bills, and hearings.

The Office of the General Counsel directs matters of law and legal policy, providing opinions, advice, and assistance to the Commission and staff with respect to all activities of the agency.

The Office of the Inspector General conducts investigations and audits directed principally toward improving program management, ensuring the integrity of the NRC's regulatory programs, and preventing and identifying fraud, waste, and abuse in the agency's programs and operations.

The Office of International Programs provides advice and assistance to the Chairman, the Commission, and the NRC staff on international issues. The office formulates and recommends policies concerning nuclear exports and imports, international safeguards, international physical security, non-proliferation matters, and international cooperation and assistance in nuclear safety and radiation protection. The office plans, develops, and implements programs to carry out policies established in these areas; plans, develops, and manages international nuclear safety information exchange programs; and coordinates international research agreements. The office obtains, evaluates, and uses pertinent information from other NRC and U.S. Government offices in processing nuclear export and import license applications; establishes and maintains working relationships with individual countries and international nuclear organizations, as well as other U.S. Government agencies; and ensures that all international activities carried out by the Commission and the staff are properly

coordinated internally and Government-wide and are consistent with NRC and U.S. policies.

The Office of Public Affairs develops policies, programs, and procedures for informing the public of NRC activities; prepares, clears, and disseminates information to the public and the news media concerning NRC policies, programs, and activities; keeps NRC management informed on media coverage of activities of interest to the agency; plans, directs, and coordinates the activities of public information staffs located at the Regional Offices; conducts a cooperative program with the schools; and carries out assigned activities in the area of consumer affairs.

The Office of the Secretary of the Commission provides executive management services to support the Commission and to implement Commission decisions; advises and assists the Commission and staff on planning, scheduling, and conducting Commission business; prepares the Commission's meeting agenda; codifies Commission decisions in memoranda directing staff action, monitors staff compliance of pending actions, and tracks commitments through the automated Commission tracking system; manages the staff paper and COMSECY systems; initiates and monitors the status of office automation initiatives into the Commission's administrative system; processes and controls Commission correspondence; maintains the Commission's official records and acts as Freedom of Information coordinator for Commission records; maintains the official adjudicatory and rulemaking dockets of the Commission and serves Commission and Atomic Safety and Licensing Board issuances in all adjudicatory matters and public proceedings; directs and administers the NRC Historical Program; and functions as the Federal Advisory Committee Management Officer.

Support Staff

The Office of Administration directs the agency's programs for contracting and procurement; transportation services; security of personnel and facilities; rulemaking support; management of space and equipment; and other administrative services.

The Office for Analysis and Evaluation of Operational Data provides agency coordination for the collection, storage, and retrieval of operational data associated with licensed activities, analyzes and evaluates such operational experience and feeds back the lessons of that experience to NRC licensing, standards, and inspections activities staff. The Office is also responsible for the NRC incident response program and the technical training center, as well as the tracking of licensee performance indicators.

The Office of the Controller develops and maintains NRC's financial management programs, including policies, procedures, and standards of accounting and financial systems—such as payroll and travel expenses—and preparation of the agency budget.

The Office of Enforcement develops policies and programs for the enforcement of NRC requirements, manages major enforcement actions, and assesses the effectiveness and uniformity of regional enforcement actions.

The Office of Information Resources Management develops, provides, and administers information resources of the agency in the areas of computer, telecommunications, and information services. These include database management, office automation, computer hardware and software, systems development, computer operations, timesharing, nation-wide telecommunications equipment, the Customer Support Center, user training, document control and management, central files, records management and services, library, graphics, and other information support services to the agency.

The Office of Investigations conducts, supervises, and assures quality control of investigations of licensees, applicants, contractors, or vendors, including the investigation of all allegations of wrongdoing by other than NRC employees and contractors. The Office develops policy, procedures and standards for these activities.

The Office of Personnel plans and implements NRC policies, programs, and services to provide for the effective organization, recruitment, placement, utilization, and development of the agency's human resources.

The Office of Small Business and Civil Rights develops and implements the NRC's program in

accordance with the Small Business Act, as amended, ensuring that appropriate consideration is given to small business firms, including women-owned and minority businesses. The Office develops and recommends NRC policy, providing for equal employment opportunity and develops, monitors, and evaluates the affirmative action program to ensure compliance with the policy. The Office also serves as contact with local and national public and private organizations with related interests and administers the Historically Black Colleges and Universities Program.

The Office of State Programs is responsible for establishing and maintaining good community relations between the NRC, the States, local governments, other Federal agencies, and Indian Tribe organizations; serves as primary contact for policy matters between the NRC and these groups; keeps the agency apprised of activities of these groups, as they may affect NRC, and conveys to NRC management the groups' views on NRC policies, plans, and activities; coordinates liaison with other Federal Agencies through the Federal Liaison Program; administers the State Agreements Program; provides training and technical assistance to Agreement States; integrates Federal regulatory activities with the States; and maintains cooperative and liaison activities with the States.

NRC Advisory Committees and Licensing Panels

The Advisory Committee on Nuclear Waste was established by the Nuclear Regulatory Commission in 1988 to advise the Commission on nuclear waste disposal facilities, as directed by the Commission.

Advisory Committee on Medical Uses of Isotopes, established in 1958, is composed of qualified physicians and scientists, employed under yearly persona services contracts. The committee considers medical questions referred to it by the NRC staff and gives expert opinions on the medical uses of radioisotopes. The Committee also advises the NRC staff, as required, on matters of policy.

The Advisory Committee on Reactor Safeguards is a statutory committee established to advise the Commission on safety aspects of proposed and existing nuclear facilities and on the adequacy of proposed reactor safety standards and performing such other duties as the Commission may request. The committee conducts a continuing study of reactor safety research and submits an annual report to the Congress. The committee also administers a fellowship program.

The Atomic Safety and Licensing Board Panel is a panel of lawyers and others with expertise in various technical fields from which three-member Licensing Boards are drawn to conduct public hearings and make such intermediate or final decisions as the Commission may authorize in proceedings to grant, amend, suspend, or revoke NRC licenses.

The Licensing Support System Advisory Review Panel, established in 1989, advises the NRC's Licensing Support System Administrator and the Department of Energy on selected aspects of the design, development, and operation of the support system.

The Nuclear Safety Research Review Committee, established in 1988 on the recommendation of the National Research Council, provides advice to the Director of the Office of Nuclear Regulatory Research regarding the direction of NRC's nuclear safety research programs.

Appendix 2

Atomic Safety and Licensing Board Panel

Full-time Panel Members:

CHIEF ADMINISTRATIVE JUDGE B. PAUL COTTER, JR., Legal, U.S. Nuclear Regulatory Commission, Rockville, Maryland

DEPUTY CHIEF ADMINISTRATIVE JUDGE—EXECUTIVE JAMES P. GLEASON, Legal, U.S. Nuclear Regulatory Commission, Rockville, Maryland

DEPUTY CHIEF ADMINISTRATIVE JUDGE—TECHNICAL FREDERICK J. SHON, Engineer, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE CHARLES BECHHOEFER, Legal, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE PETER B. BLOCH, Legal, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE G. PAUL BOLLWERK, III, Legal, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE RICHARD F. COLE, Environmental Scientist, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE CHARLES N. KELBER, Physicist, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE JERRY R. KLINE, Environmental Scientist, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE PETER S. LAM, Nuclear Engineer, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE THOMAS S. MOORE, Legal, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JUDGE THOMAS D. MURPHY, Health Physicist, U.S. Nuclear Regulatory Commission, Rockville, Maryland

Part-time Panel Members:

JUDGE GEORGE C. ANDERSON, Marine Biologist (retired), University of Washington, Seattle, Washington

JUDGE A. DIXON CALLIHAN, Physicist (retired), Union Carbide Corporation, Davidson, North Carolina

JUDGE JAMES H. CARPENTER, Environmental Scientist (retired), U.S. Nuclear Regulatory Commission, Sunset Beach, North Carolina

JUDGE THOMAS S. ELLEMAN, Nuclear Engineer (retired), North Carolina State University, Raleigh, North Carolina

JUDGE GEORGE A. FERGUSON, Nuclear Physicist (retired), Howard University, Shady Side, Maryland

JUDGE HARRY FOREMAN, Medical Doctor (retired), University of Minnesota, St. Paul, Minnesota

JUDGE RICHARD F. FOSTER, Environmental Scientist, Bend, Oregon

JUDGE DAVID L. HETRICK, Nuclear Engineer, University of Arizona, Tucson, Arizona

JUDGE ERNEST E. HILL, Nuclear Engineer, Hill Associates, Danville, California

JUDGE FRANK F. HOOPER, Marine Biologist (retired), University of Michigan, Ann Arbor, Michigan

JUDGE ELIZABETH B. JOHNSON, Nuclear Engineer, Oak Ridge National Laboratory, Oak Ridge, Tennessee

JUDGE JAMES C. LAMB, III, Environmental Engineer, George Washington University, Charlottesville, Virginia

JUDGE EMMETH A. LUEBKE, Physicist (retired), U.S. Nuclear Regulatory Commission, Chevy Chase, Maryland

JUDGE KENNETH A. MCCOLLOM, Electrical Engineer (retired), Oklahoma State University, Stillwater, Oklahoma

JUDGE MARSHALL E. MILLER, Legal
(retired), U.S. Nuclear Regulatory Commission,
Mountain View, California

JUDGE PETER A. MORRIS, Physicist (retired),
U.S. Nuclear Regulatory Commission, Potomac,
Maryland

JUDGE RICHARD R. PARIZEK, Geologist,
Pennsylvania State University, University Park,
Pennsylvania

JUDGE HARRY REIN, Medical Doctor,
Longwood, Florida

JUDGE LESTER S. RUBENSTEIN, Nuclear
Engineer (retired), U.S. Nuclear Regulatory
Commission, Oro Valley, Arizona

JUDGE DAVID R. SCHINK, Oceanographer,
Texas A&M University, College Station, Texas

JUDGE GEORGE F. TIDEY, Medical Doctor,
University of Texas, Houston, Texas

Professional Staff:

LEE S. DEWEY, Chief Counsel ASLBP, U.S.
Nuclear Regulatory Commission, Rockville,
Maryland

ROBERT PIERCE, Senior Attorney, ASLBP, U.S.
Nuclear Regulatory Commission, Rockville,
Maryland

JACK G. WHETSTINE, Director, Program
Support and Analysis Staff, ASLBP, U.S.
Nuclear Regulatory Commission, Rockville,
Maryland

Appendix 3

NRC's Federal Advisory Committees

Advisory Committee on Reactor Safeguards

The Advisory Committee on Reactor Safeguards (ACRS) is a statutory committee established to advise the Commission on the safety aspects of proposed and existing nuclear facilities, as well as the adequacy of proposed reactor safety standards, and to perform such other duties as the Commission may request.

As of December 1996, the ACRS included the following members:

CHAIRMAN: DR. THOMAS S. KRESS, retired Head of Applied Systems Technology Section, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

VICE-CHAIRMAN: DR. ROBERT L. SEALE, Professor of Nuclear and Energy Engineering, Department of Nuclear and Energy Engineering, College of Engineering and Mines, University of Arizona, Tucson, Arizona.

DR. GEORGE APOSTOLAKIS, Professor, Nuclear Engineering Department, Massachusetts Institute of Technology, Cambridge, Massachusetts.

MR. JOHN BARTON, Retired Executive, General Public Utilities Corporation.

DR. IVAN CATTON, Professor of Engineering, Department of Mechanical, Aerospace and Nuclear Engineering, School of Engineering and Applied Science, University of California, Los Angeles, California.

DR. MARIO FONTANA, Research Professor, Nuclear Engineering Department, University of Tennessee, and retired from Oak Ridge National Laboratory, Oak Ridge, Tennessee.

DR. DON W. MILLER, Professor and Chair, Nuclear Engineering, Department of Mechanical Engineering, the Ohio State University, Columbus, Ohio.

DR. DANA A. POWERS, Manager, Nuclear Facilities Safety Department, Sandia National Laboratories, Albuquerque, New Mexico.

DR. WILLIAM J. SHACK, Associate Director, Energy Technology Division, Argonne National Laboratory, Argonne, Illinois.

Advisory Committee on Nuclear Waste

The Advisory Committee on Nuclear Waste (ACNW) reports to and advises the NRC on nuclear waste disposal facilities. The committee examines and reports on those areas of concern referred to it by the Commission or its designated representatives, and undertakes other studies and activities related to those issues as directed by the Commission.

As of December 1996, the ACNW included the following members:

CHAIRMAN: DR. B. JOHN GARRICK, President, PLG, Inc., Newport Beach, California.

VICE-CHAIRMAN: DR. WILLIAM J. HINZE, Professor, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana.

DR. GEORGE W. HORNBERGER, Professor, Department of Environmental Sciences, University of Virginia.

DR. PAUL W. POMEROY, President, Rondout Associates, Incorporated, Stone Ridge, New York.

Advisory Committee on Medical Uses of Isotopes

The Advisory Committee on Medical Uses of Isotopes (ACMUI) was established in July 1958 and comprises qualified physicians and scientists. The ACMUI considers medical questions referred to it by NRC staff, gives expert opinions on the

medical uses of radioisotopes, and advises the NRC staff on matters of policy.

As of October 31, 1996, the ACMUI included the following appointed members:

CHAIRMAN: DR. JUDITH ANNE STITT, University of Wisconsin Hospital, Department of Human Oncology, Madison, Wisconsin.

MS. JUDITH I. BROWN, Patient Rights and Care Advocate, Washington, D.C.

DR. DANIEL F. FLYNN, Holy Family Hospital and Medical Center, Methuen, Massachusetts.

MR. JOHN GRAHAM, Hospital Administrator, St. Mary Hospital, Livonia, Michigan.

DR. A. ERIC JONES, U.S. Food and Drug Administration, Rockville, Maryland.

DR. WIL B. NELP, University of Washington, University Hospital, Seattle, Washington.

MR. DENNIS P. SWANSON, University of Pittsburgh School of Pharmacy, Pittsburgh, Pennsylvania.

DR. LOUIS K. WAGNER, Medical Physicist—Nuclear Medicine, University of Texas Medical School, Houston, Texas.

MS. THERESA WALKUP, Radiation Therapy Technologist, Mercy Health Center, Oklahoma City, Oklahoma.

DR. JEFFREY F. WILLIAMSON, Medical Physicist, Washington University Medical Center, St. Louis, Missouri.

Licensing Support System Advisory Review Panel

The Licensing Support System Advisory Review Panel (LSSARP) was established in 1989 to advise the NRC and the Department of Energy (DOE) on selected aspects of the design, development, and operation of the Licensing Support System, currently administered by the Deputy Director of the NRC Office of Information Resources Management. The panel consists of representatives of the NRC, DOE, the State of Nevada, the local government of Nye County (Nevada), the National Congress of American Indians, a coalition of nuclear industry organizations, and other Federal agencies having

experience with large electronic document management systems.

As of October 1996, the LSSARP included the following appointed members:

CHAIRMAN: MR. JOHN C. HOYLE, U.S. Nuclear Regulatory Commission.

MS. CLAUDIA NEWBURY, U.S. Department of Energy.

MR. KIRK BALCOM, State of Nevada.

MR. HARRY W. SWAINSTON, State of Nevada.

MS. LORETTA METOXEN, National Congress of American Indians.

MR. DENNIS BECHTEL, Clark County, Nevada.

MS. EVE CULVERWELL, Commissioner, Lincoln City Board of Commissioners, Lincoln City, Nevada.

MR. WAYNE CAMERON, White Pine County, Nevada.

MR. PETE J. GOICHOECHEA, Eureka County Commission, Nevada.

MR. VERNON POE, Director, Office of Nuclear Projects, Mineral County, Nevada.

MR. JAMES REGAN, Churchill County Commission, Nevada.

MR. BILL ELQUIST, Lander County Commission, Nevada.

MS. JUANITA D. HOFFMAN, Esmeralda County, Nevada.

MR. BRAD METTAM, Inyo County, Nevada.

MR. LES BRADSHAW, Nye County, Nevada.

MR. MALACHY MURPHY, Nye County, Nevada.

MR. JAY SILBERG, Shaw, Pittman, Potts & Trowbridge, Washington, D.C.

MR. CHRISTOPHER J. HENKEL, Nuclear Energy Institute, Washington, D.C.

MR. DAVID COPENHAFFER, U.S. Securities and Exchange Commission.

Nuclear Safety Research Review Committee

The Nuclear Safety Research Review Committee (NSRRC) was established in 1988 on

the recommendation of the National Research Council. The committee provides advice to the Director of the Office of Nuclear Regulatory Research regarding the direction of NRC's nuclear safety research programs.

As of October 1996, the NSRRC included the following members:

CHAIRMAN: DR. E. THOMAS BOULETTE, Senior Vice President, Nuclear, Pilgrim Station, Boston Edison Company.

DESIGNATED FEDERAL OFFICER: DR. JOSE LUIS M. CORTEZ, Senior Research Program Coordinator, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission.

DR. S. GEORGE BANKOFF, Chemical Engineering Department, Northwestern University.

PROFESSOR ANTHONY J. BARATTA, Nuclear Engineering Department, College of Engineering, The Pennsylvania State University.

PROFESSOR MICHAEL W. GOLAY, Professor of Nuclear Engineering, Department of Nuclear Engineering, Massachusetts Institute of Technology.

PROFESSOR ROBERT D. HATCHER, JR., Distinguished Professor of Engineering, Department of Geological Sciences, University of Tennessee.

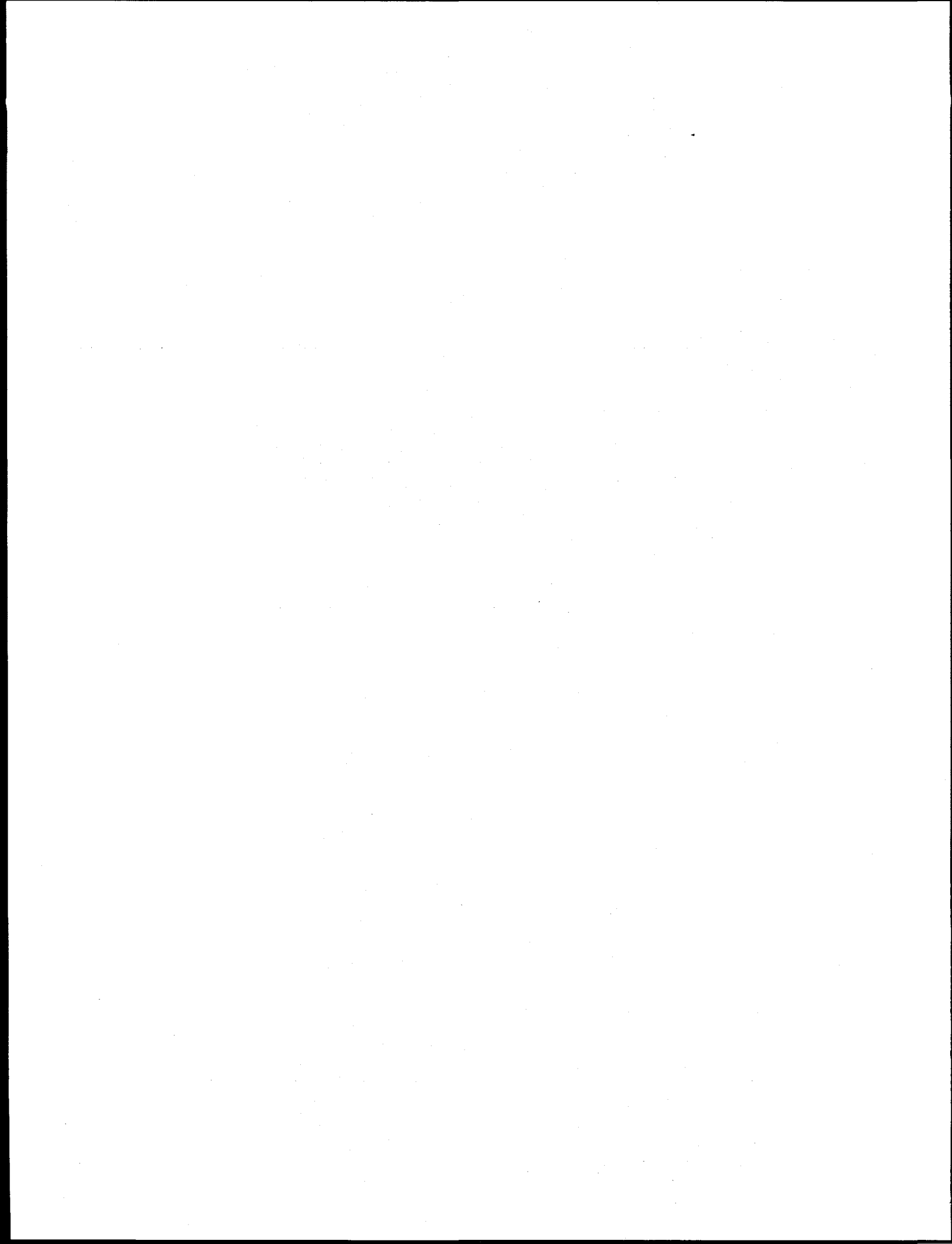
PROFESSOR CHARLES MAYO, Associate Professor of Nuclear Engineering, Department of Nuclear Engineering, North Carolina State University.

MR. FRED J. MOLZ, Westinghouse Professor, Environmental Systems Engineering Department, Clemson Research Park.

MR. JOHN TAYLOR, Retired—Electric Power Research Institute.

DR. ROBERT VOGEL, Retired—Electric Power Research Institute.

DR. SUMIO YUKAWA, Retired—General Electric Company.



Appendix 4

Local Public Document Rooms

Copies of most documents originating in the NRC or submitted to it for review are placed in the Commission's Public Document Room (PDR) in the Gelman Building, 2120 L Street, N.W., Washington, D.C., for public inspection. Other PDRs are maintained in the five Regional Offices (for documents related to nuclear material licenses, i.e., most byproduct and source material licenses). In addition, documents related to licensing proceedings or licensed operation of specific facilities are made available in local PDRs established in the vicinity of a proposed or existing nuclear facility. The locations of the local PDRs, the names of the persons to contact, and the names of the facilities for which documents are retained are listed below. (N.B., Updated listings of local PDRs may be obtained by writing to Freedom of Information/Local Public Document Room Branch, Division of Freedom of Information and Publications Services, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.)

ALABAMA

- Ms. Susan Todd, Head Librarian
Athens Public Library
405 E. South Street
Athens, Ala. 35611
Browns Ferry nuclear plant
Browns Ferry low-level waste storage
- Ms. Bettye Forbus, Director
Houston Love Memorial Library
212 W. Burdeshaw Street
P.O. Box 1369
Dothan, Ala. 36302
Joseph M. Farley nuclear plant
- Ms. Peggy McCutchen
Scottsboro Public Library
1002 South Broad Street
Scottsboro, Ala. 35768
Bellefonte nuclear plant

ARIZONA

- Ms. Linda Risseuw, Librarian II
Business and Science Division
Phoenix Public Library
1221 N. Central
Phoenix, Ariz. 85004
Palo Verde nuclear plant

ARKANSAS

- Ms. Frances Hager
Tomlinson Library
Arkansas Tech. University
Russellville, Ark. 72801
Arkansas Nuclear One nuclear plant

CALIFORNIA

- Mr. James Kirkendall
Documents Librarian
Humboldt County Library
1313 3rd Street
Eureka, Cal. 95501
Humboldt Bay nuclear plant
- Ms. Judy Horn, Department Head
University of California
Main Library
P.O. Box 19557
Irvine, Cal. 92713
San Onofre nuclear plant
- Mr. Gerald Ward
Central Library
Sacramento Public Library System
828 I Street
Sacramento, Cal. 95814
Rancho Seco nuclear plant

- Ms. Johanna Brown, Head
Government Documents and Maps Dept.
Robert E. Kennedy Library
California Polytechnic State University
San Luis Obispo, Cal. 93407
Diablo Canyon nuclear plant

COLORADO

- Ms. Sue Safarik
Weld Library District, Lincoln Park Branch
919 7th Street
Greeley, Colo. 80631
Fort St. Vrain nuclear plant

CONNECTICUT

- Ms. Marcella Kenney, Reference Librarian
Russell Library
123 Broad Street
Middletown, Conn. 06457
Haddam Neck nuclear plant
- Dr. Paul S. Price
Director of Learning Resources
Three Rivers Community
Technical College
Thames Valley Campus
574 New London Turnpike
Norwich, Conn. 06360
Millstone nuclear plant
- Mr. Vincent Juliano
Waterford Public Library
49 Rope Ferry Road
Waterford, Conn. 06385
Millstone nuclear plant
(partial collection)

FLORIDA

- Ms. Joyce Shiver
Coastal Region Library
8619 W. Crystal Street
Crystal River, Fla. 34428
Crystal River nuclear plant

- Ms. Linda Smith, Librarian
Charles S. Miley Learning Resources Ctr.
Indian River Community College
3209 South Virginia Avenue
Ft. Pierce, Fla. 34981
St. Lucie nuclear plant
- Ms. Sherry Mosley, Librarian
Library Documents Department
Florida International University
University Park
Miami, Fla. 33199
Turkey Point nuclear plant

GEORGIA

- Ms. Alice Coleman
Appling County Public Library
301 City Hall Drive
Baxley, Ga. 31513
Edwin I. Hatch nuclear plant
- Mrs. Gwen Jackson, Librarian
Burke County Library
412 4th Street
Waynesboro, Ga. 30830
Alvin W. Vogtle nuclear plant
- Mr. Bob Caban
Decatur Library
215 Sycamore Street
Decatur, Ga. 30030
Georgia Tech Research Reactor

ILLINOIS

- Mrs. Yvonne Jaycox, Assistant Librarian
Byron Public Library District
109 N. Franklin Street
Byron, Ill. 61010
Byron nuclear plant
- Mrs. Malinda Evans
Vespasian Warner Public Library
310 N. Quincy Street
Clinton, Ill. 61727
Clinton nuclear plant

- Mrs. Nancy Gillfillian
Library Director
Dixon Public Library
221 Hennepin Avenue
Dixon, Ill. 61021
Quad Cities nuclear plant
Sheffield low-level waste burial site

- Ms. Deborah Steffes
Reference Assistant
Morris Area Public Library District
604 Liberty Street
Morris, Ill. 60450
Dresden nuclear plant
Morris spent fuel storage facility

- Ms. Evelyn Moyle, Documents Librarian
Jacobs Memorial Library
Illinois Valley Community College
Rural Route 1
Oglesby, Ill. 61348
LaSalle nuclear plant

- Ms. Mary Jane Anderson, Library Director
Government Documents Collection
Wilmington Public Library
201 South Kankakee Street
Wilmington, Ill. 60481
Braidwood nuclear plant

- Ms. Tiffany Severns
Reference Librarian
Waukegan Public Library
128 N. County Street
Waukegan, Ill. 60085
Zion nuclear plant

IOWA

- Ms. Stephanie Schulte
Cedar Rapids Public Library
500 1st Street, S.E.
Cedar Rapids, Ia. 52401
Duane Arnold nuclear plant

KANSAS

- Ms. Nannette Martin, Documents Librarian
Government Documents Dept.
William Allen White Library
Emporia State University
1200 Commercial Street
Emporia, Kans. 66801
Wolf Creek Generating Station
- Mr. Paul Arrigo
NRC-LPDR Documents Collection
Washburn University School of Law
Topeka, Kans. 66621
Wolf Creek Generating Station

KENTUCKY

- Ms. Vonnice Shelton
Paducah Public Library
555 Washington Street
Paducah, Ky. 42003
Paducah Gaseous Diffusion Plant

LOUISIANA

- Ms. Mary Jane Ledvina
Government Documents Department
Troy H. Middleton Library
Louisiana State University
Baton Rouge, La. 70803
River Bend nuclear plant
- Mr. Douglas McGee
Louisiana Collection
Earl K. Long Library
University of New Orleans
Lakefront Drive
New Orleans, La. 70148
Waterford nuclear plant
- Ms. Pam Suggs, Director
Claiborne Parish Library
901 Edgewood Drive
Homer, La. 71040
Louisiana Energy Services, Inc., facility

MAINE

- Ms. Janet Morgan, Director
Wiscasset Public Library
High Street
P.O. Box 367
Wiscasset, Me. 04578
Maine Yankee nuclear plant

MARYLAND

- Ms. Mildred Ward, Library Assistant
Calvert County Public Library
30 Duke Street
P.O. Box 405
Prince Frederick, Md. 20678
Calvert Cliffs nuclear plant

MASSACHUSETTS

- Mrs. Carol Letson
Library/Learning Resource Center
Greenfield Community College
One College Drive
Greenfield, Mass. 01301
Yankee Rowe nuclear plant
- Ms. Grace E. Karbott, Reference Librarian
Plymouth Public Library
132 South Street
Plymouth, Mass. 02360
Pilgrim nuclear plant

MICHIGAN

- Mr. David O'Brien, Reference Librarian
Van Wylen Library
Hope College
137 E. 12th Street
Holland, Mich. 49423
Palisades nuclear plant
- Mr. Eric Grandstaff, Library Director
North Central Michigan College
1515 Howard Street
Petoskey, Mich. 49770
Big Rock Point nuclear plant
- Mrs. Margo Zieske
Government Documents Librarian
Monroe County Library System
3700 S. Custer Rd.
Monroe, Mich. 48161
Enrico Fermi nuclear plant

- Ms. Anne Vandermolen, Library Assistant
Maud Preston Palenske Memorial Library
500 Market Street
St. Joseph, Mich. 49085
Donald C. Cook nuclear plant

MINNESOTA

- Mr. William L. Johnston, Librarian
Technology and Science Department
Minneapolis Public Library
300 Nicollet Mall
Minneapolis, Minn. 55401
Monticello nuclear plant
Prairie Island nuclear plant

MISSISSIPPI

- Ms. Donna Janky, Director
Judge George W. Armstrong Library
220 South Commerce
Natchez, Miss. 39120
Grand Gulf nuclear plant

MISSOURI

- Mrs. Evelyn Hillard
Public Services Librarian
Callaway County Public Library
710 Court Street
Fulton, Mo. 65251
Callaway nuclear plant

NEBRASKA

- Mrs. Donna Ellis
Auburn Memorial Library
1810 Courthouse Ave.
P.O. Box 324
Auburn, Neb. 68305
Cooper nuclear plant
- Ms. Margaret Blackstone, Librarian
Business, Science and Technology Dept.
W. Dale Clark Library
215 S. 15th Street
Omaha, Neb. 68102
Fort Calhoun nuclear plant

NEVADA

- Ms. Aimee Quinn
James R. Dickinson Library
University of Nevada-Las Vegas
4505 Maryland Parkway
Las Vegas, Nev. 89154
Yucca Mountain high-level waste
geologic repository site
- Ms. Kathie Brinkerhoff
Government Publications Dept.
University Library
University of Nevada-Reno
Reno, Nev. 89557
Yucca Mountain high-level waste
geologic repository site

NEW HAMPSHIRE

- Ms. Pamela Gjettem
Exeter Public Library
Founders Park
Exeter, N.H. 03833
Seabrook nuclear plant

NEW JERSEY

- Ms. Pat Adkins
Pennsville Public Library
190 S. Broadway
Pennsville, N.J. 08070
Hope Creek nuclear plant
- Ms. Pamela Nelson, Director
Salem Free Public Library
112 West Broadway
Salem, N.J. 08079
Salem nuclear plant
Shieldalloy Metallurgical Corp.
- Ms. Ellen Parker
Reference Librarian
Reference Department
Ocean County Library
101 Washington Street
Toms River, N.J. 08753
Oyster Creek nuclear plant

NEW YORK

- Ms. Mary Bennett
Reference and Documents Department
Penfield Library
State University of New York
Oswego, N.Y. 13126
James A. FitzPatrick nuclear plant
Nine Mile Point nuclear plant
- Ms. Carolyn Johnson, Head
Business and Social Science Division
Rochester Public Library
115 South Avenue
Rochester, N.Y. 14610
Robert Emmet Ginna nuclear plant
- Mr. Erich Mayer, Assistant Librarian
Buffalo and Erie County Public Library
Lafayette Square
Buffalo, N.Y. 14203
West Valley Demonstration Project
- Mr. Oliver F. Swift
Municipal Reference Librarian
White Plains Public Library
100 Martine Avenue
White Plains, N.Y. 10601
Indian Point nuclear plant

NORTH CAROLINA

- Ms. Dawn Hubbs, Documents Librarian
J. Murrey Atkins Library
University of North Carolina at
Charlotte—UNCC Station
Charlotte, N.C. 28223
William B. McGuire nuclear plant
- Ms. Marsha Proctor, Head
Adult Services
Cameron Village Regional Library
1930 Clark Avenue
Raleigh, N.C. 27605
Shearon Harris nuclear plant

- Mrs. Eileen Brown
Reference/Documents Librarian
William Madison Randall Library
University of North Carolina at Wilmington
601 S. College Road
Wilmington, N.C. 28403-3297
Brunswick steam electric plant

OHIO

- Ms. Sally Ondrejko
Guernsey County District Public Library
800 Steubenville Ave.
Cambridge, Ohio 43725
Shieldalloy Metallurgical Corp.
- Ms. Donnie Potelicki, Director
Garfield Heights Branch Library
5409 Turney Road
Garfield Heights, Ohio 44125
Chemetron Corporation
- Ms. Ann Freed, Reference Librarian
Perry Public Library
3753 Main Street
Perry, Ohio 44081
Perry nuclear plant
- Ms. Ann Hackman
Portsmouth Public Library
1220 Gallia Street
Portsmouth, Ohio 45662
Portsmouth Gaseous Diffusion
Plant
- Mrs. Julia Baldwin, Documents Librarian
Government Documents Collection
William Carlson Library
University of Toledo
2801 West Bancroft Avenue
Toledo, Ohio 43606
Davis-Besse nuclear plant

OKLAHOMA

- Ms. O.J. Grosclaude
Stanley Tubbs Memorial Library
101 E. Cherokee St.
Sallisaw, Okla. 74955
Kerr-McGee Sequoyah

OREGON

- Mr. Michael Bowman
Branford P. Millar Library
Portland State University
P.O. Box 1151
10th and Harrison
Portland, Ore. 97207
Trojan nuclear plant

PENNSYLVANIA

- Ms. Mary Ann Paulin, Reference Librarian
B.F. Jones Memorial Library
663 Franklin Avenue
Aliquippa, Pa. 15001
Beaver Valley nuclear plant
- Ms. Judy Weinrauch
Government Publications Section
State Library of Pennsylvania
Walnut Street and Commonwealth Avenue
Box 1601
Harrisburg, Pa. 17105
Three Mile Island nuclear plant
Peach Bottom nuclear plant
- Ms. Vicki Held
Apollo Memorial Library
219 N. Pennsylvania Avenue
Apollo, Pa. 15613
Babcock & Wilcox Parks Township
and B&W Apollo
- Mr. Scott Elmer
Pottstown Public Library
500 High Street
Pottstown, Pa. 19464
Limerick nuclear plant

- Mr. Ernest Fuller
NRC Materials Aide
Saxton Community Library
Front Street
P.O. Box 34
Saxton, Pa. 16678
Saxton nuclear experimental facility

- Ms. Sandra Schimmel
Reference Librarian
Reference Department
Osterhout Free Library
71 South Franklin Street
Wilkes-Barre, Pa. 18701
Susquehanna steam electric station
Susquehanna low-level waste storage

SOUTH CAROLINA

- Mrs. Margaret Cannon, Director
Barnwell County Public Library
Hagood Avenue
Barnwell, S.C. 29812
Barnwell reprocessing plant
Barnwell low-level waste burial site
- Ms. Liz Watford, Librarian
Nuclear Information Depository
Hartsville Memorial Library
147 W. College Ave.
Hartsville, S.C. 29550
H.B. Robinson nuclear plant
Robinson independent spent fuel storage
- Mrs. Mary Mallaney
Assistant Reference Librarian
York County Library
138 East Black Street
P.O. Box 10032
Rock Hill, S.C. 29730
Catawba nuclear plant
- Ms. Joyce Lusk, Librarian
Oconee County Library
501 W. South Broad Street
Walhalla, S.C. 29691
Oconee nuclear plant

- Ms. Sarah D. McMaster, Director
Fairfield County Library
300 Washington Street
Winnsboro, S.C. 29180
Virgil C. Summer nuclear plant

TENNESSEE

- Ms. Patricia Maroney, Head
Business, Science and Technology Dept.
Chattanooga-Hamilton County Library
1001 Broad Street
Chattanooga, Tenn. 37402
Sequoyah nuclear plant
Watts Bar nuclear plant
TVA Sequoyah low-level waste storage

TEXAS

- Mr. Thomas Lindsey
Library—Documents
University of Texas at Arlington
702 College
P.O. Box 19497
Arlington, Tex. 76019
Comanche Peak steam electric station
- Ms. Patsy G. Norton, Director
Wharton County Junior College
J.M. Hodges Learning Center
911 Boling Highway
Wharton, Tex. 77488
South Texas Project

VERMONT

- Mr. Jerry Carbone
Brooks Memorial Library
224 Main Street
Brattleboro, Vt. 05301
Vermont Yankee nuclear plant

VIRGINIA

- Mr. Gregory A. Johnson
Senior Public Services Assistant
Manuscripts Dept.
Alderman Library
University of Virginia
Charlottesville, Va. 22903
North Anna nuclear plant

- Mr. Alan Zoellner
Documents Librarian
Swem Library
College of William and Mary
Williamsburg, Va. 23187
Surry nuclear plant
Surry independent spent fuel storage

WASHINGTON

- Mrs. Lois McCleary
Library Assistant
W.H. Abel Memorial Library
125 Main Street, South
Montesano, Wash. 98563
WPPSS Nuclear Projects 3 & 5
- Ms. Kathy Knutson
Richland Public Library
955 Northgate Street
Richland, Wash. 99352
WPPSS Nuclear Projects 1, 2, & 4
Richland low-level waste burial site

WISCONSIN

- Ms. Joan Robb
Government Documents Section
Cofrin Library
University of Wisconsin
2420 Nicolet Drive
Green Bay, Wis. 54311
Kewaunee nuclear plant
- Ms. Darcy Skibba
Reference Librarian
LaCrosse Public Library
800 Main Street
LaCrosse, Wis. 54601
LaCrosse nuclear plant
- Ms. Connie Kocian
Adult Services Assistant
Joseph Mann Library
1516 16th Street
Two Rivers, Wis. 54241
Point Beach nuclear plant

Appendix 5

Regulations and Amendments—Fiscal Year 1996

Regulations and Amendments Put Into Effect—FY 1996

Physical Security Plan Format Changes—Parts 50, 70, and 72

On October 16, 1995 (60 FR 53505), the NRC published an amendment to its regulations, effective November 15, 1995, to eliminate the requirement for applicants for power reactor,

Category I fuel cycle, and spent fuel storage licenses to submit physical security plans in two parts.

Revision of Specific Exemptions Under the Privacy Act—Part 9

On December 13, 1995 (60 FR 63897), the NRC published an amendment to its regulations, effective January 12, 1996, to add exemptions authorized by subsections (j)(2) and (k)(5) of the Privacy Act of 1974, as amended, to those

currently in place for System of Records NRC-18, "Office of the Inspector General (OIG) Investigative Records—NRC," under subsections (k)(1), (k)(2), and (k)(6).

Fracture Toughness Requirements for Light Water Reactor Pressure Vessels—Part 50

On December 19, 1995 (60 FR 65456), the NRC published an amendment to its regulations, effective January 18, 1996, to clarify the pressurized thermal shock requirements, make changes to the fracture toughness requirements

and the reactor vessel material surveillance program requirements, and provide new requirements for thermal annealing of a reactor pressure vessel.

One-Time Extension of Certain Byproduct, Source, and Special Nuclear Materials Licenses—Parts 30, 40, and 70

On January 16, 1996 (61 FR 1109), the NRC published an amendment to its regulations, effective February 15, 1996, to implement, on a

one-time basis, a five-year extension of certain byproduct, source, and special nuclear materials licenses.

Employee Protection Policies; Minor Amendments—Parts 19, 30, 40, 50, 60, 61, 70, and 72

On February 22, 1996 (61 FR 6762), the NRC published an amendment to its regulations, effective April 22, 1996, to require the use of an

updated NRC Form 3, "Update a Telephone Number," and to clarify the applicability of employment discrimination policies.

Minor Correcting Amendments—Parts 19, 30, 51, 52, and 55

On March 12, 1996 (61 FR 9901), the NRC published an amendment to its regulations, effective immediately, to correct several

miscellaneous errors in the *Code of Federal Regulations*.

Revision of Fee Schedules; 100% Fee Recovery, FY 1996—Parts 170 and 171

On April 12, 1996 (61 FR 16203), the NRC published an amendment to its regulations, effective June 11, 1996, to implement the Omnibus Budget Reconciliation Act of 1990,

which mandates that the NRC recover approximately 100 percent of its budget authority in Fiscal Year 1996 less amounts appropriated from the Nuclear Waste Fund.

Termination or Transfer of Licensed Activities: Recordkeeping Requirements—Parts 20, 30, 40, 61, 70, and 72

On May 16, 1996 (61 FR 24669), the NRC published an amendment to its regulations, effective June 17, 1996, to require a licensee to transfer records pertaining to decommissioning, and certain records pertaining to offsite releases

and waste disposal, to the new licensee if licensed activities will continue at the same site. The amendment also requires the new licensee to forward these same records to the NRC before the license is terminated.

Environmental Review for Renewal of Nuclear Power Plant Operating Licenses—Part 51

On June 5, 1996 (61 FR 28467), the NRC published an amendment to its regulations, effective September 5, 1996, to establish new

requirements for the environmental review of applications to renew the operating licenses for nuclear power plants.

Minor Amendments to Miscellaneous Cross-References—Parts 30, 40, 70, and 72

On June 12, 1996 (61 FR 29636), the NRC published an amendment to its regulations, effective immediately, to achieve consistency in

the cross-references associated with several recent changes to the NRC's regulations affecting decommissioning.

Production and Utilization Facilities; Emergency Planning and Preparedness Exercise Requirements—Part 50

On June 14, 1996 (61 FR 30129), the NRC published an amendment to its regulations revising its emergency planning regulations. This amendment, effective July 15, 1996, allows greater

flexibility in the licensee's emergency preparedness training activities in the 2-year period between biennial full-participation exercises.

Export of Nuclear Equipment and Materials—Part 110

On July 8, 1996 (61 FR 35600), the NRC published an amendment to its regulations pertaining to the export of nuclear equipment and materials. This amendment, effective August 7, 1996, makes the export controls of the United

States conform to the international export control guidelines of the Nuclear Suppliers Group, of which the United States is a member, and reflects the nuclear nonproliferation policies of the Department of State.

Removal of 10 CFR Part 53—Criteria and Procedures for Determining the Adequacy of Available Spent Nuclear Fuel Storage Capacity—Part 53

On July 9, 1996 (61 FR 35935), the NRC published an amendment to its regulations, effective August 8, 1996, to remove provisions concerning the "Criteria and Procedures for

Determining the Adequacy of Available Spent Nuclear Fuel Storage Capacity" from the *Code of Federal Regulations*.

Decommissioning of Nuclear Power Reactors—Parts 2, 50, and 51

On July 29, 1996 (61 FR 39278), the NRC published an amendment to its regulations pertaining to the decommissioning procedures that lead to the termination of an operating license for nuclear power reactors. The amendment, effective August 28, 1996, clarifies

ambiguities in the current rule and codifies procedures to reduce the regulatory burden, provide greater flexibility, and allow for greater public participation in the decommissioning process.

Codes and Standards for Nuclear Power Plants; Subsection IWE and Subsection IWL—Part 50

On August 8, 1996 (61 FR 41303), the NRC published an amendment to its regulations, effective September 9, 1996, to incorporate by reference the 1992 Edition with the 1992 Addenda of Subsection IWE, and Subsection IWL, of

Section XI, Division 1, of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code with specified modifications and a limitation.

Deletion of Outdated References and Minor Change—Parts 2 and 51

On August 22, 1996 (61 FR 43406), the NRC published an amendment to its regulations,

effective October 21, 1996, to delete all references to Appendix C of 10 CFR Part 2.

Proposed Regulations and Amendments

Constraint Level for Air Emissions of Radionuclides—Part 20

On December 13, 1995 (60 FR 63984), the NRC published an amendment to its regulations that would establish a constraint of 10 mrem/yr total effective dose equivalent for dose to members of

the public from air emissions of radionuclides from NRC-licensed facilities other than power reactors.

Revision of Fee Schedules; 100% Fee Recovery, FY 1996—Parts 170 and 171

On January 30, 1996 (61 FR 2948), the NRC published an amendment to its regulations that would implement the Omnibus Budget Reconciliation Act of 1990, which mandates that

the NRC recover approximately 100 percent of its budget authority in Fiscal Year 1996 less amounts appropriated from the Nuclear Waste Fund.

Reporting Requirements for Unauthorized Use of Licensed Radioactive Material—Part 20

On January 31, 1996 (61 FR 3334), the NRC published an amendment to its regulations that would require licensees to notify the NRC Operations Center within 24 hours of discovering an intentional or allegedly intentional diversion of

licensed radioactive material from its intended or authorized use. The amendment also would require licensees to notify the NRC when they are unable, within 48 hours of discovery of the event, to rule out that the use was intentional.

Petition for Rulemaking; Procedure for Submission—Part 2

On February 6, 1996 (61 FR 4378), the NRC published a notice of withdrawal of a proposed

rule that would have provided the incentive of more expeditious disposition by the NRC to those

petitioners who submitted detailed supporting information in their petitions to facilitate NRC review. The proposed rule also would have

delineated factors that affect priorities for review of the petitions.

Reporting Reliability and Availability Information for Risk-Significant Systems and Equipment—Part 50

On February 12, 1996 (61 FR 5318), the NRC published an amendment to its regulations that would require licensees for commercial nuclear power reactors to report to the NRC plant-specific summary reliability and availability data for risk-significant systems and equipment. The

amendment also would require licensees to maintain on site, and make available for NRC inspection, records and documentation that provide the basis for the summary data reported to the NRC.

Employee Protection Policies; Minor Amendments—Parts 19, 30, 40, 50, 60, 61, 70, and 72

On February 22, 1996 (61 FR 6796), the NRC published an amendment to its regulations that would require the use of an updated NRC Form 3,

“Update a Telephone Number,” and clarify the applicability of employment discrimination policies.

Modifications to Fitness-for-Duty Program Requirements—Part 26

On May 9, 1996 (61 FR 21105), the NRC published an amendment to its regulations that would modify the current requirements for the Fitness-for-Duty Program. The proposed rule is intended to ensure compatibility with changes

made to the Department of Health and Human Services testing guidelines, reduce unnecessary burdens, and ensure continued protection of public health and safety.

Reasserting NRC's Authority for Approving Onsite Low-Level Waste Disposal in Agreement States; Withdrawal—Part 150

On May 29, 1996 (61 FR 26852), the NRC published a notice of withdrawal of a proposed rule that would have reasserted the NRC's jurisdiction in Agreement States over the disposal of licensed material generated and disposed of at

nuclear reactor sites. The proposed rule also would have clarified the jurisdiction over disposal of noncritical waste quantities of special nuclear material at reactor and fuel cycle facilities.

Recognition of Agreement State Licenses in Areas Under Exclusive Federal Jurisdiction Within an Agreement State—Parts 150 and 170

On June 18, 1996 (61 FR 30839), the NRC published an amendment to its regulations that would clarify the right of Agreement State licensees to seek reciprocal recognition of their license from the NRC when they are working within areas of exclusive Federal jurisdiction in

Agreement States. The amendment also would clarify NRC regulatory requirements for reciprocity and the appropriate fees and filing procedures applicable to Agreement State licensees operating under reciprocity.

Access to and Protection of Classified Information—Parts 25 and 95

On August 5, 1996 (61 FR 40555), the NRC published an amendment to its regulations that would have the requirements for the protection of and access to classified information conform to new national security policy documents. The

amendment would ensure that classified information in the possession of NRC licensees and others under the NRC's regulatory requirements is protected in accordance with current national policies.

Deletion of Outdated References and Minor Change—Parts 2 and 51

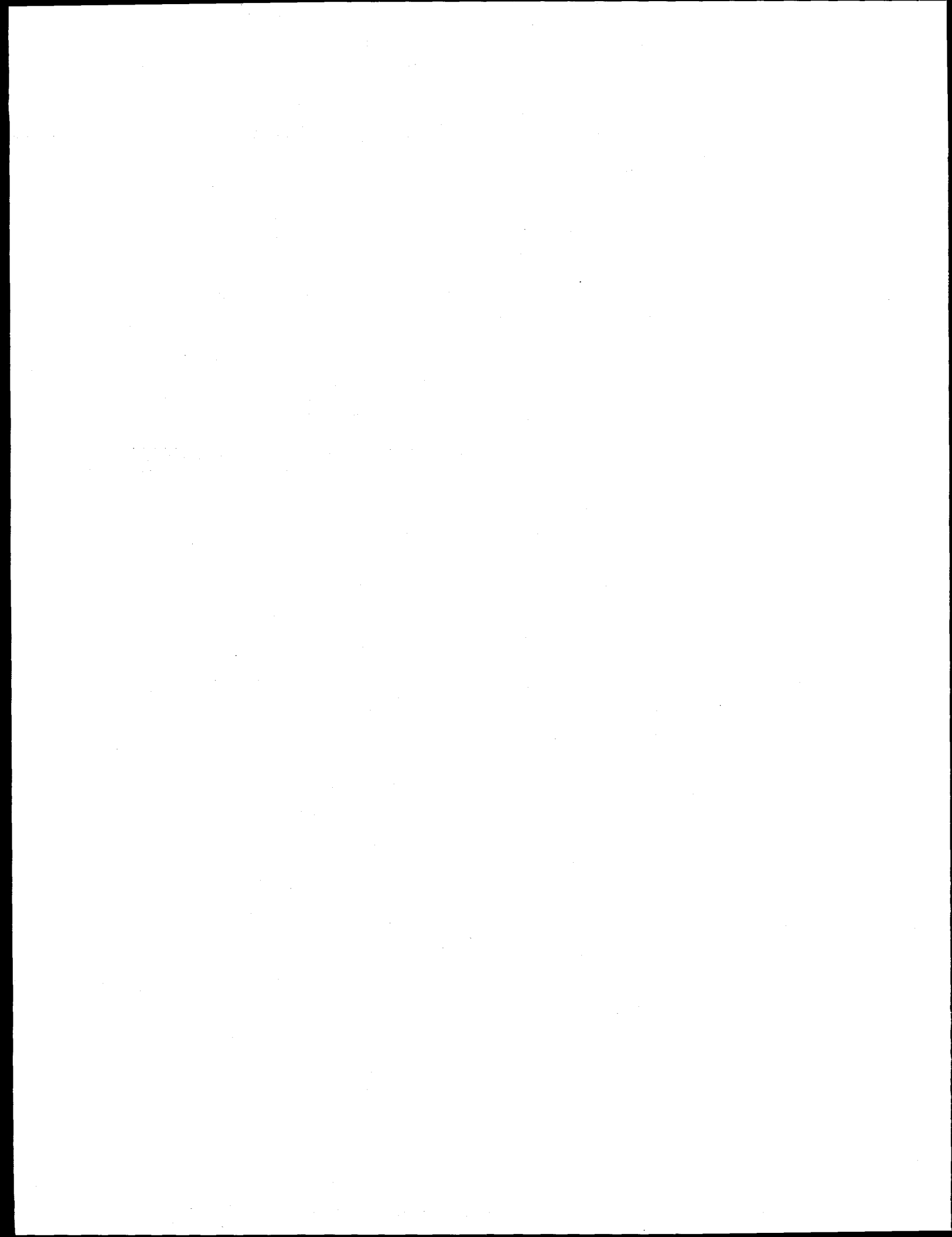
On August 22, 1996 (61 FR 43409), the NRC published an amendment to its regulations that

would delete all references to Appendix C of 10 CFR Part 2.

Advance Notices of Proposed Rulemaking**Financial Assurance Requirements for Decommissioning Nuclear Power Reactors—Part 50**

On April 8, 1996 (61 FR 15427), an advance notice of proposed rulemaking was published to invite public comment on issues pertaining to the form and content of the NRC's nuclear power

reactor decommissioning financial assurance requirements as they relate to electric utility deregulations.



Appendix 6

Regulatory Guides—Fiscal Year 1996

NRC regulatory guides describe methods acceptable to the NRC staff for implementing specific parts of the NRC's regulations. In some cases, the guides describe techniques used by the staff in evaluating specific problems or postulated accidents. Guides may also advise applicants regarding information that the NRC staff needs in reviewing applications for permits and licenses.

Comments on the guides are encouraged, and the guides are revised whenever appropriate to reflect new information or experience. The NRC issues the guides for public comment in draft form before they receive complete staff review and before an official staff position is established.

Once issued, regulatory guides may be withdrawn when superseded by Commission regulations, when equivalent recommendations have been incorporated in applicable approved codes and standards, or when changes make them obsolete.

When guides are issued, revised or withdrawn, notices are placed in the *Federal Register*.

Single copies of both active and draft guides may be obtained free of charge by writing to the Office of Administration, Attn: Distribution and Services Section, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; or by sending a facsimile to 301-415-2260. To reduce the burden on the taxpayer, the NRC has made arrangements for the sale of active regulatory guides on a standing order basis with the National Technical Information Service. NRC licensees receive pertinent draft and active regulatory guides as they are issued.

The following guides were issued, revised, or withdrawn during the period from October 1, 1995, to September 30, 1996.

Division 1—Power Reactor Guides

- 1.82 Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident (Revision 2)
- 1.149 Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations (Revision 2)
- 1.152 Criteria for Digital Computers in Safety Systems of Nuclear Power Plants (Revision 1)
- 1.153 Criteria for Safety Systems (Revision 1)
- 1.162 Format and Content of Report for Thermal Annealing of Reactor Pressure Vessels

Division 2—Research and Test Reactor Guides

None

Division 3—Fuels and Materials Facilities Guides

- 3.69 Topical Guidelines for the Licensing Support System

Division 4—Environmental and Siting Guides

None

Division 5—Materials and Plant Protection Guides

None

Division 6—Product Guides

None

Division 7—Transportation Guides

None

Division 8—Occupational Health Guides

- 8.29 Instruction Concerning Risks from Occupational Radiation Exposure (Revision 1)

Division 9—Antitrust and Financial Review Guides

None

Division 10—General Guides

None

DRAFT GUIDES**Division 1**

- DG-1012 Proposed Revision 3 of Regulatory Guide 1.8, Qualification and Training of Personnel for Nuclear Power Plants
- DG-1042 Proposed Revision 1 of Regulatory Guide 1.153, Criteria for Safety Systems
- DG-1046 Guidelines for Reporting Reliability and Availability Information for Risk-Significant Systems and Equipment in Nuclear Power Plants
- DG-1047 Standard Format and Content for Applications To Renew Nuclear Power Plant Operating Licenses
- DG-1051 Proposed Revision 2 to Regulatory Guide 1.160, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- DG-1054 Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
- DG-1055 Configuration Management Plans for Digital Computer Software Used in

Safety Systems of Nuclear Power Plants

- DG-1056 Software Test Documentation for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
- DG-1057 Software Unit Testing for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
- DG-1058 Software Requirements Specifications for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
- DG-1059 Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems of Nuclear Power Plants

Division 5

- DG-5005 Proposed Revision 1 to Regulatory Guide 5.15, Tamper-Indicating Seals for the Protection and Control of Special Nuclear Material
- DG-5007 Proposed Revision 3 to Regulatory Guide 5.44, Perimeter Intrusion Alarm Systems

Division 8

- DG-8016 Proposed Revision 1 to Regulatory Guide 8.37, Constraints for Air Effluents for Licensees Other Than Power Reactors

Division 10

- DG-0010 Preparation of Petitions for Rulemaking Under 10 CFR 2.802 and Preparation and Submission of Proposals for Regulatory Guidance Documents

Appendix 7

Notices of Violations, Civil Penalties, and Orders—Fiscal Year 1996

This appendix includes summary descriptions of (1) escalated Notices of Violation issued without civil penalties, (2) proposed civil penalty actions, and (3) orders issued during fiscal year 1996.

SUMMARY OF ESCALATED NOTICES OF VIOLATION (WITHOUT CIVIL PENALTIES)

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
A. E. Staley Manufacturing Company Lafayette, IN Supplements IV and VI, EA 96-042	A Notice of Violation was issued on April 4, 1996, for the failure to secure a moisture density gauge containing licensed material from unauthorized removal.
Abington Memorial Hospital Abington, PA Supplement IV, EA 96-186	A Notice of Violation was issued on July 12, 1996, for failure to account for a 16.75-millicurie cesium-137 brachytherapy source in required quarterly physical inventories over a period of 20 years.
Applied Construction Technologies Cleveland, OH Supplements IV and V, EA 95-266	A Notice of Violation was issued on February 5, 1996, for the failure to secure a moisture density gauge containing licensed material from unauthorized removal.
Carolina Power & Light Company (Brunswick, Units 1 & 2) Supplement I, EA 95-228	A Notice of Violation was issued on December 20, 1995, for design control failures that resulted in degraded flow control valves in the residual heat removal system.
Carolina Power & Light Company (Brunswick, Units 1 & 2) Supplement VII, EA 96-054	A Notice of Violation was issued on April 4, 1996, for multiple failures of the licensee's fitness-for-duty chemical testing program.
Carolina Power & Light Company (Brunswick, Units 1 & 2) Supplement I, EA 96-181	A Notice of Violation was issued on July 12, 1996, for design control failures that resulted in the failure of a service water pump due to the galvanic corrosion of a bolt.
Carolina Power & Light Company (Robinson, Unit 2) Supplement III, EA 96-120	A Notice of Violation was issued on May 16, 1996, for the failure to protect sensitive safeguards information.
Central Plains Clinic Sioux Falls, SD Supplement VI, EA 95-249	A Notice of Violation was issued on January 8, 1996, for the failure to establish medical quality management procedures for diagnostic iodine-131, which resulted in three misadministrations.

SUMMARY OF ESCALATED NOTICES OF VIOLATION (WITHOUT CIVIL PENALTIES)

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
Clara Maass Medical Center Belleville, NJ Supplement VI, EA 96-047	A Notice of Violation was issued on March 25, 1996, for a brachytherapy misadministration to the wrong part of the body.
Commonwealth Edison Co. (Braidwood) Supplement I, EA 95-265	A Notice of Violation was issued on January 29, 1996, for the failure of the diesel generator output breaker to close.
Commonwealth Edison Co. (Byron) Supplement I, EA 95-197	A Notice of Violation was issued on December 11, 1995, for the inoperability of the post-accident hydrogen monitoring system.
Consolidated Edison Co. (Indian Point) Supplement I, EA 96-089	A Notice of Violation was issued on May 6, 1996, for an inadequate 10 CFR 50.59 evaluation concerning the control room ventilation system.
Corning Clinical Laboratories Horsham, PA Supplement VI, EA 96-008	A Notice of Violation was issued on March 12, 1996, for violations indicative of a breakdown in control of licensed activities as involving the consolidation and termination of operations at one facility.
Duke Power Co. (McGuire) Supplement I, EA 96-080	A Notice of Violation was issued on May 9, 1996, for the failure to maintain adequate procedures to ensure adequate freeze protection.
Duke Power Co. (McGuire) Supplement I, EA 96-100	A Notice of Violation was issued on May 9, 1996, for the inoperability of the emergency diesel generators due to a cold lube oil line.
Duquesne Light Co. (Beaver Valley) Supplement I, EA 96-244	A Notice of Violation was issued on September 11, 1996, for the failure of the Anticipated Transient Without Scram (ATWS) Mitigating System Actuation Circuitry (AMSAC) system.
EDP Consultants, Inc. Kirtland, OH Supplement IV, EA 96-010	A Notice of Violation was issued on March 28, 1996, for the failure to maintain surveillance over a moisture density gauge, which was run over by a soil compactor.
Evart Products Evart, MI Supplements IV and VI, EA 96-254	A Notice of Violation was issued on September 3, 1996, for the loss of generally licensed material and the failure to report such loss.
Florida Power & Light Co. (St. Lucie) Supplement I, EA 96-249	A Notice of Violation was issued on September 19, 1996, for multiple failures involving the requirements of 10 CFR 50.59.

SUMMARY OF ESCALATED NOTICES OF VIOLATION (WITHOUT CIVIL PENALTIES)

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
FMC Wyoming Corporation Green River, WY Supplement IV, EA 95-269	A Notice of Violation was issued on February 6, 1996, for the failure to secure licensed material from unauthorized removal.
GCME, Inc. DePere, WI Supplement VI, EA 95-154	A Notice of Violation was issued on November 16, 1995, for the failure to ensure that moisture density gauge users were wearing personnel monitoring devices when using the gauges.
Geisinger Medical Center Danville, PA Supplements IV, VI, and VII, EA 96-189	A Notice of Violation was issued on July 3, 1996, for the failure to maintain complete and accurate records and for failure to conduct radiation surveys.
Georgia Power Co. (Vogtle) Supplement VII, EA 95-171	A Notice of Violation was issued on May 29, 1996, for discrimination against an employee for raising safety concerns.
Georgia Power Co. (Vogtle) Supplement VII, EA 95-277	A Notice of Violation was issued on May 29, 1996, for discrimination against an employee for raising safety concerns.
Globe X-Ray Services Tulsa, OK Supplement IV, EA 96-069	A Notice of Violation was issued on April 25, 1996, for a failure to limit the annual occupational dose to an adult radiographer to 5 rems per year.
GPU Nuclear Corporation (Three Mile Island) Supplement I, EA 95-238	A Notice of Violation was issued on March 11, 1996, for design control failures relating to a previous in-service-inspection analysis of pipe supports.
GPU Nuclear Corporation (Three Mile Island) Supplement III, EA 96-057	A Notice of Violation was issued on March 26, 1996, for a repetitive violation that involved the degradation of a storm drain cover that could have allowed unauthorized access into the protected area.
Harvard University Cambridge, MA Supplements IV and VI, EA 96-068	A Notice of Violation was issued on April 18, 1996, for failure to secure licensed material from unauthorized removal or access.
Indiana & Michigan Electric Company (Cook, Units 1 & 2) Supplement III, EA 95-219	A Notice of Violation was issued on December 8, 1995, for the inappropriate granting of unescorted access to an individual whose drug screening test results had not yet been received.
Indiana & Michigan Electric Company (Cook, Units 1 & 2) Supplement I, EA 96-020	A Notice of Violation was issued on March 11, 1996, for the inoperability of the high head safety injection pump.

SUMMARY OF ESCALATED NOTICES OF VIOLATION (WITHOUT CIVIL PENALTIES)

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
Law Engineering, Inc. Chesapeake, VA Supplements V and VI, EA 96-108	A Notice of Violation was issued on June 13, 1996, for violations indicative of a breakdown in control of licensed activities related to an incident in which the source rod of a portable moisture density gauge became stuck in its extended position. The technician failed to notify the radiation safety officer and violated transportation regulations by transporting the unshielded gauge back to the office.
Mallinckrodt, Inc. Maryland Heights, MO Supplement V, EA 95-179	A Notice of Violation was issued on October 6, 1995, for a violation involving the delivery of licensed material outside NRC radiation level limits to a carrier for transport.
Massachusetts Institute of Technology Cambridge, MA Supplement VI, EA 95-284	A Notice of Violation was issued on February 22, 1996, for the failure to secure licensed material from unauthorized removal or access.
Nationwide Testing Services, Inc. Schaumburg, IL Supplement VI, EA 96-129	A Notice of Violation was issued on May 16, 1996, for violations of the requirement in 10 CFR 150.20 to file an NRC Form-241 before an Agreement State licensee conducts operations in NRC jurisdiction.
Nebraska Public Power (Cooper) Supplement I, EA 96-094	A Notice of Violation was issued on April 17, 1996, for design control and post-maintenance testing errors that rendered the emergency diesel generators for fire protection inoperable.
Nebraska Public Power (Cooper) Supplement I, EA 96-202	A Notice of Violation was issued on September 30, 1996, for procedural errors by operators during a rod mispositioning event.
Nekoosa Papers, Inc. Nekoosa, WI Supplements IV and VI, EA 95-221	A Notice of Violation was issued on December 29, 1995, for three violations that reflected a breakdown in the management control of the licensee's radiation safety program.
Niblock Excavating, Inc. Bristol, IN Supplement VI, EA 96-298	A Notice of Violation was issued on September 25, 1996, for violations involving the unauthorized use of a moisture density gauge.
North Star Steel Ohio Youngstown, OH Supplements IV and VI, EA 95-208	A Notice of Violation was issued on December 8, 1995, for violations that represented a breakdown in control of licensed activities.
Northeast Nuclear Energy (Millstone) Supplement I, EA 95-177	A Notice of Violation was issued on December 7, 1995, for multiple failures involving 10 CFR 50.59, old design issues, and the failure to take prompt and comprehensive corrective action.

SUMMARY OF ESCALATED NOTICES OF VIOLATION (WITHOUT CIVIL PENALTIES)

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
Northern States Power Co. (Monticello) Supplement I, EA 95-244	A Notice of Violation was issued on December 28, 1995, for multiple violations involving the inoperability of both trains of drywell spray.
Omaha Public Power (Fort Calhoun) Supplement I, EA 96-204	A Notice of Violation was issued on July 31, 1996, for the disabling of the primary system overpressure protection system.
Omnitron International, Inc. Houston, TX Supplement VI, EA 96-061	A Notice of Violation was issued on June 21, 1996, for a failure to file for reciprocity prior to conducting licensed activities in areas under NRC jurisdiction.
Pacific Gas & Electric Company (Diablo Canyon, Units 1 & 2) Supplement III, EA 96-123	A Notice of Violation was issued on June 7, 1996, because the licensee granted unescorted access to a person for whom derogatory information was known.
Power Authority of the State of New York (Indian Point 3) Supplement I, EA 95-176	A Notice of Violation was issued on October 17, 1995, for failure to operate at required pressure in violation of 10 CFR 50.59.
Public Service Company of Colorado (Fort St. Vrain, Unit 1) Supplement VII, EA 95-110	A Notice of Violation was issued on October 30, 1995, for the falsification of vehicle radiation survey records and radiation work permits. Notices of Violation were also issued to the licensee's contractor, Scientific Ecology Group, Inc. (SEG) (EA 95-164) and to two employees of SEG.
Public Service Electric (Hope Creek) Supplement I, EA 96-014	A Notice of Violation was issued on April 8, 1996, for repetitive failures to correct problems with snubbers and the residual heat removal system.
Raytheon Engineers & Construction Honolulu, HI Supplement IV, EA 96-205	A Notice of Violation was issued on September 20, 1996, for the loss of licensed material.
Schleede-Hampton Associates, Inc. St. Charles, IL Supplement VI, EA 96-130	A Notice of Violation was issued on May 22, 1996, for violations of the requirement in 10 CFR 150.20 to file NRC Form-241 before an Agreement State licensee conducts operations in NRC jurisdiction.
Shilts, Graves & Associates, Inc. South Bend, IN Supplement IV, EA 96-043	A Notice of Violation was issued on April 8, 1996, for the failure to maintain constant control and surveillance of licensed material in an unrestricted area.
South Haven Community Hospital South Haven, MI Supplements V and VII, EA 96-099	A Notice of Violation was issued on July 17, 1996, for deliberate violations involving receipt of licensed material at an address not authorized on the license, failure to measure the activity of radiopharmaceutical dosages in a dose calibrator, and inaccurate records.

SUMMARY OF ESCALATED NOTICES OF VIOLATION (WITHOUT CIVIL PENALTIES)

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
St. Mary's Hospital Norton, VA Supplement VI, EA 96-006	A Notice of Violation was issued on February 22, 1996, for failure to follow the procedures of the medical quality management program, which requires a written directive for administrations of iodine-131 as sodium iodide in quantities greater than 30 microcuries.
Stocker and Yale, Incorporated Swampscott, MA Supplement VI, EA 96-036	A Notice of Violation was issued on March 18, 1996, for a programmatic breakdown of licensed activities concerning the failure to secure licensed material in an unrestricted area, transfer of licensed material without authorization, exceeding the possession limit, and the failure to comply with a license condition.
Temple University Philadelphia, PA Supplement VI, EA 95-243	A Notice of Violation was issued on March 5, 1996, for two failures to follow the procedures of the medical quality management program, which resulted in a teletherapy misadministration.
Tennessee Valley Authority (Browns Ferry) Supplement I, EA 96-199	A Notice of Violation was issued on August 1, 1996, for design failures and post-modification testing failures that resulted in the inoperability of the RCIC system.
Testwell Craig Testing Laboratories Mays Landing, NJ Supplement IV, EA 95-254	A Notice of Violation was issued on January 23, 1996, for a repetitive failure to secure a moisture density gauge containing licensed material from unauthorized removal.
Toledo Edison Co. (Davis-Besse) Supplement I, EA 96-122	A Notice of Violation was issued on June 13, 1996, for design modification failures that resulted in the inability to confirm that the emergency core cooling system was filled with water as required by technical specification surveillance requirements.
U.S. Engineering Labs, Inc. Rahway, NJ Supplement IV, EA 96-245	A Notice of Violation was issued on August 5, 1996, for the failure to secure a moisture density gauge containing licensed material from unauthorized removal.
Universal Imaging, Inc. Taylor, MI Supplement III, EA 96-157	A Notice of Violation was issued on August 2, 1996, for multiple violations representing a breakdown in the control of licensed activities involving an iodine-131 misadministration.
Vermont Yankee Nuclear (Vermont Yankee) Supplement I, EA 95-268	A Notice of Violation was issued on February 13, 1996, for numerous failures of the licensee's fire protection program.

SUMMARY OF ESCALATED NOTICES OF VIOLATION (WITHOUT CIVIL PENALTIES)

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
Virginia Electric Power (Surry) Supplement I, EA 95-223	A Notice of Violation was issued on November 22, 1995, for the failure to follow procedures that resulted in a loss of reactor coolant system inventory.
Virginia Electric Power (Surry) Supplement I, EA 95-231	A Notice of Violation was issued on August 16, 1996, for inadequate procedures that resulted in the inoperability of the hydrogen analyzers.
Washington County Memorial Hospital Salem, IN Supplement VI, EA 96-071	A Notice of Violation was issued on May 2, 1996, for a therapeutic administration of iodine-131 that took place under the supervision of a physician who was not fully qualified to perform the procedure.
Wilcox Associates Cadillac, MI Supplements IV and VI, EA 96-257	A Notice of Violation was issued on September 3, 1996, for the failure to secure a moisture density gauge containing licensed material from unauthorized removal.
Wisconsin Electric Power Company (Point Beach, Units 1 & 2) Supplement III, EA 95-158	A Notice of Violation was issued on October 11, 1995, for a failure involving a security training supervisor leaving sensitive safeguards information unsecured and unprotected.
Wisconsin Public Service (Kewanee) Supplement I, EA 95-267	A Notice of Violation was issued on February 2, 1996, for the inoperability of the auxiliary feedwater system.

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
ABB-Combustion Engineering Nuclear Fuel Hematite, MO Supplement VII, EA 96-002	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$12,500 was issued on February 29, 1996, for a violation involving three examples of a failure to provide the NRC complete and accurate information.
Arizona Public Service Company (Palo Verde, Unit 1) Supplement VII, EA 93-159	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on March 7, 1996, for a violation involving discrimination against a contract employee. The supervisor responsible for the discrimination was also issued a Notice of Violation.
Ashford Presbyterian Community Hospital San Juan, PR Supplement VI, EA 96-053	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$ 2,500 was issued on March 19, 1996, for failure to instruct technologists in the licensee's medical quality management program and failure to prepare written directives for diagnostic administrations of iodine-131 as sodium iodide.
Ashland Petroleum Co. Canton, OH Supplement VI, EA 95-103	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$500 was issued on December 6, 1995, for failures involving an unqualified person using licensed material without proper dosimetry or survey meter.
B&W Fuel Company Lynchburg, VA Supplements V and VII, EA 95-236	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$12,500 was issued on January 30, 1996, for multiple failures that were indicative of a significant lack of attention or carelessness toward licensed activities.
Baltimore Gas & Electric Company (Calvert Cliffs) Supplement III, EA 95-170	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on January 2, 1996, based on a violation involving the granting of unescorted access to an individual who the licensee believed had provided inaccurate information concerning his criminal history.
Baltimore Gas & Electric Company (Calvert Cliffs) Supplement III, EA 96-179	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on July 25, 1996, for failure to comply with fire protection requirements, such that the HVAC system would be unavailable in one room in the event of a fire.

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
Bemis Construction, Inc. Oklahoma City, OK Supplements V and VI, EA 95-276	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on March 19, 1996, for failure to file an NRC Form 241 and for the deliberate failure to perform leak tests for a moisture density gauge.
Champion International Hamilton, OH Supplement VI, EA 95-184	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on November 22, 1995, for a violation involving an unauthorized disposal of gauge containing licensed material.
Commonwealth Edison Company (Braidwood) Supplement I, EAs 96-070 & 96-102	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on May 16, 1996, for the repetitive failures to implement the configuration control and out-of-service programs.
Commonwealth Edison Company (Dresden, Units 2 and 3) Supplement V, EA 95-214	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on December 5, 1995, for the failure to deliver licensed material in a package with a radiation level that was within NRC limits to a carrier for transport.
Commonwealth Edison Company (Dresden, Units 2 and 3) Supplement I, EA 96-115	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on June 13, 1996, for failure to account for modifications in an original design calculation that rendered the corner room's structural steel outside the FSAR.
Commonwealth Edison Company (Quad Cities) Supplement I, EA 95-241	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on January 2, 1996, for the failure to take adequate corrective action to prevent overloading on the 480-Vac Motor Control Center.
Commonwealth Edison Company (Quad Cities) Supplement I, EA 96-114	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on June 13, 1996, for failure to account for modifications in an original design calculation that rendered the corner room's structural steel outside the FSAR.
Commonwealth Edison Company (Zion, Units 1 and 2) Supplement VII, EA 95-144	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on November 28, 1995, for discrimination by Commonwealth Edison Company's contractor, Bechtel Construction, against an employee for raising safety concerns. A Notice of Violation was also issued to Bechtel (EA 95-235).

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
Commonwealth Edison Company (Zion) Supplement I, EA 95-283	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on February 21, 1996, for the failure to maintain emergency lighting.
Commonwealth Edison Company (Zion) Supplement I, EA 96-216	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on August 23, 1996, for multiple procedural violations by operations personnel indicating a breakdown in the control of operations.
Community Hospital Torrington, WY Supplement VI, EA 96-056	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on June 12, 1996, for two sodium iodide iodine-131 misadministrations and the failure to maintain complete and accurate records pertaining to the misadministrations.
Consumers Power Co. (Palisades) Supplement I, EA 96-131	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,00 was issued on August 13, 1996, for failures to comply with fire protection requirements.
Department of the Navy Washington, DC Supplement VI, EA 95-210	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on December 6, 1995, for the failure of the medical quality management program to have adequate procedures to verify that sources used for brachytherapy treatments were in accordance with the physician's written directive, which resulted in a therapeutic misadministration.
Department of Veteran Affairs Medical Center Philadelphia, PA Supplement VII, EA 96-182	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$8,000 was issued on September 18, 1996, for a Severity Level II violation involving discrimination of the licensee's radiation safety officer.
Detroit Edison Co. (Fermi) Supplement I, EA 96-095	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$8,000 was issued on May 21, 1996, for the inoperability of the diesel generator and the diesel generator service water pump under certain weather conditions.
Diagnostic Reagents, Inc. Dearborn, MI Supplements VI and VII, EA 96-140	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$1,000 was issued on August 5, 1996, for a deliberate failure to amend the NRC license following a change of address.

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
Diamond H Testing Company Chubbuck, ID Supplements IV and VI, EA 95-148	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$8,000 was issued on October 25, 1995, for violations involving an apparent willful failure to lock the sealed source in the shielded position following a radiographic exposure, a failure to conduct an adequate survey of the source guide tube after a radiographic exposure, and a failure to wear an alarm ratemeter.
Duke Power Co. (Oconee) Supplement I, EA 96-019	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on March 5, 1996, for a violation associated with a spent fuel assembly being left in the refueling mast that was suspended in the spent fuel pool.
Duriron Co., Inc. Dayton, OH Supplement VI, EA 95-227	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on February 5, 1996, for the willful failure to perform leak tests at required intervals.
Energy Technologies, Inc. Knoxville, TN Supplements VI and VII, EA 95-187	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on October 24 1995, for a violation involving a willful failure by the licensee to file for reciprocity while performing licensed activities in areas under NRC jurisdiction.
Entergy Operations, Inc. (Arkansas Nuclear One) Supplement I, EA 96-274	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on September 6, 1996, for the failure of maintenance personnel to follow procedures that resulted in a main steam safety valve sticking open.
Entergy Operations, Inc. (Waterford) Supplement I, EA 96-025	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on March 28, 1996, for operability problems associated with the auxiliary component cooling water system due to water hammer events.
Florida Power & Light Co. (St. Lucie) Supplement I, EA 95-180	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on November 13, 1995, for the inoperability of the PORVs due to personnel errors during maintenance and inadequate post-maintenance testing.

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
Florida Power & Light Co. (St. Lucie) Supplement I, EA 96-040	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on March 28, 1996, for issues related a reactor coolant system boron dilution evolution and the failure of a reactor operator to provide adequate turnover that resulted in an inadvertent addition of positive reactivity.
Florida Power & Light Co. (Turkey Point) Supplement VII, EA 96-051	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on July 16, 1996, for discriminating against an employee for raising safety concerns.
Florida Power & Light Co. (Crystal River) Supplement I, EA 95-126	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$500,000 was issued on July 10, 1996, for numerous violations involving the apparent deliberate misconduct by a licensed operator resulting in overpressurization of the makeup tank.
Foley Construction Services Santa Rosa, CA Supplement VI, EA 95-270	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$1,000 was issued on February 29, 1996, for the failure to file an NRC Form 241.
Gamma Tech Industries, Inc. San Diego, CA Supplement VI, EA 96-093	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$1,500 was issued on June 6, 1996, for performance of radiography in exclusive federal jurisdiction without obtaining an NRC license or filing NRC Form 241 and the failure to provide complete and accurate information to the NRC.
Health & Human Services Bethesda, MD Supplements IV and VI, EA 96-027	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on August 23, 1996, for numerous security violations that represented a breakdown in the control of licensed activities.
Houston Lighting & Power (South Texas Project) Supplement VII, EA 95-077	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$160,000 was issued on October 17, 1995, for two Severity Level II violations for discriminating against employees for raising safety concerns.
Houston Lighting & Power (South Texas Project) Supplement VII, EA 96-133	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on September 19, 1996, for a Severity Level II violation for discriminating against employees for raising safety concerns.

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
Houston Lighting & Power (South Texas Project) Supplement VII, EA 96-136	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on September 19, 1996, for a Severity Level III violation for discriminating against employees for raising safety concerns.
Industrial Marine Testing Labs, Inc. San Diego, CA Supplement VI, EA 96-065	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$1,500 was issued on June 6, 1996, for performance of radiography in exclusive Federal jurisdiction without obtaining an NRC license or filing NRC Form 241.
Innovative Weaponry, Inc. Albuquerque, NM Supplement VI, EA 96-135	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$7,500 was issued on May 15, 1996, for violations of license conditions, selling sources in unauthorized configurations, and distributing tritium from an unauthorized source.
Madigan Army Medical Center Tacoma, WA Supplement VI, EA 96-004	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$8,000 was issued on February 22, 1996, for two violations involving a breakdown in the licensee's quality management program.
Monsanto Chemicals Company Soda Spring, IN Supplement IV, EA 95-280	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on March 1, 1996, for the loss of control of a gauge containing approximately 50 millicuries of Cs-137.
NDT Services, Inc. Hato Rey, PR Supplements IV, VI, and VII, EA 94-029	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$15,000 was issued on July 16, 1996, for multiple violations reflecting lack of management control of licensed activities.
Nebraska Public Power (Cooper Station) Supplement I, EA 96-062	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on April 17, 1996, for design control failures involving the diesel generator and blowout panel.
Niagara Mohawk Power Corporation (Nine Mile Point) Supplement I, EA 96-079	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on June 18, 1996, for design control problems that could have resulted in failure of the reactor building structure under certain conditions.
Niagara Mohawk Power Corporation (Nine Mile Point) Supplement VII, EA 96-116	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$80,000 was issued on July 24, 1996, for discriminating against an employee for raising safety concerns.

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
Northeast Nuclear Energy Company (Millstone) Supplement VII, EA 96-059	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on June 4, 1996, for discrimination by a licensee contractor, Bartlett Nuclear, Inc., against one of Bartlett's employees for raising safety concerns. A Notice of Violation was also issued to Bartlett (EA 96-060).
Nuclear Fuel Services Erwin, TN Supplement VI, EA 96-213	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$12,500 was issued on August 21, 1996, for numerous failures involving inadequate configuration control, inadequate procedures, and failure to follow procedures.
Pacific Gas & Electric Company (Diablo Canyon) Supplement I, EA 95-279	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on January 25, 1996, for the failure to follow procedures surrounding a transformer explosion and the loss of offsite power.
Pennsylvania Power & Light Company (Susquehanna) Supplement VII, EA 95-250	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on February 9, 1996, for a violation involving discrimination against an employee as a result of his engaging in protected activities.
Portland General Electric Company (Trojan, Unit 1) Supplement VII, EA 96-111	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on June 6, 1996, for submission of incomplete and inaccurate information to the NRC in a Licensee Event Report (LER) and in Revision 1 to that LER, concerning degradation of electrical penetration assembly module seals.
Power Authority of the State of New York (Indian Point 3) Supplement I, EA 95-251	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on January 2, 1996, for exceeding cold shutdown with the recirculation pump control switches mispositioned.
Public Service Electric (Hope Creek) Supplement I, EA 95-216	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$100,000 was issued on December 12, 1995, for a failure to follow procedures that violated technical specifications and caused an unplanned heatup.

SUMMARY OF PROPOSED CIVIL PENALTIES

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Proposed</i>
Public Service Electric (Salem) Supplement I, EAs 95-062, 95-065, and 95-117	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$600,000 was issued on October 16, 1996, for six violations—five involving the failure to promptly respond to and correct conditions adverse to quality over an extensive period of time and one involving the failure to perform an adequate modification on the pressurizer code safety valves.
Syncor International Corporation Chatsworth, CA Supplement VI, EA 96-104	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on July 25, 1996, for a deliberate misuse of licensed material in which the lock on an employee's locker was deliberately contaminated with technetium-99m.
Temple University Philadelphia, PA Supplement VII, EA 95-152	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$8,000 was issued on December 15, 1995, for discriminating against an employee for raising safety concerns.
Tennessee Valley Authority (Browns Ferry) Supplement VII, EA 95-220	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$80,000 was issued on February 14, 1996, for discrimination by Tennessee Valley Authority's contractor, Stone & Webster Engineering Corporation, against a Stone & Webster employee for reporting concerns about fire watches. A Notice of Violation was also issued to Stone & Webster (EA 95-190).
Tennessee Valley Authority (Sequoyah) Supplement VII, EA 95-252	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$80,000 was issued on February 20, 1996, for discriminating against an employee for raising safety concerns.
Testco, Inc. Greensboro, NC Supplements VI and VII, EA 95-101	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$5,000 was issued on October 31, 1995, for deliberate violations of the requirement in 10 CFR 150.20 to file NRC Form 241 before an Agreement State licensee conducts operations in NRC jurisdiction.
The Dial Corporation London, OH Supplement IV, EA 96-041	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on June 18, 1996, for the loss of control of a gauge containing byproduct material.
University of Oklahoma Oklahoma City, OK Supplement IV, EA 96-049	A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$2,500 was issued on June 17, 1996, for the failure to maintain constant surveillance of licensed material in an unrestricted area.

SUMMARY OF PROPOSED CIVIL PENALTIES

*Licensee, Facility, and EA Number**Facts and Civil Penalties Proposed*

Vermont Yankee Nuclear Power Co.
(Vermont Yankee)
Supplement I, EA 96-210

A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$50,000 was issued on August 23, 1996, for the failure to analyze ECCS equipment against the single-failure criterion.

Wolf Creek Nuclear Operations
(Wolf Creek Station)
Supplement I, EA 96-124

A Notice of Violation and Proposed Imposition of Civil Penalty in the amount of \$300,000 was issued on July 1, 1996, for multiple Severity Level III problems associated with the inoperability of one train of the emergency service water system, the degradation of the other train of the emergency service water system, the inoperability of the turbine-driven auxiliary feedwater pump, and the inadequate response by operational personnel in response to an icing event.

SUMMARY OF ORDERS

Imposition of Civil Penalty Orders

<i>Licensee, Facility, and EA Number</i>	<i>Facts and Civil Penalties Imposed</i>
Advacare Management Services, Inc. Bala, PA	An Order Imposing Civil Monetary Penalty (Imposition) in the amount of \$2,500 was issued on November 28, 1995.
B&W Fuel Company Lynchburg, VA EA 95-236	An Imposition in the amount of \$12,500 was issued on April 29, 1996.
Bemis Construction, Inc., Oklahoma City, OK EA 95-276	An Imposition in the amount of \$2,500 was issued on May 23, 1996.
Canspec Group, Inc. Middlesex, NJ	An Imposition in the amount of \$5,000 was issued on February 2, 1996.
Madigan Army Medical Center Tacoma, WA EA 96-004	An Imposition in the amount of \$8,000 was issued on May 20, 1996.
Diamond Testing Company Chubbuck, ID EA 95-148	An Imposition in the amount of \$5,000 was issued on March 5, 1996.
Duriron Co., Inc. Dayton, OH EA 95-227	An Imposition in the amount of \$2,500 was issued on April 12, 1996.
Industrial Marine, Inc. Albuquerque, NM EA 96-065	An Imposition in the amount of \$1,500 was issued on July 31, 1996.
Testco, Inc. Greensboro, NC EA 95-101	An Imposition in the amount of \$5,000 was issued on March 19, 1996.

CONFIRMATORY, MODIFICATION, SUSPENSION, AND CEASE AND DESIST ORDERS

<i>Licensee, Facility, and EA Number</i>	<i>Facts</i>
Applied Health Physics Bethel Park, PA EA 96-009	A Confirmatory Order Modifying License was issued on March 29, 1996, for failure to limit possession of licensed material to the limits authorized by the license.
Applied Health Physics Bethel Park, PA EA 96-353	A Confirmatory Order Modifying License was issued on September 27, 1996, based on information that the U.S. Internal Revenue Service seized the licensee's bank accounts.
Eastern Testing & Inspection Thorofare, NJ EA 96-085	An Order Suspending License was issued on March 29, 1996, based on the deliberate use of a radiographer without proper training.
Five Star Products, Inc. Fairfield, CT EA 95-133	An Order Prohibiting Involvement in NRC-Licensed Activities was issued on December 1, 1995, based on providing the NRC with false information.
GRD Steel Corporation Monongahela, PA EA 96-302	An Order Suspending License was issued on September 13, 1996, based on the inappropriate transfer of material.
HNU Systems, Inc. Newton Highlands, MA EA 96-234	A Confirmatory Order Modifying License was issued on August 22, 1996, based on numerous violations of NRC requirements.
Innovative Weaponry, Inc. Albuquerque, NM EA 96-170	A Confirmatory Order Modifying License was issued on May 15, 1996, based on violations of license conditions, selling sources in unauthorized configurations, and distributing tritium from an unauthorized source.
Middle Monongahela Industries Donora, PA EA 96-288	A Confirmatory Order was issued on August 12, 1996, to ensure that licensed material was properly controlled and secured.
Roy Sadosky Floral Park, NY EA 96-349	An Order Suspending License was issued on September 13, 1996, based on numerous violations of NRC requirements, including a willful use of licensed material at an unauthorized location and a failure to secure licensed material from unauthorized removal.

Appendix 8

Nuclear Electric Generating Units in Operation

(As of December 31, 1996)

The following is a listing of the 110 nuclear power reactor electrical generating units that were in operation or under construction in the United States as of December 31, 1996, representing a total capacity of 20,241 MWe (megawatts-electric; one megawatt is 1,000 kilowatts). Two reactor types are represented: PWR for pressurized water reactor and BWR for boiling water reactor. Of the 110 reactor units listed, 73 are PWRs and 37 are BWRs. Plant status is indicated as follows: OL—has operating license and CP—has construction permit. The dates for operation are either the year the initial full power operating license was issued (in the case of operating licenses) or as scheduled by the utilities, for plants not yet licensed for operation, as of December 31, 1996. In 1996, 110 commercial nuclear reactors were operating in the United States; these units had been operating for a cumulative 1,760 reactor-years (an additional 193 reactor-years had been accumulated by reactors now permanently shut down). See the last page of this appendix for an alphabetic listing of all nuclear plants in the United States, which gives information on power ratings and dates of licensing.

<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
ALABAMA						
Decatur	Browns Ferry Unit 1 nuclear power plant	0	BWR	OL 1973	Tennessee Valley Authority	1974
Decatur	Browns Ferry Unit 2 nuclear power plant	1,065	BWR	OL 1974	Tennessee Valley Authority	1975
Decatur	Browns Ferry Unit 3 nuclear power plant	1,065	BWR	OL 1976	Tennessee Valley Authority	1977
Dothan	Joseph M. Farley Unit 1 nuclear power plant	812	PWR	OL 1977	Southern Nuclear Operating Co.	1977
Dothan	Joseph M. Farley Unit 2 nuclear power plant	822	PWR	OL 1981	Southern Nuclear Operating Co.	1981
ARIZONA						
Wintersburg	Palo Verde Unit 1 nuclear generating station	1,227	PWR	OL 1985	Arizona Public Service Co.	1986
Wintersburg	Palo Verde Unit 2 nuclear generating station	1,227	PWR	OL 1986	Arizona Public Service Co.	1986
Wintersburg	Palo Verde Unit 3 nuclear generating station	1,230	PWR	OL 1987	Arizona Public Service Co.	1988

<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
ARKANSAS						
Russellville	Arkansas Nuclear One Unit 1 nuclear power plant	836	PWR	OL 1974	Arkansas Power & Light Co.	1974
Russellville	Arkansas Nuclear One Unit 2 nuclear power plant	858	PWR	OL 1978	Arkansas Power & Light Co.	1980
CALIFORNIA						
San Clemente	San Onofre Unit 2 nuclear generating station	1,070	PWR	OL 1982	Southern California Edison Co.	1983
San Clemente	San Onofre Unit 3 nuclear generating station	1,080	PWR	OL 1983	Southern California Edison Co.	1984
Diablo Canyon	Diablo Canyon Unit 1	1,073	PWR	OL 1984	Pacific Gas & Electric Co.	1985
Diablo Canyon	Diablo Canyon Unit 2	1,087	PWR	OL 1985	Pacific Gas & Electric Co.	1986
CONNECTICUT						
Haddam Neck	Haddam Neck nuclear power plant	560	PWR	OL 1967	Conn. Yankee Atomic Power Co.	1968
Waterford	Millstone Unit 1 nuclear power plant	641	BWR	OL 1970	Northeast Nuclear Energy Co.	1971
Waterford	Millstone Unit 2 nuclear power plant	871	PWR	OL 1975	Northeast Nuclear Energy Co.	1975
Waterford	Millstone Unit 3 nuclear power plant	1,137	PWR	OL 1985	Northeast Nuclear Energy Co.	1986
FLORIDA						
Florida City	Turkey Point Unit 3 nuclear power plant	693	PWR	OL 1972	Florida Power & Light Co.	1972
Florida City	Turkey Point Unit 4 nuclear power plant	693	PWR	OL 1973	Florida Power & Light Co.	1973
Crystal River	Crystal River Unit 3 nuclear power plant	818	PWR	OL 1977	Florida Power Corp.	1977
Hutchinson Island	St. Lucie Unit 1 nuclear power plant	839	PWR	OL 1976	Florida Power & Light Co.	1976
Hutchinson Island	St. Lucie Unit 2 nuclear power plant	839	PWR	OL 1983	Florida Power & Light Co.	1983

<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
GEORGIA						
Baxley	Hatch Unit 1 nuclear power plant	805	BWR	OL 1974	Southern Nuclear Operating Co.	1975
Baxley	Hatch Unit 2 nuclear power plant	809	BWR	OL 1978	Southern Nuclear Operating Co.	1979
Waynesboro	Vogtle Unit 1 nuclear power plant	1,162	PWR	OL 1987	Southern Nuclear Operating Co.	1987
Waynesboro	Vogtle Unit 2 nuclear power plant	1,162	PWR	OL 1989	Southern Nuclear Operating Co.	1989
ILLINOIS						
Morris	Dresden Unit 2 nuclear power plant	772	BWR	OL 1969	Commonwealth Edison Co.	1970
Morris	Dresden Unit 3 nuclear power plant	773	BWR	OL 1971	Commonwealth Edison Co.	1971
Zion	Zion Unit 1 nuclear power plant	1,040	PWR	OL 1973	Commonwealth Edison Co.	1973
Zion	Zion Unit 2 nuclear power plant	1,040	PWR	OL 1973	Commonwealth Edison Co.	1974
Cordova	Quad Cities Unit 1 nuclear power plant	769	BWR	OL 1972	Comm. Ed. Co. Mid-American Energy Co.	1973
Cordova	Quad Cities Unit 2 nuclear power plant	769	BWR	OL 1972	Comm. Ed. Co. Mid-American Energy Co.	1973
Seneca	LaSalle Unit 1 nuclear power plant	1,036	BWR	OL 1982	Commonwealth Edison Co.	1984
Seneca	LaSalle Unit 2 nuclear power plant	1,036	BWR	OL 1983	Commonwealth Edison Co.	1984
Byron	Byron Unit 1 nuclear power plant	1,105	PWR	OL 1984	Commonwealth Edison Co.	1985
Byron	Byron Unit 2 nuclear power plant	1,105	PWR	OL 1986	Commonwealth Edison Co.	1987
Braidwood	Braidwood Unit 1 nuclear power plant	1,120	PWR	OL 1987	Commonwealth Edison Co.	1988
Braidwood	Braidwood Unit 2 nuclear power plant	1,120	PWR	OL 1987	Commonwealth Edison Co.	1988
Clinton	Clinton Unit 1 nuclear power plant	930	BWR	OL 1986	Illinois Power Co.	1987

<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
IOWA						
Palo	Duane Arnold energy center	520	BWR	OL 1974	IES Utilities, Inc.	1975
KANSAS						
Burlington	Wolf Creek generating station	1,163	PWR	OL 1985	Wolf Creek Nuclear Operating Corp.	1985
LOUISIANA						
Taft	Waterford 3 steam electric station	1,104	PWR	OL 1985	Louisiana Power & Light Co.	1985
St. Francisville	River Bend Unit 1 station	936	BWR	OL 1985	Gulf States Utilities Co.	1986
MAINE						
Wiscasset	Maine Yankee Atomic Power Co.	860	PWR	OL 1973	Maine Yankee Atomic Power Co.	1972
MARYLAND						
Lusby	Calvert Cliffs Unit 1 nuclear power plant	835	PWR	OL 1974	Baltimore Gas & Electric Co.	1975
Lusby	Calvert Cliffs Unit 2 nuclear power plant	840	PWR	OL 1976	Baltimore Gas & Electric Co.	1977
MASSACHUSETTS						
Plymouth	Pilgrim Unit 1 nuclear power plant	670	BWR	OL 1972	Boston Edison Co.	1972
MICHIGAN						
Charlevoix	Big Rock Point nuclear power plant	67	BWR	OL 1964	Consumers Power Co.	1963
Covert	Palisades nuclear power plant	730	PWR	OL 1971	Consumers Power Co.	1971
Newport	Fermi Unit 2 nuclear power plant	876	BWR	OL 1985	Detroit Edison Co.	1988
Bridgman	Cook Unit 1 nuclear power plant	1,000	PWR	OL 1974	Indiana/Michigan Power Co.	1975
Bridgman	Cook Unit 2 nuclear power plant	1,060	PWR	OL 1977	Indiana/Michigan Power Co.	1978

<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
MINNESOTA						
Monticello	Monticello nuclear power plant	544	BWR	OL 1970	Northern States Power Co.	1971
Red Wing	Prairie Island Unit 1 nuclear power plant	513	PWR	OL 1974	Northern States Power Co.	1973
Red Wing	Prairie Island Unit 2 nuclear power plant	512	PWR	OL 1974	Northern States Power Co.	1974
MISSISSIPPI						
Port Gibson	Grand Gulf Unit 1 nuclear power plant	1,179	BWR	OL 1984	Entergy Operations, Inc.	1985
MISSOURI						
Fulton	Callaway Unit 1 nuclear station	1,125	PWR	OL 1984	Union Electric Co.	1984
NEBRASKA						
Fort Calhoun	Fort Calhoun Unit 1 nuclear station	478	PWR	OL 1973	Omaha Public Power District	1973
Brownville	Cooper nuclear power plant	764	BWR	OL 1974	Nebraska Public Power District	1974
NEW HAMPSHIRE						
Seabrook	Seabrook Unit 1 nuclear power plant	1,158	PWR	OL 1990	North Atlantic Energy Service Corp.	1990
NEW JERSEY						
Toms River	Oyster Creek Unit 1 nuclear power plant	619	BWR	OL 1969	GPU Nuclear Corp.	1969
Salem	Salem Unit 1 nuclear power plant	1,106	PWR	OL 1976	Public Service Electric & Gas Co.	1977
Salem	Salem Unit 2 nuclear power plant	1,106	PWR	OL 1981	Public Service Electric & Gas Co.	1981
Salem	Hope Creek Unit 1 nuclear power plant	1,031	BWR	OL 1986	Public Service Electric & Gas Co.	1986

<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
NEW YORK						
Buchanan	Indian Point Unit 2 nuclear power plant	951	PWR	OL 1973	Consolidated Edison Co.	1974
Buchanan	Indian Point Unit 3 nuclear power plant	965	PWR	OL 1976	Power Authority of the State of New York	1976
Scriba	Nine Mile Point Unit 1 nuclear power plant	565	BWR	OL 1969	Niagara Mohawk Power Co.	1969
Scriba	Nine Mile Point Unit 2 nuclear power plant	1,105	BWR	OL 1987	Niagara Mohawk Power Co.	1988
Ontario	Ginna Unit 1 nuclear power plant	470	PWR	OL 1969	Rochester Gas & Electric Co.	1970
Scriba	FitzPatrick nuclear power plant	762	BWR	OL 1974	Power Authority of the State of New York	1975
NORTH CAROLINA						
Southport	Brunswick Unit 2 nuclear power plant	754	BWR	OL 1974	Carolina Power & Light Co.	1975
Southport	Brunswick Unit 1 nuclear power plant	767	BWR	OL 1976	Carolina Power & Light Co.	1977
Huntersville	McGuire Unit 1 nuclear power plant	1,129	PWR	OL 1981	Duke Power Co.	1981
Huntersville	McGuire Unit 2 nuclear power plant	1,129	PWR	OL 1983	Duke Power Co.	1984
New Hill	Harris Unit 1 nuclear power plant	860	PWR	OL 1987	Carolina Power & Light Co.	1987
OHIO						
Oak Harbor	Davis-Besse Unit 1 nuclear power plant	873	PWR	OL 1977	Toledo Edison Co.	1978
Perry	Perry Unit 1 nuclear power plant	1,160	BWR	OL 1986	Cleveland Electric Illuminating Co.	1987
PENNSYLVANIA						
Delta	Peach Bottom Unit 2 nuclear power plant	1,093	BWR	OL 1973	PECO Energy Co.	1974

<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
Delta	Peach Bottom Unit 3 nuclear power plant	1,093	BWR	OL 1974	PECO Energy Co.	1974
Limerick	Limerick Unit 1 nuclear power plant	1,105	BWR	OL 1985	Philadelphia Electric Co.	1986
Limerick	Limerick Unit 2 nuclear power plant	1,115	BWR	OL 1989	Philadelphia Electric Co.	1990
Shippingport	Beaver Valley Unit 1 nuclear power plant	810	PWR	OL 1976	Duquesne Light Co. Ohio Edison Co.	1976
Shippingport	Beaver Valley Unit 2 nuclear power plant	820	PWR	OL 1987	Duquesne Light Co. Ohio Edison Co.	1987
Goldsboro	Three Mile Island Unit 1 nuclear power plant	786	PWR	OL 1974	GPU Nuclear Corp.	1974
Berwick	Susquehanna Unit 1 nuclear power plant	1,090	BWR	OL 1982	Pennsylvania Power & Light Co.	1983
Berwick	Susquehanna Unit 2 nuclear power plant	1,094	BWR	OL 1984	Pennsylvania Power & Light Co.	1985
SOUTH CAROLINA						
Hartsville	Robinson Unit 2 nuclear power plant	683	PWR	OL 1970	Carolina Power & Light Co.	1971
Seneca	Oconee Unit 1 nuclear power plant	846	PWR	OL 1973	Duke Power Co.	1973
Seneca	Oconee Unit 2 nuclear power plant	846	PWR	OL 1973	Duke Power Co.	1974
Seneca	Oconee Unit 3 nuclear power plant	846	PWR	OL 1974	Duke Power Co.	1974
Jenkinsville	Summer Unit 1 nuclear power plant	945	PWR	OL 1982	So. Carolina Electric & Gas Co.	1984
York	Catawba Unit 1 nuclear power plant	1,129	PWR	OL 1985	Duke Power Co.	1985
York	Catawba Unit 2 nuclear power plant	1,129	PWR	OL 1986	Duke Power Co.	1986
TENNESSEE						
Soddy Daisy	Sequoyah Unit 1 nuclear power plant	1,117	PWR	OL 1980	Tennessee Valley Authority	1981

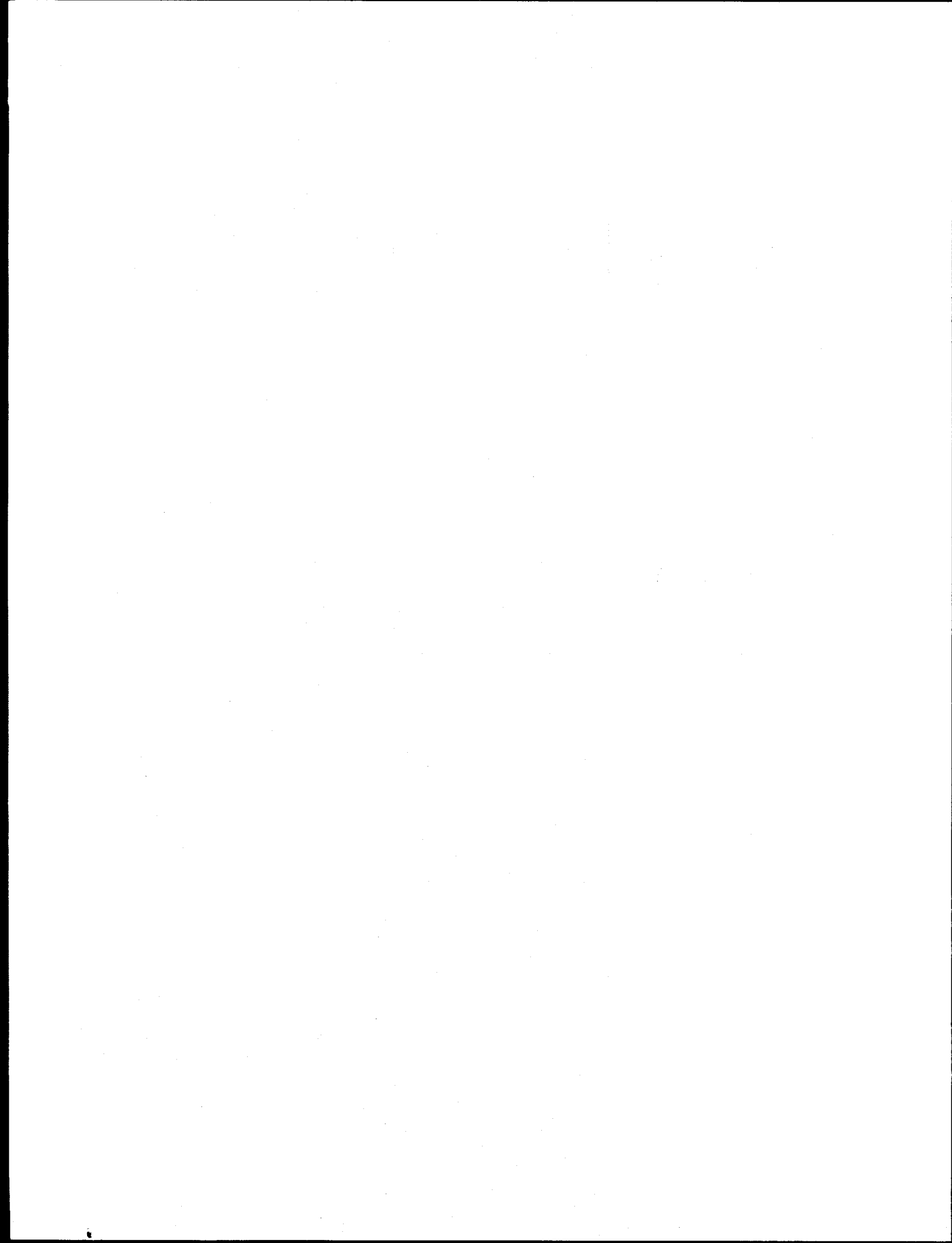
<i>Site</i>	<i>Plant</i>	<i>Capacity (Net MWe)</i>	<i>Type</i>	<i>Status</i>	<i>Utility</i>	<i>Commercial Operation</i>
Soddy Daisy	Sequoyah Unit 2 nuclear power plant	1,117	PWR	OL 1981	Tennessee Valley Authority	1982
Spring City	Watts Bar Unit 1 nuclear power plant	1,117	PWR	OL 1996	Tennessee Valley	1988
TEXAS						
Glen Rose	Comanche Peak Unit 1 nuclear power plant	1,150	PWR	OL 1990	Texas Utilities Electric Co.	1990
Glen Rose	Comanche Peak Unit 2 nuclear power plant	1,150	PWR	OL 1993	Texas Utilities Electric Co.	1993
Bay City	South Texas Unit 1 nuclear power plant	1,251	PWR	OL 1988	Houston Lighting & Power Co.	1988
Bay City	South Texas Unit 2 nuclear power plant	1,251	PWR	OL 1989	Houston Lighting & Power Co.	1989
VERMONT						
Vernon	Vermont Yankee nuclear power plant	510	BWR	OL 1972	Vermont Yankee Nuclear Power Corp.	1972
VIRGINIA						
Surry	Surry Unit 1 nuclear power plant	801	PWR	OL 1972	Virginia Electric & Power Co.	1972
Surry	Surry Unit 2 nuclear power plant	801	PWR	OL 1973	Virginia Electric & Power Co.	1973
Mineral	North Anna Unit 1 nuclear power plant	893	PWR	OL 1978	Virginia Electric & Power Co.	1978
Mineral	North Anna Unit 2 nuclear power plant	897	PWR	OL 1980	Virginia Electric & Power Co.	1980
WASHINGTON						
Richland	WPPSS nuclear project No. 2	1,107	BWR	OL 1984	Wash. Public Power Supply System	1984
WISCONSIN						
Two Creeks	Point Beach Unit 1 nuclear power plant	485	PWR	OL 1970	Wisconsin Electric Power Co.	1970
Two Creeks	Point Beach Unit 2 nuclear power plant	485	PWR	OL 1973	Wisconsin Electric Power Co.	1972
Kewaunee	Kewaunee nuclear power plant	511	PWR	OL 1973	Wisconsin Public Service Corp.	1974

U.S. Nuclear Power Plants with Operating Licenses

(Plant - type - MWe - cp - ol)*

Arkansas 1 = pwr, 836, 12/68, 5/74.	Fort Calhoun 1 (Neb.) = pwr, 478, 6/68, 8/73.	Point Beach 1 (Wis.) = pwr, 485, 7/67, 10/70.
Arkansas 2 = pwr, 858, 12/72, 9/78.	Ginna (N.Y.) = pwr, 470, 4/66, 12/69.	Point Beach 2 = pwr, 485, 7/68, 3/73.
Beaver Valley 1 (Pa.) = pwr, 810, 6/70, 7/76.	Grand Gulf 1 (Miss.) = bwr, 1179, 9/74, 11/84.	Prairie Island 1 (Minn.) = pwr, 513, 6/68, 4/74.
Beaver Valley 2 = pwr, 820, 5/74, 8/87.	Haddam Neck (Conn.) = pwr, 560, 5/64, 12/67.	Prairie Island 2 = pwr, 512, 6/68, 10/74.
Big Rock Point (Mich.) = bwr, 67, 5/60, 5/64.	Harris 1 (N.C.) = pwr, 860, 1/78, 1/87.	Quad Cities 1 (Ill.) = bwr, 769, 2/67, 12/72.
Braidwood 1 (Ill.) = pwr, 1120, 12/75, 7/87.	Hatch 1 (Ga.) = bwr, 744, 9/69, 10/74.	Quad Cities 2 = bwr, 769, 2/67, 12/72.
Braidwood 2 = pwr, 1120, 12/75, 5/87.	Hatch 2 = bwr, 809, 12/72, 6/78.	River Bend 1 (La.) = bwr, 936, 3/77, 11/85.
Browns Ferry 1 (Ala.) = bwr, 0, 5/67, 12/73.	Hope Creek 1 (N.J.) = bwr, 1031, 11/74, 7/86.	Robinson 2 (S.C.) = pwr, 683, 4/67, 9/70.
Browns Ferry 2 = bwr, 1065, 5/67, 8/74.	Indian Point 2 (N.Y.) = pwr, 951, 10/66, 9/73.	Salem 1 (N.J.) = pwr, 1106, 9/68, 12/76.
Browns Ferry 3 = bwr, 1065, 8/76.	Indian Point 3 = pwr, 965, 8/69, 4/76.	Salem 2 = pwr, 1106, 9/68, 5/81.
Brunswick 1 (N.C.) = bwr, 767, 2/70, 11/76.	Kewaunee (Wis.) = pwr, 511, 8/68, 12/73.	San Onofre 2 = pwr, 1070, 10/73, 9/82.
Brunswick 2 = bwr, 754, 2/70, 12/74.	LaSalle 1 (Ill.) = bwr, 1036, 9/73, 8/82.	San Onofre 3 = pwr, 1080, 10/73, 9/83.
Byron 1 (Ill.) = pwr, 1105, 12/75, 2/84.	LaSalle 2 = bwr, 1036, 9/73, 3/83.	Seabrook 1 (N.H.) = pwr, 1158, 7/76, 3/90.
Byron 2 = pwr, 1105, 12/75, 1/86.	Limerick 1 (Pa.) = bwr, 1105, 6/74, 8/85.	Sequoyah 1 (Tenn.) = pwr, 1117, 5/70, 9/80.
Callaway (Mo.) = pwr, 1125, 4/76, 10/84.	Limerick 2 = bwr, 1115, 6/74, 8/89.	Sequoyah 2 = pwr, 1117, 5/70, 9/81.
Calvert Cliffs 1 (Md.) = pwr, 835, 7/69, 7/74.	Maine Yankee = pwr, 860, 10/68, 6/73.	South Texas 1 = pwr, 1251, 12/75, 3/88.
Calvert Cliffs 2 = pwr, 840, 7/69, 11/76.	McGuire 1 (N.C.) = pwr, 1129, 2/73, 7/81.	South Texas 2 = pwr, 1251, 12/75, 12/89.
Catawba 1 (S.C.) = pwr, 1129, 8/75, 1/85.	McGuire 2 = pwr, 1129, 2/73, 5/83.	St. Lucie 1 (Fla.) = pwr, 839, 7/70, 3/76.
Catawba 2 = pwr, 1129, 8/75, 5/86.	Millstone 1 (Conn.) = bwr, 641, 5/66, 10/70.	St. Lucie 2 = pwr, 839, 5/77, 6/83.
Clinton (Ill.) = bwr, 930, 2/76, 4/86.	Millstone 2 = pwr, 871, 12/70, 9/75.	Summer 1 (S.C.) = pwr, 945, 3/73, 11/82.
Comanche Peak 1 (Tex.) = pwr, 1150, 12/74, 4/90.	Millstone 3 = pwr, 1137, 8/74, 1/85.	Surry 1 (Va.) = pwr, 801, 6/68, 5/72.
Comanche Peak 2 (Tex.) = pwr, 1150, 12/74, 4/93.	Monticello (Minn.) = bwr, 544, 6/67, 1/70.	Surry 2 = pwr, 801, 6/68, 1/73.
Cook 1 (Mich.) = pwr, 1000, 3/69, 10/74.	Nine Mile Point 1 (N.Y.) = bwr, 565, 4/65, 12/69.	Susquehanna 1 (Pa.) = bwr, 1090, 11/73, 11/82.
Cook 2 = pwr, 1060, 3/69, 12/77.	Nine Mile Point 2 = bwr, 1105, 6/74, 7/87.	Susquehanna 2 = bwr, 1094, 11/73, 6/84.
Cooper (Neb.) = bwr, 764, 6/68, 1/74.	North Anna 1 (Va.) = pwr, 893, 2/71, 4/78.	Three Mile Island 1 (Pa.) = pwr, 786, 5/68, 4/74.
Crystal River 3 (Fla.) = pwr, 818, 9/68, 1/77.	North Anna 2 = pwr, 897, 2/71, 8/80.	Turkey Point 3 (Fla.) = pwr, 693, 4/67, 7/73.
Davis-Besse (Ohio) = pwr, 873, 3/71, 4/77.	Oconee 1 (S.C.) = pwr, 846, 11/67, 2/73.	Turkey Point 4 = pwr, 693, 4/67, 4/73.
Diablo Canyon 1 (Cal.) = pwr, 1073, 4/68, 11/84.	Oconee 2 = pwr, 846, 11/67, 10/73.	Vermont Yankee = bwr, 5010, 12/67, 2/73.
Diablo Canyon 2 = pwr, 1087, 12/70, 8/85.	Oconee 3 = pwr, 846, 11/67, 7/74.	Vogtle 1 (Ga.) = pwr, 1162, 6/74, 3/87.
Dresden 2 (Ill.) = bwr, 772, 1/66, 12/69.	Oyster Creek (N.J.) = bwr, 619, 12/64, 8/69.	Vogtle 2 = pwr, 1162, 6/74, 3/89.
Dresden 3 = bwr, 773, 10/66, 3/71.	Palisades (Mich.) = pwr, 730, 3/67, 10/71.	Washington Nuclear 2 = bwr, 1107, 3/73, 4/84.
Duane Arnold (Iowa) = bwr, 520, 6/70, 2/74.	Palo Verde 1 (Ariz.) = pwr, 1227, 5/76, 6/85.	Waterford 3 (La.) = pwr, 1104, 11/74, 3/85.
Farley 1 (Ala.) = pwr, 812, 8/72, 6/77.	Palo Verde 2 = pwr, 1227, 5/76, 4/86.	Watts Bar 1 (Tenn.) = pwr, 1125, 2/96.
Farley 2 = pwr, 822, 8/72, 3/81.	Palo Verde 3 = pwr, 1230, 5/76, 11/87.	Wolf Creek 1 (Kans.) = pwr, 1163, 5/77, 6/85.
Fermi 2 (Mich.) = bwr, 1085, 9/72, 7/85.	Peach Bottom 2 (Pa.) = bwr, 1093, 1/68, 12/73.	Zion 1 (Ill.) = pwr, 1040, 12/68, 10/73.
Fitzpatrick (N.Y.) = bwr, 762, 5/70, 10/74.	Peach Bottom 3 = bwr, 1093, 1/68, 7/74.	Zion 2 = pwr, 1040, 12/68, 11/73.
	Perry 1 (Ohio) = bwr, 1160, 5/77, 11/86.	Total as of 12/31/96 = 110.
	Pilgrim 1 (Mass.) = bwr, 670, 8/68, 9/72.	

*Name of plant; type of plant: pressurized water reactor = pwr, boiling water reactor = bwr; electric power output in megawatts (MWe); date of construction permit (cp) issuance; date of operating license (ol) issuance.



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