U.S. NUCLEAR REGULATORY COMMISSION

1995 ANNUAL REPORT

August 30, 1996

The President
The White House
Washington, DC 20500

Dear Mr. President

This Annual Report for 1995 of the United States Nuclear Regulatory Commission is forwarded for your transmittal to the Congress, as required by Section 307(c) of the Energy Reorganization Act of 1974.

The report is devoted mainly to coverage of events and activities occurring in fiscal year 1995, with additional treatment of events after that period where circumstances warranted.

Respectfully,

Shirley Ann Jackson
Chairman

U.S. NUCLEAR REGULATORY COMMISSION

1995 ANNUAL REPORT

PREVIOUS REPORTS IN THIS SERIES

1975 NRC Annual Report, published April 1976

1976 NRC Annual Report, published April 1977

NUREG–0400, *1977 NRC Annual Report,* published April 1978

NUREG–0516, *1978 NRC Annual Report,* published February 1979

NUREG–0690, *1979 NRC Annual Report,* published March 1980

NUREG–0774, *1980 NRC Annual Report,* published June 1981

NUREG–0920, *1981 NRC Annual Report,* published June 1982

NUREG–0998, *1982 NRC Annual Report,* published June 1983

NUREG–1090, *1983 NRC Annual Report,* published June 1984

NUREG–1145, Vol. 1, *1984 NRC Annual Report,* published June 1985

NUREG–1145, Vol. 2, *1985 NRC Annual Report,* published June 1986

NUREG–1145, Vol. 3, *1986 NRC Annual Report,* published June 1987

NUREG–1145, Vol. 4, *1987 NRC Annual Report,* published July 1988

NUREG–1145, Vol. 5, *1988 NRC Annual Report,* published July 1989

NUREG–1145, Vol. 6, *1989 NRC Annual Report,* published July 1990

NUREG–1145, Vol. 7, *1990 NRC Annual Report,* published July 1991

NUREG–1145, Vol. 8, *1991 NRC Annual Report,* published July 1992

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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

HIGHLIGHTS FOR FISCAL YEAR 1995

This 21st annual report of the U.S. Nuclear Regulatory Commission (NRC) covers accomplishments, activities, and planning for fiscal year 1995 (FY 95)—October 1, 1994, through September 30, 1995. It notes activities that occurred early in the next fiscal year if they are significant, including changes in the Commission and the organization of NRC.

Its issuance complies with Section 307(c) of the Energy Reorganization Act of 1974, as amended, which requires that an annual report be submitted to the President for transmittal to the Congress.

The NRC was created by enactment in the Congress of the Energy Reorganization Act of 1974. It is an independent agency of the Federal Government. The five NRC Commissioners are nominated by the President and confirmed by the United States Senate. The Chairman of the Commission is appointed by the President from among the Commissioners confirmed by the Senate.

The mission of the NRC is to ensure that civilian uses of nuclear materials in the United States—in the operation of nuclear power plants and fuel cycle plants, and in medical, industrial, and research applications—are carried out with adequate protection of public health and safety, the environment, and national security. The agency also has a role in combating the proliferation of nuclear weapons material worldwide. The NRC accomplishes its purposes by the licensing and regulatory oversight of nuclear reactor operations and other activities involving the possession and use of nuclear materials and wastes; by the safeguarding of nuclear materials and facilities from theft and/or sabotage; by the issuance of rules and standards; and by inspection and enforcement actions.

Appendices 1 through 8 provide additional detail.

CHANGES IN THE COMMISSION AND NRC'S ORGANIZATION

On April 6, 1995, the Senate confirmed President Clinton's nomination of Dr. Shirley Ann Jackson as NRC Commissioner. Dr. Jackson was sworn in as Commissioner on May 2, 1995. A ceremonial swearing-in ceremony for Commissioner Jackson was performed by Vice President Gore on May 26, 1995, in the Indian Treaty Room of the Old Executive Office Building. President Clinton signed an order on June 14, 1995, naming Commissioner Jackson as Chair of the Nuclear Regulatory Commission effective July 2, 1995. Chairman Ivan Selin resigned on July 1, 1995, one year prior to the expiration of his five-year term. 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, and her term will expire June 30, 1998.

Between July 1, 1995, and February 15, 1996, the Commission lacked the three members needed for a quorum. During that period, the Commission operated under a delegation of authority to the Chairman, as authorized by Section 1 of NRC Reorganization Plan No. 1 of 1980.

In addition to changes in the Commission during FY 95, several office directors and a regional administrator retired: Robert M. Bernero, Director of Nuclear Material Safety and Safeguards, was succeeded by Carl J. Paperiello; Eric S. Beckjord, Director of Nuclear Regulatory Research, was succeeded by David L. Morrison; Ben B. Hayes, Director of Investigations, was succeeded by Guy P. Caputo; and, finally, John B. Martin, Administrator for Region III, was succeeded by Hubert J. Miller.

In other organizational changes, John C. Hoyle succeeded Samuel J. Chilk as Secretary of the Commission. Mr. Chilk was appointed as Director, Commission Decision Tracking System. Leo Norton was designated as Acting Inspector General when David Williams resigned to take the position of Inspector General at the Social Security Administration.

The NRC organization as of December 31, 1995, is shown in Appendix 1.

STRATEGIC ASSESSMENT AND REBASELINING INITIATIVE

The environment in which the NRC conducts its activities is rapidly changing as a result of many influences. These include resource restraints, changes in the industry that NRC regulates, and the potential for new and revised mission requirements. Against this backdrop of change in our 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 which the Commission can consider in determining the agency's future path. This effort was initiated in August 1995, and is being completed in four phases. The effort is divided into four broad phases that will be carried out sequentially, with each phase building on the preceding phase. As described below, they are Phase I: Strategic Assessment, Phase II: Rebaselining and Issue Papers, Phase III: Development of a Strategic Plan, and Phase IV: Implementation.

PHASE I: STRATEGIC ASSESSMENT

The first phase, the Strategic Assessment phase, began in August 1995 and is expected to be completed in the Spring of 1996. The Steering Committee began with a bottom-up approach for assessing where the agency is today, with an examination of 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. Each of these direction-setting issues is being developed into an options paper for Commission consideration.

PHASE II: REBASELINING AND ISSUE PAPERS

The second phase builds on the issues identified in Phase I. Two parallel and interrelated actions are planned for Phase II. They are development and resolution of issue papers and providing the Commission appropriate Steering Committee insight for the FY 1998 budget. The Commission's decisions will result in a rebaselining or a resetting of the agency's goals.

PHASE III: DEVELOPMENT OF A 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 goals of the agency. It is anticipated that the Strategic Plan will be completed early in 1997.

PHASE IV: IMPLEMENTATION

Phase IV, the implementation phase, may begin as soon as the Commissioners make final decisions on the issue papers. The implementation phase includes implementing the Commission's decisions based on the issue papers, 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 development of future Commission decisions.

POWER REACTOR REGULATION

POWER REACTOR LICENSING ACTIONS

No new licenses were issued during fiscal year 1995 (FY 95).

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 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 95, the NRC's Office of Nuclear Reactor Regulation (NRR) completed about 1871 licensing actions. About 98 percent of these actions were directed at specific plants and licensees. The balance were multiplant actions deriving from the imposition of NRC requirements. During FY 95, total inventory of licensing actions under review decreased from about 1293 to 1000. (See Chapter 2.)

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 92 percent of the other MPAs had been implemented at the 107 operating plants as of September 30, 1995.

IMPROVED STANDARD TECHNICAL SPECIFICATIONS

The NRC places its highest priority on license amendment applications to fully implement the Improved Standard Technical Specifications (STS), and more than 70 percent of power reactor plants are planning to convert. In a related effort, the NRC continues to work with the industry to develop ongoing improvements to technical specifications and license amendment practices. These activities are supported by the August 1995 amendment to NRC regulations, regarding the content of technical specifications.

RENEWAL OF OPERATING LICENSES

The first operating license of a currently active plant—Big Rock Point—will expire in the year 2000, and the operating licenses of nearly 20 percent of these plants will expire by the end of the year 2010. Preparation for expected license renewal applications continues to be a high priority. During FY 95, the NRC staff issued a revised rule to simplify license renewal, and continued to develop implementation guidance.

IMPROVING THE LICENSING PROCESS

The Commission strongly encouraged the nuclear industry to standardize the next generation of reactor designs, and to resolve design- and site-related issues early in the licensing process. The NRC plans to realize the benefits of standardization with the new licensing process in the *Code of Federal Regulations*, Title 10, Part 52 (10 CFR Part 52), which includes provisions for design certification, early site permits, and combined licenses. In addition, the NRC is preparing final standard design certification rules for two evolutionary light-water reactor (LWR) designs; these rules should be published in mid-1996.

POWER PLANT MAINTENANCE

From September 1994 to March 1995, the NRC staff performed a series of nine pilot site visits to verify the adequacy of a draft version of inspection procedure (IP) 62706. The NRC will use this procedure to verify each licensee's implementation of the maintenance rule, 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The NRC performed these pilot visits at sites that had volunteered to have the staff review their maintenance rule implementation before the effective date of the rule, July 10, 1996.

The staff documented the results of these site visits in NUREG–1526, "Lessons Learned from Early Implementation of the Maintenance Rule at Nine Nuclear Power Plants." On June 27, 1995, the staff held a public workshop in St. Louis, Missouri, to review the lessons learned from the pilot site visits. On July 17, 1995, the staff issued a Commission Paper, SECY 95–179, to apprise the Commission of the status of recent and planned maintenance rule activities. On August 31, 1995, the staff issued the final version of IP 62706, which incorporated appropriate comments and suggestions received from the public and industry representatives.

Beginning on July 10, 1996, the staff will perform baseline inspections of each licensee's implementation of the maintenance rule. These inspections will be conducted by resident and region-based inspectors, and will be completed within 2 years. To ensure uniform implementation, the NRR maintenance section staff will participate in these inspections, and will provide training to the resident and region-based inspectors. The training will be completed before the rule takes effect on July 10, 1996.

SPECIAL REACTOR PLANT INSPECTIONS

During FY 95, the NRC headquarters and regional staffs continued to perform special team inspections involving 4 to 10 inspectors and requiring 1 to 2 weeks of onsite inspection. The objective of these special inspections was to determine whether, when called upon to do so in an emergency, the nuclear plant's systems and personnel would perform their safety functions in the manner set forth in the facility's safety analysis report.

GRADED QUALITY ASSURANCE

One activity associated with the probabilistic risk assessment (PRA) implementation plan is the development of a graded quality assurance (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 considerations by an expert panel would result in the categorization of plant equipment by safety significance.

Initially, the staff focused on interacting with the Nuclear Energy Institute (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, describes the initial stages of the project. During FY 95, three volunteer licensees indicated a desire to work with the staff to develop graded QA implementation practices. 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 significance categorization.

HUMAN FACTORS COORDINATION COMMITTEE

A task force established by the Deputy Executive Director for Nuclear Reactor Regulation, Regional Operations, and Research, recommended the formation of an interoffice committee to coordinate the agency's human factors programs. As a result, the Human Factors Coordination Committee was established with representatives from NRR, the Office for Analysis and Evaluation of Operational Data (AEOD), the Office of Nuclear Regulatory Research (RES), the Office of Nuclear Material Safety and Safeguards (NMSS), and the regions. As required by its charter, they began by developing a Human Performance Program Plan that reflects the goals, objectives, and activities associated with the agency's human factors programs. The Committee issued this program plan in August 1995.

NUCLEAR MATERIALS REGULATION

MATERIALS LICENSING BUSINESS PROCESS REENGINEERING

In October 1994, the staff began to examine the process used to issue materials licenses, in order to identify ways to improve the process. During this examination, the staff found that licensing was being accomplished using a complex process involving anywhere from 54 to 94 exchanges of information among individuals and computer systems during a routine license review. On average, the NRC took 84 days to complete a licensing action, although only 2 days were actually needed to complete the technical safety review of a typical licensing request. During the remaining 82 days, paper was either in transit or in the queue. The staff proposed to reduce the licensing process to an average of four days.

Therefore, consistent with the goals of the National Performance Review and the Paperwork Reduction Act of 1995, the staff initiated an innovative approach to improve management of information collections. As directed by the Commission, the staff held various meetings and workshops to gather input from Agreement States, licensees, and the public. The selected approach, called Business Process Reengineering (BPR), fundamentally changes the way work is performed, to achieve significant improvements in speed, cost, and quality. This new process, BPR, will also most likely lead to more clear, consistent, and timely regulatory guidance, ensuring that its implementation will not have any adverse effect on public health and safety. In fact, many licensees believe that fewer operational problems will occur if the NRC is able to significantly reduce the time necessary to process licensing actions.

In the first BPR phase a core team of people who work in licensing, administration, and information technology developed a generalized design for a new materials licensing process. Specifically the core team proposed using a graded licensing approach that matches the safety hazards associated with a license application. A more streamlined workflow for materials licensing actions is expected to result from the Business Process Reengineering initiative.

MATERIALS ACTIVITIES

During fiscal year 1995 (FY 95), the NMSS completed the following activities related to nuclear materials regulation:

- nearly 90 reviews of transportation and spent fuel storage packages, and 6 route approvals for transporting special nuclear material and spent fuel.

- safety inspections of 7 transportation packaging and dry spent fuel storage system suppliers, and observations of 3 Department of Energy (DOE) audits of multipurpose canister (MPC) contractors
- more than 4600 licensing actions on applications for new byproduct materials licenses, as well as amendments and renewals of existing licenses, and reviews of sealed sources and devices
- approximately 2100 materials licensee inspections

FUEL CYCLE LICENSING ACTIVITIES

By the end of FY 95, the NRC had completed 121 fuel cycle licensing actions. Table 1 shows these licensing actions by category.

INTERNATIONAL COOPERATION

During the fiscal year 1995 (FY 95) reporting period, the NRC continued its involvement in the international arena, including the following noteworthy activities:

- Support for 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 play an important part.
- Nuclear safety cooperation with the New Independent States of the former Soviet Union and countries of Central and Eastern Europe. These activities included strengthening their regulatory organizations, training foreign inspectors, and working together in the areas of operational safety and risk reduction.
- Efforts to help countries of the former Soviet Union—particularly Russia, Ukraine, and Kazakstan—to improve their systems for protecting, controlling, and accounting for nuclear materials. These efforts focused on improving regulatory programs and enhancing facility safeguards within the framework of agreements signed by the United States with these countries in the fall of 1993.
- Continued efforts to work (in conjunction with other U.S. Government and related entities) with countries of the former Soviet Union—specifically Russia, Ukraine, and Belarus—to study the health effects of exposure to ionizing radiation resulting from the Chornobyl accident and from Russian defense-related activities.

Table 1. Fuel Cycle Licensing Actions (Safety/Safeguards) Completed in FY 95

Category	No. of Actions
Fuel Fabrication and Conversion	73
Critical Mass Materials	6
Fuel Research, Development, Pilot, and Fresh Fuel Storage	6
Other Source Materials	3
Material Control and Accounting	24
Physical Security	4
West Valley Demonstration	4
Department of Energy Waste Processing	1

- Raising the priority of regulatory cooperation with several Pacific Rim areas (Indonesia, China, Korea, and Taiwan) that are embarking on, or are considering, new or expanded nuclear power programs.
- Maintaining an active information exchange with coutries that have substantial nuclear power programs, and with multilateral organizations promoting international nuclear safety as well as assuming a proactive role 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 resolutions, which were submitted to the Congress in May 1995 for its advice and consent and ratification. If ratified, these resolutions could become effective during 1996. Implementation of U.S. obligations under the Convention will be carried out primarily by the NRC. A separate Convention on the Safety of Radioactive Waste Management is now in active international negotiation, with the NRC playing an active role in its development.
- Continuation of active, cooperative nuclear safety research with other nations having major nuclear power programs, including France, Germany, Japan, and the United Kingdom.

NRC LICENSE AND ANNUAL FEES

The Omnibus Reconciliation Act of 1990 (Public Law 101-508) requires that in FY 95, 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 103-316 appropriated approximately $525.6 million to the NRC for FY 95, and Public Law 104-19 (Emergency Supplemental) enacted a recision of $1.7 million for a net FY 95 appropriation of $523.9 million. Approximately $22.0 million of the budget was appropriated from the Nuclear Waste Fund. Of the remaining $501.9 million, 100 percent was collected through fees and annual charges. A detailed account of NRC financial management, with an audited financial report, is provided in the Fiscal Year 1995 Accountability Report (NUREG-1542), which will be available April 1996.

ADMINISTRATIVE ACCOMPLISHMENTS

LABOR RELATIONS

On October 1, 1993, the President signed Executive Order 12871 dealing with Labor-Management Partnerships in the Federal Government. The order expands the scope of bargaining and calls for a more cooperative and less confrontational relationship between labor and management. Pursuant to the order, the agency, and the union, have 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 in a dispute to work together in framing possible resolutions.

NATIONAL PERFORMANCE REVIEW

The Office of Personnel (OP) has been carefully reviewing the human resources management recommendations in the *National Performance Review* (NPR) report, published in September 1993 and the follow-on report, *Reinventing Human Resources Management*. While many NPR recommendations require changes in the law or in OPM regulations, others may be implemented without delay. The OP has already begun to implement some of the suggested changes. Two of the changes that will have an impact on the agency are (1) the reduction in staff size and the ratio of supervisors and managers to employees, and (2) the elimination or reduction of personnel directives and processes. While the former change will affect the nature of supervisory relationships, the latter will provide management with more flexibility and fewer procedural barriers in managing the NRC's human resources. During FY 95, the ratio of supervisors and managers to employees was decreased from 1:4.8 to 1:5.4 (a decrease of 12.5 percent), and seven Management Directives were eliminated.

FACILITIES PROGRAM

During fiscal year 1995 (FY 95), several special facilities were completed on the plaza level of the Two White Flint North (TWFN) complex in Rockville, Maryland. First, a newly renovated Health Unit opened in May 1995 in the One White Flint North building for use of employees within the complex. Second, an 8000-square foot, 300-seat, full-service cafeteria capable of serving approximately 1500 people daily, opened in June 1995. A fitness center, opened in September 1995, offering a comprehensive wellness and fitness program to accommodate individual needs. Also, in September 1995, the Maryland Blind Industries opened a "Snack 'N Go" store, specifically to sell sundries such as cards, chips, and sodas.

To enhance the safety and comfort of employees walking from one building to the other, the White Flint Limited Partnership, Inc. awarded contracts to design and construct an enclosed link between Two White Flint and One White Flint. Construction is expected to be completed by the end of September 1996.

In March 1995, the NRC's Office of Administration (ADM) published its policy concerning public use of the auditorium in Two White Flint North.

Executive Order 12821, "Improving Mathematics and Science Education in Support of the 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 an aggressive program for donating computer equipment to school systems nationwide. In FY 95, the NRC donated more than 4700 pieces of computer equipment, including color monitors, system units, and printers with an acquisition value of about $5.4 million.

CHAPTER 2

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) to 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. Responsibilities of NRR also include technical review, certification, and licensing of advanced nuclear reactor facilities, as well as 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, NRR takes action in coordination with the responsible regional offices and licensees. NRR also assesses and recommends or takes action in response to incidents or accidents. In addition, NRR is responsible for licensing issues and regulatory policy concerning the following areas:

- 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)
- inspection of nuclear component supplier facilities

LICENSING THE NUCLEAR POWER PLANT

All nuclear power plants licensed to date have followed a "two-step" licensing process as required by 10 CFR Part 50 (see Appendix 8). First, the NRC issues a *construction permit* after reviewing the siting issues and preliminary design issues. Second, the NRC issues an *operating license* after the detailed design is completed, the plant is built, and the NRC has reviewed and inspected the plant. Owing to many factors, including the political and regulatory environment, the process sometimes generates uncertainty as to whether a facility will be allowed to operate after billions of dollars have been spent on its construction.

The issuance of 10 CFR Part 52 in 1989 established a streamlined licensing approach that resolves many issues before construction of a facility begins. The new licensing approach allows for the following distinct siting and design issues:

- approval of an early site permit for the siting of a nuclear power plant
- *design certification* of a final standard nuclear power plant design that could be used at multiple sites

- issuance of a *combined license*—before construction—for a facility that references a certified standard design to be built and operated at a site

- authorization for fuel load following facility construction, upon successful demonstration that the stringent inspection, testing, analysis, and acceptance criteria (ITAAC) in the combined license are met

Part 52 relies heavily on the existing 10 CFR Part 50 technical requirements and regulations for the reviews of reactor designs. Several applications for design certification of advanced reactor designs are already nearing completion.

Before applications are submitted to initiate either licensing process, considerable consultation takes place between the applicant and the NRC staff. This can involve many volumes of preliminary data, covering both safety and environmental aspects of construction and operation. The consultation may also involve discussion of the major safety issues for new designs, which may be resolvable under existing regulations or Commission policy, by requiring new Commission policy guidance to the staff, or by requiring confirmatory research and/or development.

PART 50 LICENSING PROCESS

According to 10 CFR Part 50, the nuclear power plant licensing process begins when an entity, traditionally a utility, files an application for a construction permit with the NRC. The construction permit application includes a preliminary safety analysis report (PSAR), which describes the proposed nuclear plant design and site safety issues, as well as an environmental report (ER), which addresses environmental protection issues. Regulatory Guides 1.70 and 4.2, respectively, provide guidance to prospective applicants concerning the standard format and content of these reports.

The NRC subjects each construction permit application to an acceptance review to determine whether it contains sufficient information to satisfy NRC requirements. Upon accepting ("docketing") the application, the staff publishes a notice of the fact in the *Federal Register*, and furnishes copies of the application to the appropriate State and local authorities, to a public document room established by the NRC near the proposed plant site, and to the NRC public document room in Washington, DC. The NRC also publishes a notice of a public hearing in the *Federal Register* and in local newspapers, giving 30 days for members of the public to petition to intervene in the proceeding. Such petitions are entertained and adjudicated by the NRC Atomic Safety and Licensing Board (ASLB) appointed to the case, allowing the petitioner the right to appeal to the Commission.

Next, the NRC staff reviews various safety, environmental, safeguards (from theft or sabotage), and antitrust issues. The safety review is performed in accordance with the "Standard Review Plans (SRPs) for Light-Water-Cooled Reactors" (NUREG-0800), initially published in 1975 and periodically revised since then. The plans set forth the acceptance criteria used in evaluating the various systems, components, and structures related to safety and in appraising the suitability of the proposed site; they also describe the procedures to be used in performing the safety review, during which the NRC staff examines the applicant's PSAR.

Through the safety review, the staff determines whether the plant design is safe and consistent with NRC rules and regulations, whether the applicant used valid methods of calculation, and whether the applicant conducted its analysis and evaluation in sufficient depth and breadth to ensure adequate safety. Upon verifying that the applicant's PSAR meets the acceptance criteria of the SRPs, the staff prepares a safety evaluation report (SER) describing the expected effect of the construction and operation of the proposed facility on public health and safety. Following publication of the SER, the independent Advisory Committee on Reactor Safeguards (ACRS) completes its assessment and meets with the staff and the applicant. The ACRS then prepares a report, under letter to the Chairman of the NRC, presenting the results of its independent evaluation and its recommendations as to whether a construction permit should be issued. The staff then issues a supplement to the SER, incorporating any changes or actions adopted as a result of ACRS recommendations. A public hearing can then be held, generally in a community near the proposed facility site, on the safety aspects of the licensing decision.

In a similar manner, the NRC staff evaluates the applicant's ER to assess the environmental consequences of construction and operation of the proposed facility. The staff performs this environmental review in accordance with the "Environmental Standard Review Plans for the Environmental Review of Construction Permit Applications for Nuclear Power Plants" (NUREG-0555), published in 1979 and currently under revision. The plans establish the criteria used in benefits assessment in conformance with the National Environmental Policy Act (NEPA) and NRC environmental protection regulations. Upon completion of the analysis, the staff publishes and distributes a draft environmental statement with specific requests for evaluation and comment by Federal, State, and local agencies; other interested parties; and members of the general public. Comments received are taken into account as the staff prepares the final environmental statement for the facility. Both the draft and the final statements are made available to the public at the time of their publication. During the environmental review, the NRC staff also conducts analyses and prepares a report concerning the site suitability concerns of the proposed licensing action. A public hearing, presided over by the appointed ASLB, may then be held to discuss the environmental and site suitability issues related to the proposed licensing action (or a single hearing on both safety and environmental matters may be held).

Antitrust reviews are carried out by the NRC and the U.S. Attorney General before or during other licensing reviews. If an antitrust hearing is required, it is held separately from hearings on safety and the environment. Thereafter, as required by law, the independent ACRS assesses the proposed project and the results of the earlier reviews, and makes its recommendations. The next phase is a mandatory public hearing conducted by a three-member ASLB, which makes an initial decision as to whether a construction permit should be granted. This decision is subject to appeal to the Commission by any person or group with standing in the proceeding. Appeal beyond the final NRC decision is available by recourse to the Federal courts.

Where appropriate, the NRC may grant a limited work authorization to an applicant before a final decision is reached concerning the construction permit, in order to allow work to begin at the site; such a step can save months in construction time. This authorization will not be given until the NRC staff has completed its reviews of environmental impact and site suitability, and until the ASLB has conducted the environmental impact and site suitability hearing and has reached a favorable finding. To realize the desired savings in construction time, the applicant must submit the environmental portion of the application early in the process.

The subsequent operating license review reconsiders many of the issues evaluated during the construction permit review, and is also subject to ACRS and ASLB review and recommendations.

PART 52 LICENSING PROCESS

Under 10 CFR Part 52, a number of licensing actions can be initiated that do not immediately lead to the construction of a nuclear power plant. The *early site permit* is considered a partial construction permit, with many of the elements of the 10 CFR Part 50 construction permit previously described. An early site permit may be incorporated by reference in a combined license application, but is not required. Early site permit provisions allow early resolution of site safety, environmental protection, and emergency preparedness issues, independent of a specific design. The early site permit application must address the safety and environmental characteristics of the site, and must evaluate potential physical impediments to the development of an emergency plan. Additionally, the application may address more detailed emergency preparedness issues.

Upon accepting the application, the staff publishes a notice of the fact in the same manner described for 10 CFR Part 50. The staff prepares SERs to document its findings on site safety characteristics and emergency planning, as well as draft, "for comment", and final environmental statements to document findings related to environmental protection issues. The early site permit also has provisions for a limited work authorization to perform non-safety site preparation activities, subject to redress, before a combined license application is processed. After the NRC completes its review and the ACRS completes its safety review, the NRC issues a notice for mandatory public hearing. The early site permit is valid for no less than 10 and no more than 20 years, but can be renewed for 10 to 20 years.

The design review process can involve up to three stages of staff review, including preliminary design approval (PDA), final design approval (FDA), and design certification through rulemaking. The PDA is an optional, preliminary approval of a standard plant design. The FDA is a final design approval, issued by the staff, deeming a standard design acceptable for incorporation by reference in individual facility license applications. The FDA can be referenced in construction permit and operating license applications under Part 50, or in combined construction permit and operating license applications under Part 52. The FDA is followed by certification of the standard plant design through a rulemaking by the Commission, which also identifies the ITAAC for the design. The ITAAC specify the criteria for those inspections, tests, and analyses that are necessary and sufficient for a licensee to perform in order to provide a reasonable assurance that a facility referencing the standard design, has been built and will operate in accordance with the design certification and applicable regulations. The design certification rule is valid for 15 years, and can be renewed for 10 to 15 years. The resolution of issues for a certified design is considered final. That is, the design cannot be modified unless the change is necessary to meet applicable NRC regulations in effect at the time of the design certification, or to ensure adequate protection of the public health and safety. A rulemaking must be conducted for these changes. An applicant or licensee may request an exemption to portions of the rule, and may make changes to a facility that do not affect the design certification.

An entity intending to construct and operate a nuclear power plant under Part 52 can incorporate by reference a design certification or an early site permit in the application for a combined license. The advantage of this approach is that the issues resolved during the early site permit hearing process and the design certification rulemaking process are precluded from reconsideration at the combined license stage. An application for a combined license must contain all information required of applicants for both construction permits and operating licenses. This includes the site-specific design features and acceptance criteria that were not approved in the standard design certification, as well as portions of the emergency plan that were not approved for the early site permit. If an application does not incorporate by reference either a certified design or an early site permit, the applicant must include all relevant information to make the application complete, and this information is subject to hearings. Upon accepting application, the staff publishes a notice of the fact in the same manner described for Part 50. The NRC staff and ACRS then review the combined license application for those issues not resolved in the early site permit or the design certification. Following this review and before the license is issued, the NRC holds a mandatory hearing. Additionally, the combined license review includes an antitrust review, which is carried out by the NRC and the U.S. Attorney General; if an antitrust hearing is required, it is held separately from hearings on safety and the environment. The issuance of a combined license permits an entity to construct and operate the plant. For this reason, the combined license under 10 CFR Part 52 is sometimes referred to as a "one-step" licensing process.

When the NRC issues a combined license to an entity, the recipient is permitted to construct the plant in accordance with the approved design on the specified site. Within the combined license, the Commission also specifies the inspections, tests, and analyses that the licensee shall perform, as well as the acceptance criteria that are necessary to provide reasonable assurance that the facility has been constructed and will operate in conformance with the license. After issuing a combined license, the Commission shall ensure that the licensee performs these required inspections, tests, and analyses, and that the acceptance criteria are met. At periodic intervals during construction, the NRC staff publishes notices of the successful completion of the inspections, tests, and analyses in the *Federal Register*. In addition, not less than 180 days before the date scheduled for initial loading of fuel, the NRC publishes a notice of intended operation of the plant. An opportunity for a 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 operation of the facility begins, the Commission shall find that the acceptance criteria in the combined license are met.

LICENSE APPLICATIONS, ISSUANCES, AND DECOMMISSIONING

During fiscal year 1995 (FY 95), the NRC staff continued revising regulations to clarify their applicability and to change the decommissioning policy regarding permanently shutdown reactors. On July 20, 1995, the Commission issued a "Notice of Proposed Rulemaking on Decommissioning of Nuclear Power Plants." The proposed rule redefines the decommissioning process, defines terminology related to decommissioning, requires licensees to give the NRC early notification of planned decommissioning activities at their facilities, and explicitly defines the applicability of certain NRC requirements to permanently shutdown reactors. The Commission believes that the proposed rule will enhance efficiency and uniformity in the process of decommissioning nuclear power reactors. In addition, the proposed rule will allow greater public participation in the decommissioning process, and will afford both 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 staff plans to issue a final rule in summer 1996.

On August 18, 1995, the Commission published a proposed rule that addresses physical protection requirements for the storage of spent fuel and high-level radioactive waste in a permanently shutdown reactor, an independent spent fuel storage installation, a monitored retrievable storage installation, and a geologic repository. The public comment period expired on November 13, 1995, and the staff is scheduled to issue a final rule in summer 1996.

These rulemakings represent a collaborative effort between the Offices of Nuclear Reactor Regulation (NRR), Nuclear Regulatory Research (RES), Nuclear Material Safety and Safeguards (NMSS), and the General Counsel (OGC). To further clarify responsibilities between the two technical program offices, NRR and NMSS reached agreement on March 15, 1995 to realign certain responsibilities for power reactor decommissioning. In the future, NRR will maintain project management responsibility for power reactor facilities until NMSS assumes that responsibility when the fuel is permanently transferred from the spent fuel pool to either an authorized licensee (onsite or offsite) or to the Department of Energy (DOE).

On January 10, 1995, the Citizens Awareness Network (CAN), an activist group based in Rowe, Massachusetts, petitioned the U.S. Court of Appeals for the First Circuit (Boston) for a review of the NRC decision not to grant a hearing to CAN regarding the component removal program conducted at Yankee Nuclear Power Station. (This program was discussed in the 1993 and 1994 annual reports.) In its decision of July 20, 1995, the Court held that CAN was entitled to a hearing, and remanded the case to the Commission for further action. In the *Federal Register*, on September 6, 1995, the Commission notified the public of the Court's decision, solicited public comment regarding the Commission's legal authority to allow or forbid further decommissioning activity at Yankee, and stated the Commission's intention to issue a future *Federal Register* notice that would offer an opportunity for a hearing on the Yankee decommissioning plan. On October 12, 1995, the Commission issued an order forbidding, Yankee Atomic Electric Company, the licensee for Yankee, from conducting further "major" decommissioning activities at the facility until the hearing is completed. On October 27, 1995, the Commission provided public notice of the opportunity for a hearing regarding reapproval of the Yankee decommissioning plan.

In November 1994, Portland General Electric (PGE), the licensee for the Trojan Nuclear Plant (Oregon), 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. (This program was discussed in the 1994 annual report.) On September 6, 1995, in a *Federal Register* notice separate from, but similar to, the Yankee Nuclear notice previously discussed, the Commission announced its intention to issue a *Federal Register* notice offering an opportunity for a hearing on whether to approve the Trojan decommissioning plan. In addition, the notice solicited public comment on the decommissioning activity at Trojan. Following publication of the *Federal Register* notice, the Don't Waste Oregon Council filed lawsuits in the Oregon State Supreme Court and the U.S. Court of Appeals for the Ninth Circuit requesting suspension of the LCRP activities. In response to the injunctions, the two courts imposed stays that they subsequently lifted after determining that the courts lacked jurisdiction over the matter.

In 1993, the NRC staff issued its safety evaluation and environmental assessment of the proposed decommissioning plan for the Rancho Seco Nuclear Generating Station in California. However, NRC approval of the decommissioning plan was delayed because of hearing contentions raised by the Environmental and Resources Conservation Organization (ECO). During FY 94, however, the ECO reached a settlement with the Sacramento Municipal Utility District, the licensee for Rancho Seco, and withdrew from the proceeding on August 1, 1994. Following the court decision, the staff reviewed and updated its previous safety evaluation and, on March 20, 1995, issued the order authorizing decommissioning of the Rancho Seco facility.

SPECIAL CASES

Commonwealth Edison Company. The Commonwealth Edison Company (ComEd) owns and operates 12 nuclear power plants at each of 6 sites in Illinois, including Braidwood, Byron, Dresden, LaSalle, Quad Cities, and Zion. These plants range in time of operation from 8 years for Braidwood to 25 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 and the NRC staff 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. The staff discussed these probable causes with the utility's senior managers. In response, ComEd developed and began to implement an Integrated Management Action Plan to improve organizational and management effectiveness, business planning, and issue management. Despite these initiatives, in January and June 1994, the NRC issued letters to ComEd expressing concerns about adverse performance trends at both the LaSalle and Quad Cities stations. ComEd then developed and implemented a series of more focused and much more effective initiatives.

In 1995, the NRC instituted site focus teams to closely monitor the performance at all six ComEd facilities. The NRC also conducted periodic and integrated plant performance assessments through semiannual plant performance reviews, semiannual senior management meetings, and the systematic assessment of licensee performance (SALP) program. The NRC used these assessments to adjust the application of inspection resources.

Throughout 1995, performance of activities at the Byron plant was generally excellent. Similarly, 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. Performance at Braidwood and Zion was acceptable, but inconsistent.

Dresden also performed adequately, but the pace of improvement continued to be slow, and Dresden remained on the NRC's Watch List. In 1995, both Dresden units conducted extensive outages to correct several long-standing material condition problems. ComEd continued to make substantial changes in the station's management and organizational structure. The licensee also developed an overall improvement plan and executed other initiatives to improve performance at the station. In addition, station management identified seven focus areas to be improved in

1995, including (1) work management, (2) material condition, (3) outage preparation, (4) training, (5) procedural adherence, (6) corrective action programs, and (7) radiation protection.

Each of these focus areas has been assigned to a senior plant manager, and specific objectives and corresponding actions have been identified, assigned, and scheduled for each focus area. These efforts have begun to show some positive results; however, the NRC has determined that continued close monitoring is warranted until a period of sustained performance improvement is observed.

Fermi

The Fermi 2 Nuclear Plant is a single-unit, 1139-megawatt (electric) General Electric (GE) boiling-water reactor (BWR) 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 turbine generator while the plant was at 93 percent reactor power. The Region III Administrator issued a confirmatory action letter (CAL) on December 28, 1993, documenting actions required of the licensee before restart. In addition, with the concurrence of NRR, the Regional Administrator formed a restart panel, in accordance with NRC Manual Chapter (MC) 0350, "Staff Guidelines for Restart Approval," to evaluate and track the licensee's investigative and recovery actions before restart. The panel developed a formal restart action plan with over 33 action items to be resolved before restart. By letter dated December 14, 1994, the licensee notified the NRC of its resolution of the action items. As a result, 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 1 year after the catastrophic turbine failure, the licensee restarted the Fermi 2 plant.

After restart, the Fermi 2 plant began an aggressive campaign of startup testing, power ascension, and turbine balancing. However, during the outage, the licensee had decided to remove the seventh- and eighth-stage blades from all three low-pressure (LP) turbines, and to replace the blades with pressure plates, even though this would result in a net 200-230 MWe derating. As a result, 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 licensee's turbine vibration subsequently ran slightly higher on the highest bearing (no. 8) than the goal of 6 mils (8-9 mils).

The licensee also planned to replace all three LP turbine rotors during the next refueling outage, scheduled for March 1996. Because of delays in fabricating and shipping the replacement rotors, as well as a lower-than-anticipated fuel burnup, the licensee postponed the refueling outage until fall 1996.

Cooper Nuclear Station

The Cooper Nuclear Station is a single-unit, 778-megawatt (electric) GE BWR facility, located in Nemaha County, Nebraska. The plant is owned and operated by the Nebraska Public Power District (the licensee).

In May 1994, the Cooper Nuclear Station entered a forced, unplanned outage, which continued until the restart in February 1995. The plant was shut down because of deficiencies identified by the NRC in the surveillance testing of the electrical distribution system, the control room emergency filter system, and the primary containment penetrations. Several confirmatory action letters (CALs) sent out from May through August of 1994 required the licensee to address these issues and to evaluate its operational experience review and testing programs.

The licensee's independent diagnostic self-assessment (DSA) report, released in September 1994, concluded that corporate and station management did not foster high standards of performance, and that management and quality assurance oversight were not effective. In addition, the DSA stated that significant weaknesses existed in the licensee's long-range planning efforts, and that its testing, configuration control, and corrective action programs were deficient. The NRC subsequently conducted a special evaluation, finding that the DSA was an effective and comprehensive assessment that reached substantive conclusions, which were supported by the NRC's independent assessment.

In November 1994, because of the nature and extent of the managerial and programmatic weaknesses observed at the Cooper plant, the NRC staff established a formal restart panel, to review in accordance with NRC Manual Chapter 0350, plant readiness for restart and to coordinate the inspection efforts necessary to identify any outstanding restart issues. In addressing the identified problems, the licensee made extensive management changes and initiated a three-phased performance improvement plan (PIP) to define and address actions needed to prepare for (1) plant restart, (2) the short-term period following restart, and (3) long-term plant operation. The restart panel determined that the PIP included all significant issues, and that it provided an acceptable process for resolving those issues. The panel subsequently concluded that the licensee had successfully completed the first (restart) phase of the PIP by addressing the CAL issues and the fundamental managerial weaknesses identified by both the DSA and the special evaluation. In reaching its conclusion, the panel reviewed the results of extensive NRC inspections, including the findings of the January 1995 restart team inspection. In addition, the panel held five public meetings at the site to examine the licensee's progress in implementing the PIP. Based on the recommendations of the restart panel, and in consultation with the Office of the EDO and NRR, the regional administrator granted plant restart approval on February 6, 1995.

The licensee began the process of startup and power ascension on February 9, 1995. Throughout this process, the NRC resident inspection staff was augmented by Region IV and NRR personnel to provide 24-hour-a-day oversight. The plant reached 100-percent power on February 27, 1995, and operated at or near full power until it was shut down for the 16th refueling outage on October 13, 1995.

In June 1995, the NRC staff concluded that the licensee's corrective actions had been effective, that both hardware and personnel performance had improved, and that the downward trend in performance had been arrested. The SALP report (dated August 2, 1995) stated that the licensee had demonstrated its ability to operate the plant safely, but a number of challenges remain to further improve the overall level of performance.

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. During FY 94, a number of issues were raised regarding dry-cask storage at Palisades. 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 intends to offload the fuel from cask 4 after the NRC staff reviews the unloading procedure submitted by Palisades in June 1995. The offloading of cask 4 has been delayed until 1996.

In early 1995, CPCo discovered that the shield lid material used in the VSC–24 cask storage system (the multiassembly sealed baskets (MSBs)) for casks 1 through 4 had not undergone Charpy V-notch impact tests as required by the safety evaluation report. CPCo submitted its interpretation of Section 1.2.13 of Certificate of Compliance 1007 for the VSC–24 spent fuel storage cask. Specifically, CPCo's interpretation is that future movement of MSBs 1 through 4 is permissible, but should be restricted to ambient temperatures of at least 10°F to maintain the specified safety margin to brittle fracture. The NRC staff reviewed CPCo's interpretation and found it consistent with the vendor's safety analysis report, as well as the NRC's safety evaluation report on protection against MSB brittleness.

In early 1995, the U.S. 6th Circuit Court of Appeals upheld the NRC's position on *Kelley v. Selin*. Filed in May 1993 by the Attorney General of the State of Michigan and petitioners against the NRC and CPCo, this lawsuit challenged the use of dry fuel storage casks at Palisades. In a similar ruling in June 1995, the Supreme Court denied to hear a petition for *certiorari* filed on

April 11, 1995, by the Attorney General of the State of Michigan and petitioners.

Palisades Reactor Vessel Annealing

The pressurized thermal shock (PTS) screening criteria provided in 10 CFR 50.61 require that a licensee submit updated information to the NRC whenever there is a significant change in the projected values used to calculate the reference temperature (i.e., the value compared to the screening criteria). During fall 1994, CPCo performed material properties tests and chemistry analyses of samples of weld material acquired from the shells of Palisades' retired steam generators. These tests and analyses were important because the newly acquired material samples had been fabricated using the same procedures and weld wire heat number as the limiting weld in the reactor pressure vessel (RPV). On the basis of these tests and analyses, CPCo concluded that the degree of embrittlement of the Palisades RPV could be higher than previously calculated. Consequently, with the new data included in the evaluation used in PTS screening and analyses performed in accordance with 10 CFR 50.61, the PTS rule indicated that the Palisades RPV will satisfy the requirements of this rule until the end of the plant's 14th refueling outage, scheduled for late 1999.

In reviewing the PTS analyses, the staff noted a large variability in the reported copper and nickel chemistry data for the limiting RPV weld. To assess this concern, the NRC staff employed the Palisades plant-specific chemistry and fluence data to perform RPV failure frequency calculations similar to those in a Commission Paper, SECY-82-465, "Pressurized Thermal Shock" (November 23, 1982), which established the basis for the PTS screening criteria. These analyses confirmed that the Palisades RPV will satisfy the safety margins intended by the PTS rule through the 14th refueling outage, even with the variability observed in the Palisades chemistry data.

Under a contract awarded to Westinghouse, CPCo currently plans to anneal the Palisades RPV in 1998, using an indirect gas heating system. Inside the reactor vessel, Westinghouse will use a compartmentalized heating can with five zones, each of which will have two independent burners located outside containment. Ductwork and exhaust ventilation will be routed through the equipment hatch and/or the escape hatch. CPCo currently plans to use a controlled thermal profile during heatup and cooldown with a 7-day soak at approximately 850 °F.

CPCo predicts that the Palisades reactor vessel materials will recover 80 percent or more of the original material properties. CPCo also estimates that only 40-percent recovery is required to reach the target license expiration date of 2011 (which includes a recapture of the construction period).

An annealing demonstration project (ADP) using the indirect gas heating method is scheduled for spring 1996 at Marble Hill, a four-loop Westinghouse plant. This demonstration project is independent of the Palisades annealing program, but is expected to yield information useful to the Palisades project.

In October 1995, CPCo submitted for staff review the first section of the Palisades Thermal Annealing Report. Additional sections of the report are expected during the next few months, with the final sections to be submitted following the Marble Hill ADP. In addition to material issues, the NRC staff will review the structural integrity of the bioshield during elevated annealing temperatures, as well as radiological shielding issues during the dry lift of reactor vessel internals, and fire protection issues associated with the indirect gas heating equipment.

Callaway and Grand Gulf Transfers

On October 1, 1995, the NRC transferred regional oversight responsibility for the Grand Gulf Nuclear Station and the Callaway Plant, to the Region IV office in Arlington, Texas. Grand Gulf (located in Clairborne County, Mississippi) had previously been overseen by the Region II office in Atlanta, Georgia. Callaway (located in Callaway County, Missouri) had been overseen by the Region III office in Lisle, Illinois. Grand Gulf was transferred to place all nuclear plants operated by Entergy Operations, Inc. (EOI), in Region IV. The Callaway Plant, a standardized nuclear power plant system (SNUPPS) design plant, was transferred to Region IV because the only other SNUPPS plant in operation (Wolf Creek) is located in Region IV. Placing all of the EOI and SNUPPS plants in Region IV enhances day-to-day oversight activities and makes the reactor inspection program more efficient.

Dry Cask Storage of Spent Reactor Fuel

In November 1980, the NRC published a final rule adding Part 72 to its regulations in Title 10. Part 72 defines the regulatory requirements for licensing and operating independent spent fuel storage installations (ISFSIs). In July 1990, the NRC amended 10 CFR Part 72 to simplify the licensing process for storing spent fuel in NRC-approved storage casks at power reactor sites. This amendment was developed in response to Section 133 of the Nuclear Waste Policy Act of 1982.

To date, seven reactor sites have constructed ISFSIs and placed them into operation:

- Calvert Cliffs, Calvert County, Maryland
- Fort St. Vrain (permanently shut down), Weld County, Colorado
- H.B. Robinson, Darling County, South Carolina
- Oconee, Oconee County, South Carolina
- Palisades, Van Buren, Michigan
- Prairie Island, Goodhue County, Michigan
- Surry, Surry County, Virginia

Four additional reactor sites plan to place ISFSIs into operation in FY 96:

- Arkansas Nuclear One, Pope County, Arkansas
- Davis Besse, Ottawa County, Ohio
- Oyster Creek, Ocean County, New Jersey
- Point Beach, Manitowoc County, Wisconsin

The NRR staff is closely monitoring licensee activities associated with the ISFSIs at these sites, in cooperation with staff from the regions and from NMSS. In addition, NRR and NMSS have jointly developed a Dry Cask Storage Action Plan to address issues and problems associated with fabricating, installing, and licensing ISFSIs. The NRR is actively resolving some of the technical issues (such as heavy-load crane control and cask loading and unloading), as well as some of the programmatic issues (such as public responsiveness and inspections of site activities).

BWR Power Uprates

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 both boiling-water reactors (BWRs) and pressurized-water reactors (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. This 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.

GE plans to submit additional licensing topical reports containing generic bounding analyses for specific aspects of BWRs. Currently, GE and the

Northern States Power Company are completing extended power uprating studies for Monticello. The NRC expects to receive a license amendment application in 1996 to increase the authorized thermal power of Monticello by about 6.3 percent.

Two GE-designed BWRs in Switzerland have 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 expects to receive approval for a 20-percent uprate in early 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.

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

TVA PROJECTS

In September 1985, the NRC staff issued a letter to the Chairman of the Board of Directors of the Tennessee Valley Authority (TVA), discussing significant continuing weaknesses in TVA performance, and stating that management of the TVA nuclear program was ineffective.

Browns Ferry

The Browns Ferry Nuclear (BFN) Plant (Alabama) consists of three boiling-water reactor units, which are owned and operated by the Tennessee Valley Authority (TVA). BFN Unit 2 was shut down for a planned refueling outage in September 1984. BFN Units 1 and 3 were voluntarily shut down in March 1985 because of poor performance, including significant enforcement actions, several operational events, equipment failures, and the inability of management to identify and correct problems. In March 1985, TVA volunteered to maintain all three BFN units in a cold shutdown condition until corrective actions could be implemented to resolve NRC concerns regarding TVA's ability to safely operate the BFN facility.

Following extensive NRC review and inspection of TVA corrective actions, BFN Unit 2 was restarted on May 24, 1991, and is currently in its third fuel cycle after restart. In a letter dated June 30, 1992, the NRC notified TVA that Unit 2 had demonstrated excellent plant performance, and would therefore be removed from the list of plants warranting close NRC monitoring. However, the NRC informed TVA that Units 1 and 3, would remain in the close monitoring category and would require explicit NRC authorization to be operated.

After restarting Browns Ferry Unit 2, TVA focused attention on Unit 3 restart. In general, TVA adopted the approved Unit 2 methods, criteria, and technical positions for restoring Unit 3 to service, and corrective actions were completed in 1995. However, TVA revised some programs based primarily on lesson learned from Unit 2. The NRC staff reviewed and approved the proposed changes, and TVA completed the corrective actions in 1995.

A restart panel, consisting of NRC managers and the Senior Resident Inspector, was established in February 1995 to coordinate NRC staff activities, monitor Browns Ferry activities, and keep the Regional Administrator informed regarding the restart of Unit 3. The NRC staff conducted numerous inspections of licensee activities, including verifying licensee corrective actions identified from the TVA Nuclear Performance Plan, TMI action items, generic letters, bulletins, and operational readiness reviews. TVA successfully completed the BFN Unit 3 fuel load on October 29, 1995; and, on November 19, 1995, the NRC authorized TVA to restart the unit. BFN 3 reached criticality and has completed a power ascension test program enroute to full power operation. TVA remains ahead of their schedule to return BFN Unit 3 to full power by February 1996.

A decision on whether to pursue restart of Browns Ferry Unit 1 is part of TVA's Integrated Resource Plan, which is expected at the end of 1995. To restart Unit 1, TVA expects to require a license amendment to "recover" a portion of the extended shutdown time.

Watts Bar

During FY 95, TVA continued its activities to complete Watts Bar Unit 1, including work on corrective action programs (CAPs) and special projects (SPs), as well as other construction and modification activities. As systems were tested, they were turned over to the plant's operating staff.

In support of the Watts Bar licensing process, the staff prepared a supplement to NUREG–0498, "Final Environmental Statement Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2" (FES), during FY 95. The document was prepared to supplement the NRC's 1978 FES in the interest of furthering the National Environmental Policy Act. The supplement evaluated changes in the environment, as well as changes in the plant design, procedures, and proposed methods of operation, since the staff's previous environmental evaluation in 1978. The staff transmitted the draft supplement for public comment via a *Federal Register* notice and held a public meeting near the site to solicit further comments. The staff considered and responded to the comments in the final supplement. The staff concluded that there are no changes in the design, operation, population, demographics, land use, water use, regional climatology, meteorology, terrestrial environment, aquatic environment, or background radiological characteristics that will result in a significant change in the environmental impact.

In July–August 1995, TVA performed a series of integrated tests, called "hot functional tests," at normal operating pressure and temperature. These hot functional tests demonstrated the performance of significant plant safety systems and equipment. Moreover, TVA conducted the plant heatup and pressurization as if a reactor startup was being conducted in accordance with technical specifications. This provided a unique opportunity for the NRC staff to observe plant operators under simulated operating conditions.

On September 1995, representatives of NRR and Region II held a public meeting near the Watts Bar site, in order to allow members of the public to ask questions. The meeting was transcribed, and written answers were provided to those members of the public who asked questions and provided addresses. Also in September, the Commission was briefed on the status of Watts Bar by both TVA and the NRC staff. The following photographs are of Chairman Jackson's visit to Watts Bar Unit 1 before startup.

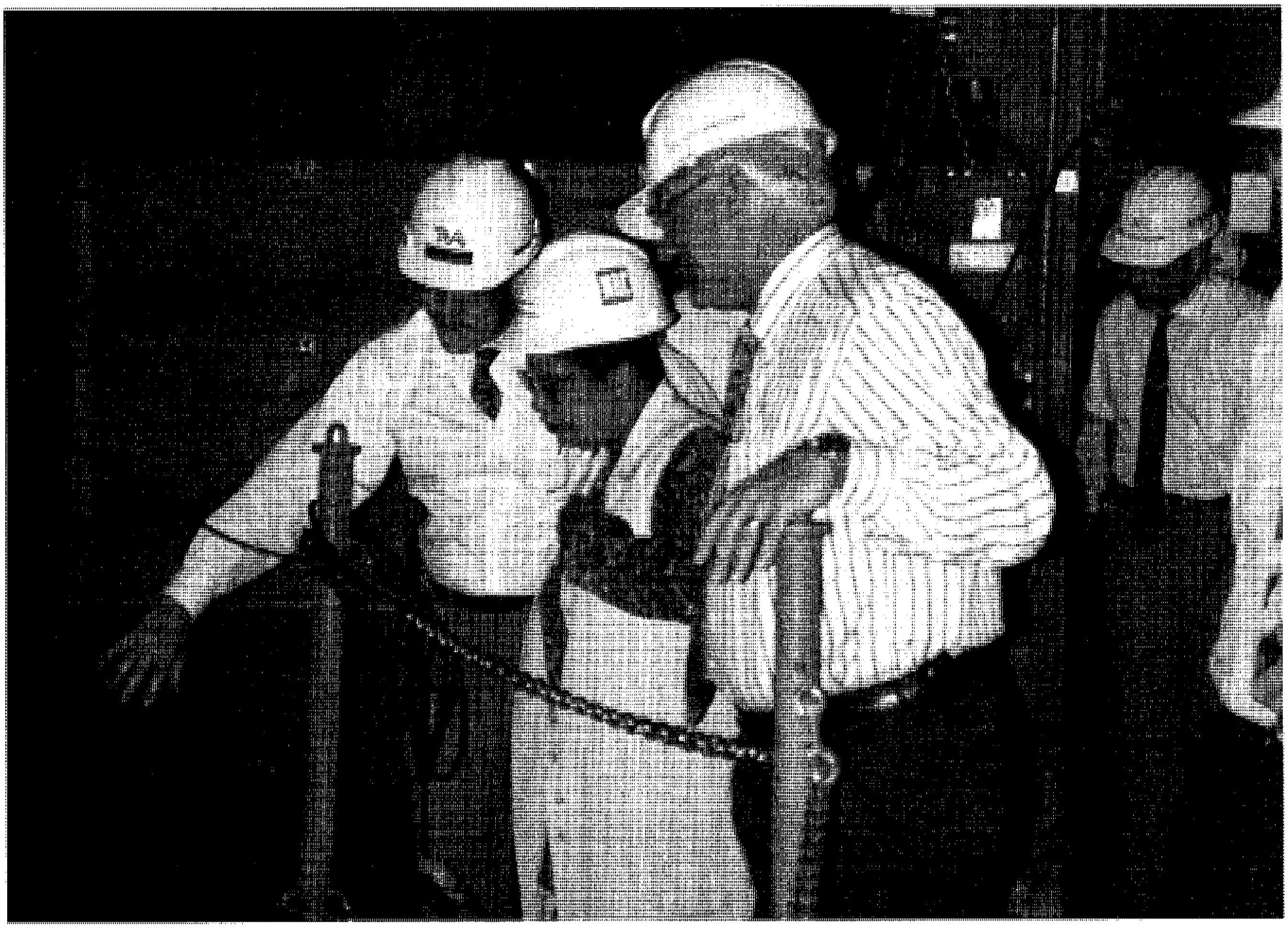
In October 1995, the staff published NUREG–1528, assessing the completion of the construction inspection program at Watts Bar. Later in October, the staff published Supplement 17 to the Watts Bar Safety Evaluation Report (NUREG–0847). Supplement 17 dealt with the history of Watts Bar, and identified the reasons that the NRC could conclude that the plant was now adequately built and ready to operate.

On November 3, 1995, NRC inspection confirmed that TVA had successfully implemented all of the CAPs and SPs. On that same day, TVA certified that Unit 1 was completed, and requested a low-power operating license.

The NRC issued the requested license on November 9, 1995. This license authorized TVA to load fuel and operate Unit 1 up to five percent of rated power. Fuel loading commenced on November 11, 1995, and was completed on November 13, 1995. Initial criticality is targeted for January 1996.

PLANT LICENSE RENEWAL

The U.S. Department of Energy has projected an increase in national demand for electricity of 100,000 megawatts in the next decade. In light of the anticipated demand, the electric utility industry has urged the NRC to expedite its rulemaking and development of regulatory



Chairman Jackson with NRC and TVA officials looking into the reactor cavity at Watts Bar Unit 1 before start up.

guidance to permit timely renewal of operating licenses for existing plants. According to the industry, if the current operating license for a plant is not renewed, the licensee will need a lead time of 10 to 12 years to plan for replacement power alternatives and capital acquisition before the license expires.

Renewing operating licenses for nuclear power plants has long been a top priority for the NRC and the nuclear industry. Within the next 20 years, many commercial nuclear power plants will have reached the standard 40-year term of their operating licenses, a figure adopted by Congress in the Atomic Energy Act of 1954, as amended. The Act permitted the NRC staff to renew operating licenses, but did not set forth a process to be followed.

Rulemaking

In December 1991, the NRC established a process for renewing nuclear power plant operating licenses (10 CFR Part 54). Since publishing the rule, the NRC identified a number of policy issues as a result of pre-implementation activities associated with lead plant reviews and further interaction with the industry. Consequently, the NRC published an amendment to the license renewal rule on May 8, 1995. The revised rule emphasizes managing the effects of aging (rather than managing the aging mechanism); focuses the review on passive, long-lived structures and components; and allows greater credit for existing

Chairman Jackson talking with TVA officials at the remote shutdown panel at Watts Bar Unit 1 before startup.

licensee programs in the license renewal process. Further, the revised rule resolves ambiguities between the rule and the statements of consideration, and establishes a more efficient, stable, and predictable license renewal process.

The NRC is also putting forth environmental initiatives to improve the efficiency of license renewal, in the context of National Environmental Policy Act (NEPA) requirements. The NRC has proposed amendments to the "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" (10 CFR Part 51), and a generic environmental impact statement (GEIS), in support of the proposed amendment. Public comments on the draft GEIS and proposed rule have raised concerns related to NRC policy for treatment of "need for power" and "alternative energy source" issues. In an effort to openly discuss the commenters' concerns and to formulate resolution of these policy issues, the staff conducted three public workshops in February 1994. On July 25, 1994, the staff published a supplement to the rule, which contained the staff's proposal to resolve the policy issues. The staff expects to complete the environmental protection rulemaking in early 1996.

Regulatory Guidance Development

Since publication of the amended license renewal rule, the staff has been preparing implementation guidance for the rule, including development of a draft regulatory guide. By letter dated August 3, 1995, the Nuclear Energy Institute (NEI) informed the NRC of its activities related to developing an industry guideline for implementing the requirements of the amended license renewal rule. The NEI proposed that the NRC staff review the guideline and endorse it in a regulatory guide, rather than preparing its own separate regulatory guide. After carefully considering the benefits of the industry's proposal and performing a cursory review of the draft industry guideline, the staff determined that endorsement of an appropriate industry guideline would be equivalent to an NRC-generated regulatory guide and would meet the requirements of the license renewal rule.

The staff is developing a draft regulatory guide for the format and content of a license renewal application. The draft regulatory guide proposes to endorse an implementation guideline prepared by the Nuclear Energy Institute (NEI) as an acceptable method of implementing the license renewal rule. A notice of availability and request for public comments is scheduled to be published in the *Federal Register* in August 1996 for the draft regulatory guide and NEI guideline. In addition, the staff is also participating in an NEI-sponsored demonstration program that is assessing the effectiveness of guidance contained in the NEI guideline. A workshop is planned for October 1996, and the final regulatory guide and NEI guideline incorporating lessons learned are expected to be issued in final form in August 1997.

The staff also expects to publish a draft standard review plan (SRP) for license renewal. However, the staff will not publish the SRP until it gains experience with implementing the final rule amendment, based on the review of a few license renewal applications.

Industry Activities

Several industry efforts are currently underway to implement the license renewal process and conduct initial reviews for preparing applications. One such activity is a pilot demonstration program to implement portions of the industry guideline. This demonstration will involve a mix of volunteer plants that have participated in developing the industry guidelines, as well as others that have not. The pilot demonstration will be conducted between March and August 1996. The NRC staff is considering onsite audits of the demonstration to obtain information that should assist in the development of other regulatory implementation guidance, such as the inspection program.

The Babcock & Wilcox Owners' Group (B&WOG) submitted a topical report on managing aging effects for reactor coolant system piping. The staff reviewed the report and issued a draft safety evaluation report dated October 18, 1995. The staff will issue a final safety evaluation after the open items are resolved.

Industry owners' groups are continuing to develop topical reports and related documents on managing aging of plant structures and components for renewal. For example, the Westinghouse Owners' Group submitted a topical report on the aging of reactor coolant system supports, the B&WOG submitted a topical report on the pressurizer, and Baltimore Gas and Electric Company (BG&E) submitted an integrated plant assessment methodology it plans to use to meet the license renewal rule. The staff is currently reviewing all of these reports.

IMPROVING THE LICENSING PROCESS

ONGOING REGULATORY IMPROVEMENT INITIATIVES

On September 30, 1993, President Clinton issued Executive Order 12866, "Regulatory Planning and Review," requiring all Federal Government agencies to perform a periodic review of their existing regulations, and to eliminate unnecessary and unproductive requirements. At that time, the NRC already had several initiatives under way to identify and eliminate requirements that were considered to provide only marginal safety benefits. These initiatives have since been consolidated within the "Continuing Program for Regulatory Improvement," which is based on the fundamental principle that all regulatory burdens must be justified, and that the NRC's regulatory process must be efficient.

The Commission's Continuing Program for Regulatory Improvement incorporates three NRC initiatives:

1. the "Marginal to Safety" Program
2. the Regulatory Review Group (RRG) Implementation Plan
3. the Cost Beneficial Licensing Action (CBLA) Program

In 1994, NRR created the RRG/CBLA Program Group to oversee and facilitate the implementation of these initiatives. Since its creation, the RRG/CBLA Program Group has served as a focal point for the NRC staff, industry, and public on issues and initiatives associated with CBLAs. The RRG/CBLA group has not replaced the normal process for reviewing and approving licensee requests. Nonetheless, the RRG/CBLA group has tracked and trended CBLA submittals and approvals, as well as NRC responsiveness related to CBLA activities. The group has also provided general CBLA policy guidance to licensee staffs, and worked with the staff and industry to identify CBLAs with generic implications. In addition, the RRG/CBLA group has focused management attention on implementing the CBLA process within the staff. As a result, processing license amendment requests as CBLAs has become a part of the NRC's normal work planning process. Based on successful implementation or closure of many of the actions under these initiatives during 1994 and 1995, the functions of this group will be folded back into the NRR organization by the end of 1995. However, the NRR staff will continue to ensure resolution of remaining RRG Implementation Plan and Marginal to Safety Program actions, which will be carried out as part of ongoing agency programs.

"Marginal to Safety" Program

Through the "Marginal to Safety" Program, the NRC focuses on petitions for rulemaking and regulatory guidance identified by industry that might be costly to implement and only marginally effective in enhancing safety. The staff recognizes that the industry is in the best position to identify which regulations impose a heavy economic burden with little commensurate safety benefit, and the methods used to meet existing requirements that are most cost-effective. To expedite processing of petitions that include a comprehensive regulatory analysis of the basis for the petitioned rulemaking, the NRC revised 10 CFR 2.802, "Petition for Rulemaking," and published the revision for public comment on March 28, 1995. Public comments generally supported the concept behind the proposed revision, but indicated that rulemaking was not the most appropriate regulatory vehicle for expediting the NRC's handling of petitions for rulemaking. Consequently, the staff reevaluated its approach and determined that alternative regulatory vehicles could be used to provide guidance on the scope and level of detail of information that should be submitted with petitions for rulemaking so that they can receive expeditious processing.

Regulatory Review Group Implementation Plan

The NRC's Regulatory Review Group (RRG) Implementation Plan, issued in early 1994, resulted from a review by senior-level staff in the RRG of selected power reactor regulations and related processes, programs, and practices. The RRG recommended specialized areas within which the NRC's regulations might be changed, in order to reduce the regulatory burden with little or no adverse safety impact. The implementation plan included 71 recommendations covering a wide spectrum of issues and topics related to power reactor licensing activities. In its December 1995 report to the Commission, the staff identified 42 recommendations that have been implemented or closed. Work on the 29 remaining recommendations has progressed to a point where they can be resolved under other ongoing programs and no longer require special attention by the CBLA group.

Cost Beneficial Licensing Actions

The Cost Beneficial Licensing Action (CBLA) program was created to increase the staff's receptiveness to licensee requests that would reduce or eliminate license requirements that have an incrementally small effect on safety, but carry a heavy economic burden. This new receptiveness differs from the past when the NRC staff gave the lowest priority to requests for approval of license amendments that might have marginal safety significance, but might result in large cost savings. After a successful pilot program in mid-1993, the program was made available to all licensees in 1994.

On February 23, 1995, the staff issued Administrative Letter 95–02, "Cost Beneficial Licensing Actions," to all licensees to provide additional information on the CBLA program, including questions and answers based on past meetings between licensees and the staff. The CBLA group conducted a public workshop on April 13, 1995, and has also participated in a number of industry forums to further communicate the advantages of the program. Through December 5, 1995, the staff received 271 CBLA submittals, and approved 166 submittals, resulting in an estimated lifetime savings (based on industry estimates) of approximately $588 million.

STANDARDIZATION OF REACTOR DESIGN

The Commission strongly endorses regulatory policies that encourage the industry to pursue standardization of next-generation reactor designs. Standard designs are expected to benefit public health and safety by (1) concentrating industry resources on common approaches to solving design problems that have wide application, (2) stimulating adoption of sound construction practices and quality assurance, (3) fostering constantly improving maintenance and operating procedures, and (4) permitting a more effective licensing and inspection process. The NRC plans to achieve these benefits with the design certification process. Together, design certification, early site permits, and combined licenses constitute the major provisions of the new licensing process in 10 CFR Part 52. The NRC is currently preparing proposed standard design certification rules for two light-water reactor (LWR) designs.

NEXT-GENERATION REACTOR DESIGNS

The staff is currently reviewing five applications for design certification under Subpart B of 10 CFR Part 52. Two of these applications are for the evolutionary LWR designs known as the advanced boiling water reactor (ABWR) and System 80+, two are for passive LWR designs known as the simplified boiling water reactor (SBWR) and AP600, and one is for a heavy-water reactor design known as CANDU 3. The status of these reviews, is as follows.

ABWR

The staff issued its final safety evaluation report (NUREG–1503) in July 1994, followed by the final design approval on July 13, 1994. The Commission then issued a notice of proposed rulemaking for certification of the ABWR design on April 7, 1995. The staff will address public comments, and plans to issue a final rulemaking by late 1996.

System 80+

The staff issued the final safety evaluation report (NUREG–1462) and final design approval in July 1994. The Commission then issued a notice of proposed rulemaking for certification of the Combustion Engineering (CE) System 80+ standard plant design on April 7, 1995. The staff will address public comments, and plans to issue a final rulemaking by late 1996.

SBWR

On August 27, 1992, GE Nuclear Energy submitted an application for final approval and certification of its SBWR design. GE subsequently furnished supplements to its application on February 25, February 28, and May 7, 1993. The SBWR is a 600-megawatt (electric) advanced reactor design that employs passive features (such as gravity flow and natural convection) to perform essential safety functions. The staff docketed GE's application for design certification in May 1993. However, problems in resolving staff concerns led GE to reassess its SBWR testing and analysis program, and to request a realignment of the SBWR design certification. In response, the staff suspended all review activities not related either to testing and analysis, or to the TRACG thermal-hydraulic code. In November 1994, the NRC issued a DSER on the GE's SBWR Test and Analysis Program Description (TAPD). GE-sponsored testing is expected to continue into early 1996. Following GE's announcement to redirect the focus of its SBWR programs from plants of the 670 MWe size to plants of 1,000 MWe or larger, the staff's efforts have been directed to orderly closure of the SBWR review. These activities should be completed toward the latter portion of 1996.

AP600

In June 1992, Westinghouse Electric Corporation submitted an application for final approval and certification of its AP600 design. The AP600 is a 600-megawatt (electric) pressurized-water reactor incorporating passive safety systems and features. On November 30, 1994, the staff issued a draft safety evaluation report (DSER) identifying 1145 open items, 63 confirmatory items, and 165 combined operating license action items. To date, the staff has also issued approximately 2800 requests for additional information (RAIs), as well as follow-on questions in support of its evaluation of the application. Westinghouse has responded to most of the questions raised by the staff. In support of the passive design, Westinghouse established an AP600 test program that includes separate-effects (SE) experiments on the passive approach, as well as two integral systems test (IST) programs. See "Testing for Passive Designs," later in this chapter. At the request of Westinghouse, the staff reprioritized portions of the AP600 review. As a result, Westinghouse and the staff are in the process of reevaluating the review schedule for the AP600; however, the staff expects to issue a DSER supplement in 1996 to report the results of its review of the Westinghouse passive design testing program.

PRE-APPLICATION REVIEW OF THE MHTGR DESIGN

During FY 95, the staff continued its pre-application review of the modular high-temperature gas-cooled reactor (MHTGR) design. Expeditious completion of the review is consistent with the Commission's "Statement of Policy for the Regulation of Advanced Nuclear Power Plants," which called for early Commission review and interaction with potential applicants for the licensing of advanced designs.

CANDU 3

The CANDU 3 is a 450-megawatt (electric), natural uranium-fueled, heavy-water-moderated and -cooled, pressure tube reactor developed by Atomic Energy of Canada, Ltd. (AECL). In its letter of September 30, 1994, AECL Technologies (AECLT) applied for design certification under 10 CFR Part 52, and submitted the safety analysis report for the CANDU 3 design. The staff completed the certification acceptance review for the CANDU 3 design, and notified AECLT of the review findings on December 15, 1994. By letter dated March 9, 1995, AECL requested that the NRC discontinue all work on CANDU 3 because of the anticipated high cost of NRC's review and the lack of any near-term market in the United States.

MHTGR

DOE submitted the MHTGR design to the NRC in 1986. The design is a helium-cooled, graphite-moderated thermal reactor with multicoated fuel particles, which uses fuel and core similar to those used in Fort St. Vrain. The NRC issued a draft PSER for the MHTGR (NUREG-1338) in March 1989. Since then, the NRC conducted meetings with DOE, and issued RAIs on the design. DOE responded to the RAIs, and submitted three amendments to the preliminary safety information document for the MHTGR. The staff is scheduled to complete the final PSER in 1996.

TESTING FOR PASSIVE DESIGNS

The requirements for certification of advanced reactor designs, under 10 CFR Part 52.47(b)(2), include demonstration that the reliability of each design safety feature has been confirmed through analysis, testing, experience, or a combination thereof, and that sufficient data exist to confirm the accuracy of the analytical tools used in safety analyses. Both the AP600 and the SBWR designs rely on passive systems for reactor safety. Accordingly, the vendors for both designs have developed testing programs to provide data to satisfy the requirements of 10 CFR Part 52.47(b)(2). The NRC is monitoring the vendors' test programs using the procedure described in SECY-91-273, and is reviewing these test programs to determine whether they will yield the necessary data. The staff is also examining the experimental data, as it becomes available, to ensure that the codes are adequate.

Westinghouse's AP600 test program includes separate-effects (SE) experiments on several of the key systems and components involved in the passive safety approach. These tests examine the performance of the passive residual heat removal (PRHR) system, the core makeup tanks (CMTs), the automatic depressurization system (ADS), and the passive containment cooling system (PCCS). In addition, Westinghouse has conducted two integral systems test (IST) programs. For the first program, a low-pressure IST facility was constructed at Oregon State University to study the behavior and interactions of the safety systems and important nonsafety systems at low pressures corresponding to the later stages of several accident sequences. For the second program, a high-pressure, full-height IST facility was built at the Societas' Informazione Esperienze Termoidrauliche (SIET) laboratories in Piacenza, Italy, to examine the behavior of the passive safety systems during the high-pressure phase of accidents. Testing in both integral facilities was completed in 1994. The staff is evaluating the data from all of Westinghouse's design certification test programs.

GE Nuclear Energy developed a broad testing program to support SBWR design certification. GE has completed much of the planned testing, including SE experiments on the unique squib-type, explosive-actuated depressurization valves used in the SBWR ADS, and SE heat transfer tests related to the operation of the SBWR PCCS. Tests related to operation of the gravity-driven cooling system have been run in the GIST facility at GE's San Jose site, and an IST program has been carried out at Toshiba's GIRAFFE facility in Japan to study the behavior of the PCCS. Further SE tests are in progress in the new PANTHERS facility at SIET, and the new PANDA integral test facility at the Paul Scherrer Institute (PSI) in Wuerenlingen, Switzerland. The staff has also identified several other tests that must be included in the GE test program, and testing activities are scheduled to be completed by early 1996. The staff is actively evaluating the GE test data.

The NRC is conducting confirmatory research for both the AP600 and SBWR designs. The research will provide valuable data to aid in validating the NRC's analytical codes used to audit the vendors' calculations, and will provide experimental knowledge to improve the staff's understanding of the unique behavior of the safety systems designed for the passive ALWR. (The need and planning for confirmatory research are discussed in SECY-92-037 and SECY-92-219 for the AP600, and in SECY-92-211 for the SBWR.) AP600-related testing began in early 1994 in the modified ROSA-V/LSFT facility in Japan, and is providing insights into passive system behavior. The NRC will perform SBWR confirmatory testing at PUMA, a reduced-height, low-pressure integral systems SBWR loop, located at Purdue University.

EARLY SITE PERMITS

On April 18, 1989, the Commission issued, in 10 CFR Part 52, the regulatory framework for obtaining early resolution of site-related issues. In 1995, the NRC continued upgrading its capabilities for managing and conducting environmental and site-licensing reviews, developing regulatory guidance, and accessing and analyzing requisite geographical and land use information.

IMPROVED STANDARD TECHNICAL SPECIFICATIONS

The NRC continues to place the highest priority on license amendment applications related to full conversion to the improved Standard Technical Specifications (STS). During 1995, the NRC issued license amendments implementing the improved STS for an additional six units at four plant sites.

The NRC is presently reviewing license amendment applications to implement the improved STS for another five units.

As of November 1995, about 70 percent of all commercial nuclear units have converted, are converting, or plan to convert to the improved STS. An additional 10 percent of the units are undecided about converting to the improved STS, and about 20 percent of the units are not presently planning to convert. Compared to those of a year ago, these estimates represent a substantial shift toward the adoption of the improved STS in the commercial nuclear power industry. As the process required to complete a conversion to the improved STS continues to become more efficient, the NRC anticipates that additional licensees will decide to convert to the improved STS.

In August 1995, an amendment to the regulations (in 10 CFR 50.36) pertaining to the content of the technical specifications became final. Specifically, the amendment codifies the criteria for determining the content of technical specifications that were first published in the July 1993 final policy statement on technical specifications. These criteria were developed in recognition of the need to concentrate the technical specifications on those requirements of immediate importance to public health and safety. Under the rule change, licensees may voluntarily propose to relocate existing technical specification requirements from the facility license to the appropriate licensee-controlled program or document, when the requirements do not meet the criteria for inclusion in the technical specifications.

The NRC places a high priority on improving the existing technical specifications, using the process codified by the change to 10 CFR Part 50.36 and the process of adopting "line item" generic STS improvements. In the latter process, licensees may voluntarily request license amendments to selectively adopt improvements to the STS as "line item" changes to their existing licenses. However, the impact of future resource reductions may eventually limit the NRC's ability to focus on "line item" amendments, which are less efficient than full conversion as a way to improve technical specifications.

The NRC continues to work with the Nuclear Energy Institute standing task force established to coordinate industry initiatives for improvements to technical specifications and related license amendment practices. In April 1995, as a result of NRC and industry efforts, revisions to the improved STS for each reactor design were issued. These revisions incorporate the numerous generic improvements made in various specifications since the original improved STS were issued in September 1992. Future revisions to the improved STS will be issued as additional enhancements evolve and performance-based regulatory reforms are instituted.

INSPECTION PROGRAMS

A basic element in the NRC reactor regulation program is the inspection of licensed reactor facilities to ensure reactor safety by confirming that the operations comply with the Regulations, provisions of the license, and to look for other conditions that have safety implications serious enough to warrant corrective action.

NRR is responsible for developing, maintaining and assessing the effectiveness of the reactor inspection program, which applies to all applicant and licensee activity carried out in connection with the construction and operation of nuclear facilities. Most of the inspection effort is dedicated to operations at the 109 plants where operating licenses are in effect (as of September 30, 1995), with added coverage of the five facilities with construction permits.

The NRR 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 ensure that the licensee's systems and techniques for conducting internal inspections and maintaining control 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 inspection staff seeks through direct observation and verification of licensee activities determines whether the facility is being operated safely, whether the licensee's program is effective, and whether regulatory requirements are being satisfied.

The NRC conducts a program of routine inspections at each reactor licensee. This includes a "minimum" program conducted at every site (core), plus initiative inspections based on licensee performance, and reactive inspections as required. Reactive inspections are performed to determine the root cause of safety-related events or conditions; evaluate the licensee management's response to it, including action to prevent recurrence; and decide whether a similar problem could occur at other facilities. The NRC, through this inspection program, is committed to dealing aggressively with unsafe or potentially unsafe conditions occurring at individual plant sites.

The four NRC Regional Offices conduct most of the NRC inspection programs, while the NRC Headquarters directly conducts only a limited number. NRR is responsible for developing inspection policies and procedures and for monitoring and assessing the effectiveness and uniformity of the programs carried out by the NRC Headquarters and Regional Offices.

REACTOR INSPECTION PROGRAM

The operating 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 major 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 "walk-down" 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 resident inspectors are the primary onsite evaluators with respect to licensee event reports, events and incidents, and other general inspections of licensee activities.

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 program during FY 95, based on knowledge gained from experience with the current program.

The inspection program comprises the following three elements:

(1) *Core Inspections.* As "regular" inspections conducted at every plant, core inspections provide a minimum examination of licensee activities in order to confirm the adequacy of licensee performance and identify potential problems in the early stages. Core inspections are performed by resident and region-based inspectors.

(2) *Plant-Specific Regional Initiative Inspections.* This program element consists of three parts:

   (a) *Regional Initiative Inspections* address specific areas decided by several factors, particularly the results of other inspections, licensee performance, and the results of interactions with the licensee.

   (b) *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.

   (c) *Team Inspections* provide an independent, indepth, and balanced 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. Team members include NRR personnel, resident and region-based inspectors, and contractors.

(3) *Generic Safety Issue Inspections.* This program element consists of two parts:

(a) *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.

(b) *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.

SPECIAL TEAM INSPECTIONS

During FY 95, NRC headquarters and regional staffs continued to perform special team inspections. Such inspections usually involve a team of 4 to 10 individuals, with several engineering disciplines represented, 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 on to do so in an emergency, plant systems and personnel will perform their safety functions as set forth in the safety analysis report.

Headquarters staff members develop the method for each new type of team inspection, test the method during a limited number of pilot inspections, and incorporates the developed inspection methodology into the NRC Inspection Manual. Responsibility for most of the special team inspections is assigned to the Regional Offices. Headquarters may also lead a team inspection in some circumstances. Examples of headquarters-led special team inspections during 1995 were the engineering inspection at South Texas, the configuration management inspection at Washington Nuclear Plant Unit 2 (WNP-2), and the maintenance and engineering inspection at Watts Bar. Headquarters also led two operational readiness assessment team (ORAT) inspections at Watts Bar and one at Millstone. An ORAT is an independent review of licensee readiness to begin initial plant operation or to resume plant operation after an extended outage.

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 1991, the staff developed a team inspection, known as the Service Water System Operational Performance Inspection (SWSOPI), which addressed a new area of concern to the NRC. The staff conducted pilot SWSOPIs in each region to test the methodology and scope of each. In accordance with TI 2515/118, Revision 1, the NRC proceeded with the SWSOPI, as a "generic safety issue" inspection, at sites licensed before 1979 and at other sites having service water system problems, or more general maintenance, engineering, or technical support problems. As a result of a SWSOPI performance effectiveness review in 1995, the staff eliminated the licensing date criterion for selecting plants for SWSOPIs. In the future, all plants will be selected based on service water or more general problems. The staff issued a Commission Paper (SECY-95-041, dated February 17, 1995) and TI 2515/118, Revision 2, to effect these changes. At the end of FY 95, the NRC had completed 37 SWSOPIs, including the pilot inspections. The NRC maintains an electronic database of SWSOPI findings. In addition, IN 94-03 discusses deficiencies and weaknesses identified during the initial seven SWSOPIs.

New Initiatives

In 1994 and 1995, the NRC developed a new process to improve the periodic, long-term integration of objective information (e.g., inspection reports, licensee self-assessments, 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, and it 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, issued the final inspection procedure (IP 93808), and began planning IPAPs to be conducted at 16 plants during FY 96.

Inspection Procedure 40501, "Licensee Self-Assessments Related to Team Inspections," allows reduced NRC inspections at facilities that demonstrate good performance over time. Under this pilot effort, the NRC would evaluate a licensee's self-assessment effort as an alternative to a full-scope NRC "area-of-emphasis" inspection. The NRC would sample areas covered by a licensee's self-assessment, as well as significant areas not covered. The goals of this approach are to more effectively apportion NRC inspection resources, and to reduce the impact of NRC inspection activities on licensee operations (e.g., licensees are required to respond to a smaller NRC team). At the end of FY 95, licensees had either completed or initiated 27 SWSOPI self-assessments, and the staff had completed and overviewed most self-assessments. NRC experience has shown that reduced-scope SWSOPIs use about 25 percent of the direct inspection resources of a full-scope SWSOPI. Based on the staff's positive impressions of licensee self-assessments through the end of FY 95, the NRC has expanded IP 40501 to cover all team inspections.

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 nuclear power plants, 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 95 addressed public allegations and reports from industrial organizations. According to the provisions of 10 CFR Part 21, licensees and vendors are required to report the NRC problems and defects in safety-related equipment, materials, and services. In FY 95, the vendor inspection staff had the responsibility for screening, tracking, and ensuring the closeout of approximately 80 notifications required in 10 CFR Part 21. The staff determined the validity, extent, and safety significance of each reported and alleged deficiency, and determined the need for inspection. Further, as appropriate, the staff ensured that licensees were apprised of potential problems 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 corresponded with vendors and licensees, both orally and in writing, to explain the NRC's position on specific interpretations and applications of 10 CFR Part 21 and other Federal regulations.

In FY 95, the NRC vendor inspection staff conducted 34 vendor inspections, 4 inspections of licensees, and 3 information gathering trips to vendors. Of the inspections, 13 involved allegations. The vendor inspections covered those who provide commercial grade dedication or equipment qualification services, as well as those who manufacture or supply instrumentation and control systems and components, switchgear and distribution equipment, transmitters, switches, fasteners, pumps, valves, digital systems, fire barrier material and testing, rupture discs, or snubbers. Two major inspection activities were undertaken during the year. The first involved three large team inspections of fuel manufacturers, including sub-tier material suppliers. The second was the continuing involvement of the inspection staff in the review and inspection of the GE and Westinghouse advanced water reactor quality assurance program.

As a result of inspection findings and other information in the vendor program area, the NRC issued 13 information notices informing the nuclear industry of problems. These information notices dealt with concerns involving circuit breakers, including contaminated lubricants, problems with contact blocks, and material lodged in the trip mechanism; Thermal lag fire barriers, including test results and legal actions; fasteners; pressure transmitters; problems with relay latching mechanisms; failure of pump shafts; air regulator problems with pilot-operated relief valves (PORVs); inadequate heat treatment of material; and degradation of scram solenoid pilot valve pressure and exhaust diaphragms.

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

PERFORMANCE EVALUATION

The NRC evaluates the performance of nuclear power plant 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 process. Senior NRC regional managers assess licensees' long-term performance through the systematic assessment of licensee performance (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.

SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE

The SALP program is a principal and regular method for assessing licensee safety performance. Under the SALP program, the performance of each licensee with a nuclear power facility in operation or under construction 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 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, and to direct NRC resources to, 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, and licensing issues for the previous 1 to 2 years. Also important are evaluations by resident and region-based inspectors, licensing project managers, and senior managers—all of whom are familiar with the facility's performance. New data are not necessarily generated in conducting a SALP assessment, which consists of performance evaluations in specific functional areas.

In 1995, the Commission solicited feedback from licensees and the public on the effectiveness of changes made to the program in 1993. The NRC is currently reviewing the responses, and the results of the feedback will be issued in FY 96.

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 projections 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.

Through selective examinations, the NRC inspection program ensures that licensees meet their responsibilities. 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. Through the inspection program, the NRC seeks to independently verify the effectiveness of the licensee's implementation of its programs, to ensure that operations are being carried out safely and in accordance with applicable NRC requirements. 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, quality material, conformance to approved design, and a well-formulated and well-implemented quality assurance program. As construction nears completion, pre-operational testing begins in order 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 staff is developing a new construction inspection program for reactors to be built under combined construction and operating licenses issued under 10 CFR Part 52. The new inspection program will continue to verify the safety aspects of a plant's construction and testing, as previously described for the current program, and will allow for more systematic inspection planning and documentation of inspection results. The new construction inspection program will be structured to verify a licensee's satisfactory completion of the inspections, tests, analyses, and acceptance criteria (ITAAC) as specified in the combined license and required by 10 CFR Part 52.

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 consists of three major elements:

- core inspections—the minimum required at all plants
- plant-specific regional initiative inspections—focus on plant performance
- generic safety issues inspections—focus on a safety significant problem of a generic nature

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 nuclear power plants 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 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.

During FY 95, the NRC issued 44 SALP reports. Among the 44 reports, 7 plant sites (with a total of 11 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 6 plant sites (with 10 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.

HUMAN FACTORS

Human performance is a crucial element of nuclear power plant safety. More than half of the incidents reported by commercial nuclear power plant 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 95, the Human Factors Assessment Branch (HFAB) staff participated in 1 augmented inspection team (AIT), 3 operational readiness assessment team (ORAT) inspections, 2 restart assessment team inspections (RATIs), and 14 special inspections at operating plants. The objectives in each of these 20 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 often used in such inspections. The NRC developed HPIP specifically to consider issues related to human performance—the design of human-systems interfaces, plant procedures, training, and communications, as well as the effects of supervision, management, and organization.

The HFAB staff developed the Human Factors Information System (HFIS) to evaluate, track, trend, and manage various types of information on human performance at nuclear power plants. HFIS comprises a database of six modules for storing and analyzing data on human performance. Specifically, the modules include the Detailed Control Room Design Review (DCRDR) and Safety Parameter Display System (SPDS), Licensee Event Reports (LERs), Emergency Operating Procedures (EOPs), training, inspection reports, and HPIP. During FY 95, the staff continued to use HFIS information to determine the need for, and focus of, plant-specific and generic inspections and other reviews, such as event investigations, relating to human performance. In addition, HFIS information is used to monitor plant-specific and national trends of issues related to human performance. LER information in HFIS is used to develop insights on the contribution of human performance to operational events. Inspection report information from HFIS is also used to gain insights into human performance that is not necessarily related to significant operational events. During FY 95, several improvements were made to HFIS, and the HFIS database was made available agency-wide in November 1995.

One of the most important ways the staff evaluates the effectiveness of licensee training efforts is by monitoring the Institute of Nuclear Power Operations (INPO) training program accreditation process. During FY 95, NRC personnel observed National Nuclear Accrediting Board meetings, during which utility training programs are evaluated for initial accreditation or accreditation renewal. NRC staff members also observed two INPO accreditation team site visits. 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 95, the staff conducted inspections of accredited training programs at two sites. On June 13, 1995, the staff updated Inspection Procedure 41500, "Training and Qualification Effectiveness," to include training inspection selection criteria.

During FY 95, the staff continued to perform follow-up inspections of emergency operating procedures (EOPs). The objective of the region-led EOP inspections was to follow up on items previously identified by event investigations or previous EOP inspections. During FY 95, the staff supported all four regions by providing onsite human factors specialists and systems experts for 10 EOP inspections. During FY 95, the staff revised Inspection Procedure 42700, "Plant Procedures," to focus the inspection effort on areas where procedure problems have been identified. In particular, the inspection procedure was revised to provide additional guidance on inspecting the usability of the procedures by assessing the degree to which accepted human factors principles have been incorporated.

On October 10, 1995, the staff issued Information Notice (IN) 95-48, "Results of Shift Staffing Study," to inform licensees of the results of the NRC study that addressed the adequacy of minimum shift staffing levels at nuclear power plants. The IN gave licensees several insights into problems that could result from inadequate controls to ensure that shift staffing is sufficient to accomplish all functions required by an event.

In July 1994, the staff published the "Human Factors Engineering Program Review Model," NUREG-0711, 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 95, the staff completed two supplements to NUREG-0711, supporting the program review model in the areas of human factors engineering insights based upon operating experience and review criteria for group-view displays.

Human Factors Coordination Committee

A task force established by the Deputy Executive Director for Nuclear Reactor Regulation, Regional Operations and Research, recommended the formation of an interoffice committee to coordinate the agency's human factors programs. As a result, the Human Factors Coordination Committee, was established with representatives from NRR, AEOD, RES, NMSS, and the regions.

The overall responsibilities of this committee are to coordinate human factors program review activities; research programs and integration of findings; operational performance reviews and followup activities; and the collection, evaluation, compilation, and dissemination of human performance information.

As required by its charter, the committee began by developing a Human Performance Program Plan that reflects the goals, objectives, and activities associated with the agency's human factors programs. The committee issued this program plan in August 1995.

Also in accordance with its charter, and to enhance communication and coordination among the offices, the committee will meet approximately every 6 months in order to monitor agency human performance activities and update the program plan. The committee will also review new developments in the area of human factors, both within the nuclear arena and in other related fields. In addition, the committee will review trends of human performance data identified in various information systems, and will communicate related initiatives and activities to each of the involved offices.

INSTRUMENTATION AND CONTROL SYSTEM UPGRADES

Through the years, the industry became aware that some earlier analog electronic instrumentation and control (I&C) systems are subject to age-related degradation, and it has become increasingly difficult to obtain qualified replacement components for those systems. Licensees have also come to desire enhanced features such as automatic self-test and diagnostics, greater flexibility, and increased data availability. Together, these factors have prompted some operating reactor licensees to replace existing analog systems with digital systems.

The Nuclear Management and Resources Council (NUMARC) and the Electric Power Research Institute (EPRI) took the initiative to develop guidance for implementing digital system modifications. Together, NUMARC and EPRI wrote a topical report to address the issue of evaluating such upgrades in accordance with the requirements of 10 CFR Part 50.59. The staff commented on this report while it was in draft form, and the resulting final report, NUMARC/EPRI Topical Report TR-102348, "Guideline on Licensing Digital Upgrades," dated December 1993, reflects a coordinated effort between industry and the staff.

The staff reviewed the final report and determined that, with certain clarifications, it can be used as guidance by licensees for both properly designing analog-to-digital replacements and making proper unreviewed safety question determinations under 10 CFR Part 50.59. The staff issued the related draft generic letter for public comment in the *Federal Register* on October 18, 1994. After reviewing the public comments, the staff issued NRC Generic Letter (GL) 95-02, "Use of NUMARC/EPRI Report TR-102348, 'Guideline on Licensing Digital Upgrades,' In Determining the Acceptability of Performing Analog-to-Digital Replacements under 10 CFR 50.59," on April 26, 1995, endorsing report TR-102348 with clarifications.

Specifically, the staff included in GL 95-02 two clarifications to TR-102348. The first concerns the system level to be used when licensees make the 10 CFR Part 50.59 unreviewed safety question determination, since 10 CFR Part 50.59 does not use this term. The staff stated that the system level to be considered in this regard should be the digital system being installed. The staff believed that this clarification was necessary because the EPRI report used the term "system" both to refer to the digital system being installed, and to the larger trip or fluid system of which the digital system is a part. This led to the possibility that the unreviewed safety question evaluation would focus on the entire fluid system, rather than the system being changed. The second clarification concerned the use of engineering judgment when making a 10 CFR Part 50.59 unreviewed safety question evaluation. Since this judgment is not readily quantifiable, such judgment may be difficult to duplicate and understand at a later time. Therefore, the staff stated that the basis for the engineering judgment and the logic used in the determination should be documented to the extent practicable.

The intent of the report and the staff was not to predispose the outcome of the 10 CFR Part 50.59 process for determining whether an unreviewed safety question exists. Rather, the intent was to provide a consistent process that will assist licensees in reaching a proper conclusion regarding the existence of an unreviewed safety question when undertaking a digital system replacement. The introduction to TR-102348 states that the guidance is supplemental to and consistent with that provided in NSAC-125, "Guidelines for 10 CFR 50.59 Safety Evaluations." GL 95-02 reminded licensees that NSAC-125 has not been endorsed by the staff; therefore, any use of those guidelines is advisory only, and nothing in NSAC-125 should be construed as a substitute for the requirements of 10 CFR Part 50.59. The actual determination of whether or not an unreviewed safety question exists must be made in accordance with 10 CFR Part 50.59. The generic letter also cautioned licensees that if while making the 10 CFR Part 50.59 unreviewed safety question determination there is uncertainty about whether the probability or consequences of an accident may increase, or whether the possibility of a different type of accident or malfunction may be created, the uncertainty should lead the licensee to conclude that the probability or consequences may increase or a new type of malfunction may be created, and therefore, an unreviewed safety question is involved.

The staff is confident that issuance of GL 95-02 created a consistent regulatory basis upon which licensees may proceed to implement digital I&C system upgrades. The staff will continue to inspect digital modifications, including the accompanying 10 CFR Part 50.59 evaluations. Lessons learned from the staff inspections and from implementing the guidelines in TR-102348 will assist in maintaining a consistent approach to digital I&C system modifications in accordance with 10 CFR 50.59.

MAINTENANCE

On July 10, 1991, the Commission published in the *Federal Register* (56 FR 31306) a new maintenance rule 10 CFR Part 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." This rule takes effect on July 10, 1996, and will require 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.

During the period from September 1994 to March 1995, the NRC staff performed a series of nine pilot site visits to ensure the adequacy of a draft version of inspection procedure (IP) 62706, which will be used to verify implementation of the rule. These pilot visits were performed at sites that volunteered to have the staff review their maintenance rule implementation before the effective date of the rule. The results of these site visits were documented in NUREG-1526, "Lessons Learned from Early Implementation of the Maintenance Rule at Nine Nuclear Power Plants." On June 27, 1995, the staff held a public workshop in St. Louis, Missouri, to review the lessons learned from the pilot site visits. On July 17, 1995, the staff issued a Commission Paper, SECY-95-179, to give the Commission a status report on the recent and planned maintenance rule activities. On August 31, 1995, the staff issued the final version of IP 62706, which incorporated appropriate comments and suggestions received from the public and industry representatives.

Beginning on July 10, 1996, the staff will perform baseline inspections of each licensee's implementation of the maintenance rule. These inspections will be conducted by resident and region-based inspectors, and will be completed within two years. To ensure uniform implementation, NRR maintenance section staff will participate in these inspections, and will provide training to the resident and region-based inspectors. This training will be completed before the rule takes effect on July 10, 1996.

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 Headquarters is responsible 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 nuclear power plant, 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 operator licensing examinations at nonpower reactors are similar to those at power reactors, with two major exceptions. Specifically, 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 95, the NRC administered approximately 500 site-specific initial licensing examinations to RO and SRO applicants at power and nonpower reactor facilities. In addition, the NRC administered approximately 325 GFEs to prospective license applicants at power reactor facilities.

During FY 95, the NRC also evaluated the licensed operator requalification programs at approximately 60 power reactor facilities to verify capacity of the programs to ensure the continued competence of their individual licensed operators. All of the programs were evaluated using the process described in Inspection Procedure (IP) 71001, "Licensed Operator Requalification Program Evaluation." The NRC uses this 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 95.

On August 14, 1991, the NRC amended 10 CFR Part 55 to make the licensee's fitness-for-duty requirements a condition of each operator's license. Through September 1995, the NRC received 41 reports of licensed individuals exceeding their facility licensee's cutoff levels for drugs or alcohol. One additional operator at a non-power facility voluntarily sought treatment for alcohol abuse.

The NRC is continuing to monitor the performance of the utilities' certified and approved simulation facilities to ensure that they remain acceptable for conducting operating tests in accordance with 10 CFR Part 55. In observing the conduct of NRC licensing examinations and requalification inspections, and in evaluating licensees' quadrennial simulator performance test reports through September 1995, the staff did not identify any deficiencies that would result in invalid operating tests.

In continuing to improve the operator licensing program during FY 95, the NRC staff implemented or is considering a number of initiatives that will enhance the initial licensing and requalification examination processes:

(1) The NRC is considering a change that will give licensees the option to prepare draft written examinations and operating tests for review and administration by the NRC. This proposed change is consistent with Administration initiatives and the NRC's ongoing efforts to streamline the functions of the Federal Government, and to accommodate anticipated resource reductions including the elimination of contractor support in the operator licensing area.

    From October 1995 through March 1996, the staff will conduct a voluntary pilot program to evaluate the effectiveness of the proposed examination process; 21 facility licensees are expected to participate. These 2 licensees will prepare the pilot examinations in accordance with the existing procedures in NUREG-1021, "Operator Licensing Examiner Standards," with supplemental instructions provided by NRR. 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, and they will ensure that changes are made (as necessary) to bring the examinations into conformance. NRC examiners will also continue to administer and grade the operating tests, and they will review the written examinations after they are graded by the facility licensee. In addition, the NRC will continue to issue or deny operator licenses based upon the qualifications and competence of the license applicants.

    Before formally implementing the revised process in the next revision of NUREG-1021, NRR will evaluate the results of the pilot examinations, refine the examination procedures, solicit public comments, and obtain Commission approval.

(2) The NRC issued Revision 1 of the "Knowledge and Abilities Catalog for Nuclear Power Plant Operators" for both pressurized water reactors and boiling water reactors (NUREG-1122 and NUREG-1123), which were originally published in 1985 and 1986, respectively. The revised catalogs incorporate evolutionary changes in licensed operators' tasks and the operator licensing program.

(3) In an effort to conserve resources, the NRC changed the frequency of the requalification program inspections (IP 71001) from once per SALP cycle to once every 24 months (i.e., the maximum requalification cycle permitted by 10 CFR Part 55). This change is not expected to have a significant effect on the staff's ability to oversee the facility licensees' requalification programs.

PLANT PERFORMANCE REVIEWS

The Plant Performance Review (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 PPRs are used to adjust a region's plant inspection plan (increasing or decreasing the number and scope of inspections), and to distribute inspection resources among the plants over the upcoming 6 months. The PPRs also provide a primary source of input to the senior management meeting (SMM) process, described below.

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. This information includes insights regarding the licensee's ability to identify, resolve, and prevent issues that degrade the quality of plant safety. Following each PPR, the staff issues to the licensee a revised master inspection plan, reflecting any 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.

SENIOR MANAGEMENT MEETINGS

The SMM process is a semiannual review and integration of the agency's observations and findings regarding nuclear reactors, which culminates in a meeting of senior NRC managers during which operating nuclear power plant 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. Since the first SMM was held in 1986, the scope of the meetings has been expanded to include major fuel facilities and materials licensees, nuclear power plants that have demonstrated superior performance, and plants at which performance is declining.

Preparations for the SMM occur over several months leading up to the meeting. During this time, NRC regional and headquarters staff integrate licensing, inspection, and operating experience to evaluate the safety performance of operating facilities. They also determine whether the licensees are finding and effectively correcting problems, or if they are experiencing adverse performance trends. The review emphasizes the effectiveness of licensee self-assessment and corrective actions. Plants that are of greatest concern are slated for discussion at the SMM.

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 the respective region. During these discussions, the managers determine which plants, if any, to place in one of the three problem plant categories:

- category 1, plants removed from the problem plant 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 start up, and that will be closely monitored by the NRC

In addition to the three problem plant categories, senior managers identify plants that are exhibiting adverse performance trends that could cause the NRC to place the plants on the problem plant 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 problem plant 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 problem plant 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.

During the two SMMs that were held in 1995, five plants remained on the problem plant list, two were removed from the list, and three were issued trending letters. No new plants were placed on the problem plant list. In addition, eight plants at five sites were recognized by the EDO for superior performance.

EMERGENCY PREPAREDNESS

During FY 95, the emergency preparedness (EP) staff focused its attention on three major areas, including onsite EP inspections, EP licensing 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 32 nuclear power plant sites around the country, and performed routine EP inspections at more than 36 sites. In support of the inspection effect, the staff prepared technical guidance in the form of three emergency preparedness positions (EPPOS), which were issued and placed in the NRC's public document room. Subjects covered in the EPPOS included timely classification of emergency conditions, on-shift dose assessment capability, and additional guidance for emergency action level scheme modifications. Additionally, in response to lessons learned from the effect of Hurricane Andrew on the Turkey Point (Florida) nuclear power plant in 1993, the staff prepared a temporary inspection (TI) to evaluate licensees' offsite communication systems.

Major EP licensing activities in FY 95 included the following:

- completing the final steps in issuing a low-power operating license for Watts Bar (Tennessee)
- preparing a Commission Paper on the use of the corporate emergency operations facility (EOF) as an interim EOF for Commonwealth Edison nuclear facilities
- relocating the backup EOF for the Wolf Creek Generating Station (Kansas)
- continuing the review and assessment of licensee-submitted changes to emergency plans and implementing procedures for nuclear power plants, as well as research and test reactors

The staff reviewed 18 proposed emergency classification schemes representing industry implementation of the guidance in NUMARC/NESP-007, "Methodology for Development of Emergency Action Levels." As a result of this effort, the staff issued 12 safety evaluation reports.

In response to a staff requirements memorandum, the staff worked closely with the Office of Nuclear Regulatory Research (RES) to develop recommendations to simplify EP requirements for reactor designs with greater safety margins. This process includes conducting a study to reevaluate the existing technical bases for EP using the following input:

- insights from a plant-specific severe accident risk study conducted by the staff (published as NUREG-1150)
- revised severe accident source term information (published as NUREG-1465)
- available plant design and probabilistic risk assessment information for passive and evolutionary reactor designs

During FY 95, the staff also supported several rulemaking activities related to emergency planning. These included eliminating the annual "off-year" exercise, and establishing regulations for independent spent fuel storage installations.

The staff also participated in two working groups involved in developing EP-related industrial standards for nuclear power plants. One new standard, ANSI/ANS-3.8.7, "Criteria for Planning, Development, Conduct, and Evaluation of Drills and Exercises for Emergency Preparedness," was issued for comment in 1995. The other standard, ANSI/ANS-3.8.9, "Criteria for Radiological Emergency Response Plans and Implementing Procedures for Permanently Defueled Commercial Nuclear Power Plants," is currently under development.

The staff continued to work closely with FEMA to address issues related to offsite emergency preparedness (at and around nuclear power plants 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 lead 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 95 to develop and assess emergency planning for the Watts Bar plant in Tennessee. In that process, FEMA reviewed the offsite plans, assessed the adequacy of the alert and notification system in the emergency planning zone, and observed the full participation exercises preceding the licensing of the facility.

The NRC and FEMA staffs also coordinated closely in monitoring the potential impact on emergency planning of hurricanes that threatened nuclear power plants on the Atlantic and Gulf coasts during the rather active 1995 hurricane season. In particular, Hurricane Opal impeded evacuation routes and damaged the alert and notification system in the Farley (Alabama) emergency planning zone. In that instance, FEMA was able to determine that despite communication difficulties, emergency preparedness remained adequate as a result of the efforts of State of Alabama and local emergency response officials with the support of the licensee. NRC and FEMA staffs are currently reviewing the lessons learned from the 1995 hurricane season, with the objective of improving coordination procedures between the two agencies.

In addition, the NRC and FEMA staffs coordinated closely on the following EP-related program matters during FY 95:

- initiation of efforts to improve the agencies' responsiveness to public inquiries concerning offsite EP issues
- reexamination of the guidance for conducting and evaluating emergency preparedness exercises
- development of a standardized exercise report format
- consolidation of program policies and guidance in a planning manual

SAFETY REVIEWS

PROBABILISTIC RISK ASSESSMENT POLICY STATEMENT AND IMPLEMENTATION PLAN

In August 1994, the staff forwarded to the Commission the proposed Probabilistic Risk Assessment (PRA) Policy Statement, which was subsequently published in the *Federal Register* on December 8, 1994, in order to solicit public comment. After addressing the public comments, the Commission published the Final PRA Policy Statement in the *Federal Register* on August 16, 1995. According to that policy statement, the use of PRA technology should be increased in all regulatory matters to the extent supported by state-of-the-art PRA methods and data, and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy. In addition, the final policy stated that PRA should be used to reduce unnecessary conservatism associated with current regulatory requirements, and that PRA evaluations in support of regulatory decisions should be as realistic as practicable. In late 1995, the staff forwarded the Commission Paper entitled "Framework for Applying Probabilistic Risk Analysis in Reactor Regulation," which described a process to ensure consistent and appropriate application of PRA insights in regulatory decisions.

In order to manage the expanded use of PRA methods and techniques in a manner consistent with the Commission's policy statement, the NRC staff developed a PRA Implementation Plan, which was submitted to the Commission in August 1994. On December 2, 1994, the staff conducted a workshop to inform the public of NRC activities related to the implementation plan, and to receive public comments. In March 1995, the staff briefed the Commission on the status of the activities described in the PRA Implementation Plan. The NRC staff then performed a preliminary review, and provided comments to the industry on the EPRI "Probabilistic Safety Assessment (PSA) Applications Guide," the draft NEI "Guideline for Risk-Based Inservice Testing (IST)," and the draft American Society of Mechanical Engineers (ASME) "Risk-Based IST Guideline."

Also in 1995, NRC, NEI, and industry representatives initiated a number of pilot programs to test several PRA applications. The purpose of these pilots was to develop, test, and validate risk-informed methodologies for specific regulatory applications, and to finalize the guideline documents. The Commission has assigned a high priority to these pilot applications. Several PRA pilot applications started in 1995 included graded quality assurance, risk-informed inservice testing, risk-informed inservice inspection, and risk-informed technical specification improvements. The staff expects to continue interaction with industry representatives and licensees, with the objective of completing all pilot programs during the next 2 years.

The staff is currently completing the individual plant examination (IPE) review, and is continuing the individual plant examination external events (IPEEE) review. The staff also initiated a program to summarize insights gained from the IPE reviews. This effort is expected to continue during 1996. In addition, PRA Training Focus Group was formed to review current PRA training for NRC staff, and to provide recommendations to senior NRC managers regarding a PRA training program for NRC technical managers and staff members. As a result, several existing PRA courses were improved and new ones were added in 1995.

REACTOR VESSEL MATERIALS

Reactor pressure vessel (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 Part 50.60(a), the NRC requires that licensees for all light-water nuclear power plants meet fracture toughness requirements and have a material surveillance program for the RPV materials that are subject to neutron irradiation. In addition, 10 CFR Part 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 concluded that Beaver Valley Unit 1 (Pennsylvania) and Palisades (Michigan) are the only two plants likely to exceed the pressurized thermal shock (PTS) screening limits before their current operating licenses expire, unless mitigative actions are taken. As a result of information recently obtained by testing material from Palisades' retired steam generators, it was determined that the Palisades RPV will exceed the PTS screening criteria in late 1999, before the end of its operating license in 2007. Similarly, Beaver Valley Unit 1 is projected to exceed the PTS screening limits in 2012, before the end of its operating license in 2016.

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, and plans to provide periodic updates of the NUREG report on the basis of this information. 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 Part 50.61. The RVID was made available for public access in early 1995, and will be updated periodically on the basis of NRC assessments of new information from the industry and licensees.

In order to continue operation of the Palisades RPV beyond 1999, the licensee is evaluating annealing the reactor vessel during its refueling outage in 1998. 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, which is scheduled for 1996. In preparation, the staff began processing an annealing rule and regulatory guide, which are expected to be published in December 1995.

HIGH-PERFORMANCE COMPUTING IN NRR

In FY 95, NRR's high-performance computing capability continued to grow providing NRR technical staff with improved analytical capabilities and advanced electronic communications. NRR staff members use high-performance UNIX workstations to perform analyses involving complex calculations:

- the thermal-hydraulic performance of reactor coolant systems and reactor containment systems during normal operation, transients, and accidents
- reactor core and fission product behavior during severe accidents
- structural and mechanical analyses of reactor structures and components during normal operations, accidents, and seismic events
- radiation shielding
- electrical network stability

To perform these calculations, the staff uses computer programs (codes) that have been developed internally (such as RELAP5, TRAC, MELCOR, CONTAIN, SCALE and CAERES), as well as commercially available programs (such as ALGOR and ANSYS). At one time, these codes ran on large supercomputers, but now they run on powerful UNIX workstations that are the size of a normal personal computer. The 25 workstations distributed within 7 different branches in 4 divisions of NRR are tied together in a network that allows each user to share networked resources for the analysis of engineering problems. In addition, the high-performance computer network is also connected to the agency's office automation network, so that engineers with less-frequent needs for analyses can use them.

In FY 95, the staff used this capability to support probabilistic risk assessment (PRA) success path determinations for advanced light-water reactors (ALWRs). These determinations enabled the staff to understand the behavior of operating reactor steam generator internal deflections during main steam line break accidents. Specifically, the staff was able to analyze test data from ALWR experimental facilities, to calculate soil-structure interactions under a turbine building caused by earthquakes, and to calculate heat losses and gains through electrical insulation during a fire. The staff also used the available communications capability to exchange electronic mail with code users and developers at the National laboratories and at regulatory organizations in foreign countries. In addition, the staff transferred large amounts of data from experimental test facilities between the NRC and the National laboratories.

With the establishment of this internal analytical capability, the staff significantly enhanced its ability to judge the quality of technical work performed by licensees and agency contractors. Immediate access to analytical tools has also brought a more timely response to incidents and events, as well as reduced dependence on contractors. The visualization tools that are now being built into the analytical tools improve analytical quality, as well as access to the analytical results by non-experts. As the agency moves toward increased use of PRA-based regulation, this improved analytical capability will form a strong foundation for risk-informed decision making.

PERFORMANCE OF MOTOR-OPERATED VALVES

On June 28, 1989, the NRC staff issued Generic Letter (GL) 89–10, "Safety-Related Motor-Operated Valve Testing and Surveillance," as a result of problems 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 designbases, verifying MOV switch settings initially and periodically, and testing MOVs under design-basis conditions where practicable. GL 89–10 also requested that licensees improve evaluations of MOV failures, necessary corrective actions, and trends regarding MOV problems. In addition the staff requested that licensees complete the GL 89-10 program within approximately 3 refueling outages or 5 years from the issuance of the generic letter. Since 1989, the staff issued Supplements 1 through 6 to GL 89-10 to provide additional information and clarify GL 89-10 recommendations.

On July 26, 1995, the staff issued for public comment a proposal for Supplement 7 to GL 89-10, which would eliminate the recommendation that licensees of pressurized-water reactor nuclear plants address the inadvertent mispositioning of MOVs as part of their GL 89-10 programs. (This is similar to Supplement 4 to GL 89-10, issued in 1992, which applied to boiling-water reactor licensees.) The staff plans to issue Supplement 7 to GL 89-10 in early 1996.

Many nuclear power plant 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, and the staff has completed its review for about 25 percent of the licensees. Most licensees will have completed MOV design-basis capability verification under GL 89-10 by the end of 1995.

The staff is preparing a proposed generic letter to address the need for periodic verification of the design-basis capability of safety-related MOVs. The staff is also working with the American Society of Mechanical Engineers (ASME) to revise ASME code requirements by including long-term provisions for monitoring and maintaining the capability of MOVs to perform their design-basis safety functions. In addition, the staff is completing a safety evaluation of the MOV Performance Prediction Program developed by the Electric Power Research Institute (EPRI) to predict thrust and torque requirements to operate gate, globe, and butterfly valves. The new generic letter will include discussion of the ASME and EPRI efforts. The staff also intends to discuss other attributes of an effective, periodic MOV verification program in the new generic letter.

The staff continues to monitor the industry's efforts toward resolving concerns about the performance of MOVs at nuclear plants by inspecting the implementation of GL 89-10 programs. The staff also provides information to licensees on MOV issues through NRC-sponsored public meetings, participation in industry meetings, and issuance of NRC information notices.

The industry has issued several event reports describing operational failures of safety-related gate valves as a result of pressure locking or thermal binding of the valve disks. Such pressure locking or thermal binding can be caused by valve design characteristics (wedge and valve body configuration, flexibility, and material thermal coefficients) when the valve is subjected to specific pressures and temperatures during various modes of plant operation. Operating experience indicates that these situations are not always considered as part of the design basis for valves in many plants. Despite industry awareness of the problem, pressure locking and thermal binding events continue to occur.

On August 17, 1995, the NRC issued Generic Letter (GL) 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves." In that letter, the staff requested that licensees take the necessary actions 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 facilities. The staff also requested that licensees perform a screening evaluation, within 90 days from the issuance of the generic letter (to ensure that no immediate safety concerns exist), and complete the GL 95-07 program within 180 days from the issuance of the generic letter. However, GL 95-07 states that schedules for corrective action (if corrective actions are needed) may be based on risk significance, including consideration of common cause failure of multiple valves. Plant operation and outage schedules may also be considered in developing corrective action schedules. A licensee's schedule for completing corrective action in response to GL 95-07 is considered independent from GL 89-10.

The staff anticipates receiving summary information regarding licensee actions in response to GL 95-07 by February 1996. The staff will review these submittals and provide a safety evaluation for each facility. The staff also anticipates the need to perform limited follow-up inspections on an as-needed basis.

EVALUATION OF SHUTDOWN AND LOW-POWER RISK ISSUES

After investigating the March 1990 loss of ac power at the Vogtle (Georgia) plant, an NRC incident investigation team reported the need for improvement and risk management of shutdown operations (NUREG-1410). As discussed in the 1991–1994 NRC Annual Reports, the staff subsequently conducted an evaluation of shutdown and low-power issues. In February 1992, the NRC published a draft report, "Shutdown and Low-Power Operations at Nuclear Power Plants in the United States" (NUREG-1449), documenting the evaluation and its findings. Comments on the draft report were addressed in the final NUREG-1449, which was issued in September 1993.

The staff also prepared a regulatory analysis of potential requirements for shutdown and low-power operations, and documented its preliminary findings in SECY-93-190, "Regulatory Approach to Shutdown and Low-Power Operations," dated July 1993. The regulatory analysis supported the staff's preliminary findings, in NUREG-1449, that public health and safety have been adequately protected during shutdown operation, but safety levels could be substantially improved and such improvement is warranted.

The staff proposed rulemaking to resolve concerns regarding shutdown and low-power operations, and prepared a rulemaking package consisting of a draft regulatory analysis, a *Federal Register* notice with a statement of considerations, and a regulatory guide. This package was approved by the Commission on September 12, 1994, and was published for public comment in the *Federal Register* (59 FR 53707-52714) on October 19, 1994.

The proposed rule would have required that licensees conduct analyses, establish administrative controls, and implement design modifications to improve safety during shutdown operations. However, numerous comments were received, and many identified significant operational and cost implications. The NRC has worked with commenters via announced public meetings to understand the comments and to discuss the implications of possible changes to the proposed rule. The objective was to ensure the appropriate safety benefit while minimizing or eliminating the regulatory burden. As a result, the staff has drafted a revised rule and corresponding regulatory guide, and has developed a new regulatory analysis to fully address the comments. The NRC plans to publish this revised rulemaking package, along with a statement of considerations, during 1996 in order to solicit public comment.

STEAM GENERATOR ISSUES

Steam generator tube integrity continues to be a significant issue for the nuclear industry. Degradation of mill-annealed alloy 600 steam generator tubes has resulted in the development of improved inspection techniques, alternative tube repair criteria, and improved primary-to-secondary leak rate monitoring programs.

As discussed in the *1994 Annual Report*, an increasing number of plants have reported the occurrence of circumferential cracking at the expansion-transition location. Such circumferential cracking of steam generator tubes was the subject of Generic Letter 95-03, which was issued on April 28, 1995. In GL 95-03, the staff alerted the industry to recent steam generator tube inspection findings at Maine Yankee Atomic Power Station (Maine) and requested licensees to take the following actions:

(1) Evaluate recent operating experience with respect to the detection and sizing of circumferential indications to determine the applicability to their plant.

(2) Develop a safety assessment justifying continued operation until the next scheduled steam generator tube inspections are performed.

(3) Develop plans for the next steam generator tube inspections as they pertain to the detection of circumferential cracking.

In addition, GL 95-03 alerted licensees to the importance of performing comprehensive examinations of steam generator tubes using techniques and equipment capable of reliably detecting the degradation to which the steam generator tubes may be susceptible. The staff also issued Information Notice (IN) 95-40, which provided information supplemental to GL 95-03. The staff is currently reviewing the responses to GL 95-03, and has issued requests for additional information on a plant-specific basis, as necessary.

During outages conducted in fall 1995, a number of plants have detected circumferential cracks at the expansion-transition region and at dented tube support plate locations. At one plant, several thousand circumferential indications were detected at the expansion-transition region of the tubes. At several plants, the circumferential extent of the indications were large. These tubes were removed from service, and the severity and safety significance of these indications is being assessed. These inspection findings may be attributed, in part, to improved inspection techniques and heightened data analyst sensitivity to circumferential cracks.

Circumferential cracking has also historically been observed in the U-bend portion of tubes with small bend radii. In addition to circumferential cracking at these locations, cracking continues to occur in parent tubes in which sleeves have been installed. Tube sleeving was discussed in the *1994 Annual Report.*

Various flaw-specific tube repair criteria have been proposed by the industry for axially oriented outside diameter stress corrosion cracking (ODSCC) confined to within the thickness of the tube support plate. In support of these criteria, the staff issued GL 95-05, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking," on August 3, 1995. The methodology described in this generic letter is intended to ensure adequate structural and leakage integrity of the steam generator tubing throughout the operating cycle, without taking credit for tube support plates minimizing the likelihood of tube burst or tube leakage under postulated accident conditions.

Currently, on an interim basis, nine nuclear power plants have implemented voltage-based limits for ODSCC at the tube support plates. It is expected that these and other plants will implement the criteria on a permanent basis. With respect to voltage-based limits, the staff recently reviewed and approved an amendment that defines a methodology similar to that documented in GL 95-05. However, this methodology explicitly takes credit for the tube support plates minimizing the likelihood of tube burst and tube leakage under postulated accident conditions. This amendment permits the use of higher voltage limits, and was approved on an interim basis for two plants operated by the same utility.

To more broadly address steam generator tube integrity issues, the staff issued an advanced notice for proposed rulemaking in August 1994. In general, public comments on the proposed rule were supportive of the staff's efforts. The objective of the steam generator rule is to provide continued assurance that steam generator tubes will remain capable of performing their intended safety functions while considering changing forms of degradation and providing incentives for using state-of-the-art inspection and repair methods. The NRC intends that licensees will accomplish this objective by developing and implementing steam generator programs that contain the appropriate elements important to ensuring defense-in-depth. Such programs must maintain a balance of preventive, inspection/repair, and mitigative measures that reflect current operating experience and risk considerations. It is also intended that the steam generator rule will provide the broad performance objectives, while an associated regulatory guide would provide more detailed performance criteria with guidance, as necessary, to ensure that these performance goals are met. The NRC expects to issue a draft steam generator rule and regulatory guide for public comment in early 1997.

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 nozzles.

In 1992, the NRC staff conducted meetings with the owners' groups to discuss the significance of the CRDM leak at Bugey-3, with respect to domestic plants. Evaluations of CRDM nozzles in U.S. reactor vessels showed that they are not inherently less susceptible to PWSCC than European CRDM nozzles. However, the NRC concluded that the cracking was not safety significant. The basis for this conclusion was that, with perhaps one exception, the cracks were short and axial, leakage would 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.

To address PWSCC of CRDMs at U.S. plants, the industry responded by developing a comprehensive inspection, repair, and mitigation program. Qualification test results demonstrated that the vendors' inspection procedures and personnel would be highly likely to find any PWSCC in the CRDM nozzles.

In FY 95, Palisades conducted a limited examination of eight in-core instrumentation penetrations and found no cracking. These penetrations were selected because they could be inspected from the top of the reactor head with relatively low radiation dose. Inspection of all CRDM penetrations would require inspection from underneath the reactor head and would result in a much higher radiation dose. Results were consistent with those from earlier evaluations, and the NRC's view of the safety significance remains unchanged. However, the fact that cracking was found in two of four U.S. vessels indicates that the problem is generic.

Westinghouse has developed a model to establish a susceptibility rating for all U.S. PWRs. The model is continually updated as more plants have CRDM inspections. Currently, the model predicts that Virginia Power Company plants, North Anna 1 and 2 and Surry 1 and 2, have the most susceptible CRDM penetrations. Virginia Power Company is planning to conduct a CRDM penetration inspection at North Anna 1 in spring 1996, and is considering inspecting North Anna 2 and the Surry units later.

The NRC staff is continuing to interact with the industry on this issue. The industry, in turn, is continuing its proactive approach to this problem, updating the susceptibility model, developing an inspection plan, and determining the required inspection frequencies and repair techniques.

RADIATION PROTECTION AT NUCLEAR REACTORS

Daily monitoring of licensee and region 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 result in subsequent reactive regional inspections. One example of NRR involvement and close coordination with regional counterparts in an event was the onsite airborne release from the radioactive waste system at the Hope Creek plant in New Jersey.

During FY 95, the NRC staff provided radiation protection support in licensing activities at most of the operating nuclear power reactors, as well as reviews of design criteria and conceptual designs for the Westinghouse AP600 advanced reactors. Such support included detailed evaluations of occupational radiation protection design features, systems, equipment, and public dose controls and projections for normal operations. The staff was also active in the accident source term evaluation for the AP600. In addition, the staff's licensing support activities for operating plants included assessments of the postulated dose consequences for design-basis accidents, including quick-turnaround evaluations of plant-specific steam generator interim tube plugging criteria.

An important staff function has been to provide radiation protection evaluation of low-level waste handling and disposal activities at power reactors. In this area, the staff has evaluated proposals from several plants for the onsite disposal of wastes contaminated with very low levels of radioactivity. Another important staff function falls in the area of generic communications on radiation protection matters. During FY 95, an Information Notice (IN) was issued to warn licensees of a serious, continuing material problem with certain self-contained breathing apparatus used for emergency escape and rescue, firefighting, and in other hazardous environments. Another IN was written to alert licensees of a shielding deficiency at an operating boiling water reactor.

The staff continued to closely monitor the implementation of the major revision to 10 CFR Part 20, "Standards For Protection Against Radiation." The staff provided Regional inspection guidance and answered the licensees' implementation questions on the revised rule. Previously developed guidance (NUREG/CR-6204, "Questions and Answers Based on Revised 10 CFR Part 20," and NUREG/CR-5569, Rev.1, "Health Physics Positions Data Base") was placed on the public-accessible NRC Electronic Bulletin Board in early 1995.

To ensure consistent regional implementation and inspection of the revised rule, the staff closely monitored the regional inspection activities governed by Temporary Instruction (TI) 2512/123, "Implementation of the Revised 10 CFR Part 20." This TI focuses the inspectors on the major aspects of the new rule, and provides specific inspection guidance for each area. Based on the TI feedback to date, the power plant licensees are effectively implementing the rule. Finally, the staff continues oversight and review of significant proposed escalated enforcement actions as a result of inspector findings.

ENVIRONMENTAL RADIOACTIVITY NEAR NUCLEAR POWER PLANTS

Under Federal regulations, all licensed U.S. nuclear power plants are required to periodically measure samples from the environment outside the boundaries of the plant site for indications of radioactivity originating from the plant. This environmental monitoring program is to verify that measurable concentrations of radioactive material and levels of radiation are not higher than allowed or expected. In turn, the studies certify that the plant is in compliance with regulations, and that the releases measured do not exceed the amounts defined in the final environmental statements as representing very small risks to members of the public.

Extensive monitoring is required for each plant. The radiological environmental monitoring program records when, if ever, radioactive contamination above natural background is detected outside the plant boundaries. Samples come from sources that range from lake, river, and well water for water-borne contaminants; to radioiodine and particulate dusts for airborne contaminants; to milk, fish, shellfish, and vegetables for contaminants that might be ingested as foods. Direct radiation from each of up to 16 specific sectors of land surrounding the plant is also measured, by special radiation dosimeters that gauge the cumulative radiation dose for each calendar quarter.

Results of licensees' radiological environmental monitoring programs are recorded in an annual radiological environmental report, which is submitted each May for the preceding calendar year. These reports for each year of operation of a power reactor are available for public inspection in local public document rooms (LPDRs; see Appendix 4 for listing).

The NRC conducts two programs that are independent from, but supplemental to, these licensee monitoring programs. In one, the NRC independently measures the direct radiation in the sectors surrounding each plant using dosimeters at locations similar to those measured by the licensee. The results of measurements for each power reactor site from this "NRC Direct Radiation Monitoring Network" are published quarterly in NRC documents, which are also available in the LPDRs.

In addition, NRR contracts with 27 States to conduct environmental sampling activities. The purpose of these contracts is to have the States independently collect and analyze samples from the environs of the NRC-licensed facilities. The sample collections duplicate, as closely as possible, certain parts of the licensee's environmental monitoring efforts, but they are executed independent of the licensee. The results of State monitoring are compared to the results of licensee monitoring programs.

OCCUPATIONAL EXPOSURE DATA AND DOSE REDUCTION STUDIES

Since 1969, the NRC staff has been collating the annual occupational doses at light-water reactors (LWRs). Although the annual dose averages for both pressurized water reactors (PWRs) and boiling water reactors (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 steadily declined.

The 1994 dose compilation includes data from 72 PWRs and 37 BWRs, for a total of 109 LWRs. Plants that have not been in commercial operation for a full year are not included in this compilation. One new PWR, Comanche Peak 2 (Texas), has been added to the plant dose compilation for 1994. Another PWR, San Onofre 1 (California), has been dropped from the 1994 annual listing because the plant has been permanently shut down. Other plants that are no longer included in the dose compilation are Dresden 1 (Illinois), Fort St. Vrain (Colorado), Humboldt Bay (California), Indian Point 1 (New York), LaCrosse (Wisconsin), Rancho Seco (California), Three Mile Island 1 (Pennsylvania), Trojan (Oregon), and Yankee Rowe (Massachusetts).

In 1994, the average dose per unit for all LWRs was 197 person-rem. This is 18 percent lower than the 1993 average of 240 person-rem, and is the lowest LWR average dose since 1969 (when only seven LWRs were operating).

In 1994, the average dose per unit for PWRs was 131 person-rem, down more than 32 percent from the average dose per unit of 194 person-rem in 1993. The activities that most frequently contributed to PWR doses in 1994 were steam generator related work, area and system decontamination, refueling activities, inservice inspections, and valve-related maintenance and repair work.

In 1994, the average dose per unit for BWRs was 327 person-rem, down slightly from the average dose per unit of 330 person-rem in 1993. Major contributors to BWR doses in 1994 included valve maintenance work, inservice inspections, pump maintenance, repair and refurbishment of control rod drive mechanisms, and refueling activities.

In FY 95, the NRC continued its ongoing contracts with Brookhaven National Laboratory (BNL) in the area of occupational dose reduction at LWRs. The NRC-sponsored program monitors U.S. and foreign nuclear power plant efforts to reduce occupational dose. Under the contract, BNL publishes a periodical entitled "ALARA Notes," which contains ALARA-related information submitted by U.S. and foreign nuclear power plants. (ALARA is an acronym for "as low as reasonably achievable," the criterion characterizing the dose-reduction objective.) As part of this contract, BNL is also involved on a regular basis in compiling an ongoing annotated bibliography of selected readings in radiation protection and ALARA. In another continuing radiation protection-related contract with the NRC, BNL performed a study in FY 95 to assess hot particle production, mitigation, and dosimetry. Another NRC-sponsored BNL study on the impact of reduced dose limits was completed during FY 95.

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 and the construction and functions of the core shroud were provided in the 1993 and 1994 Annual Reports. Since 1988, the NRC staff has been meeting every year with the Boiling Water Reactor Owners' Group (BWROG) and the General Electric Company (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° circumferential separation of the shroud following a postulated loss-of-coolant accident (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 emergency core cooling systems (ECCS) from fulfilling their intended safety functions.

In order to verify compliance with the structural integrity requirements of 10 CFR Part 50.55a and to ensure that the risk associated with core shroud cracking remains low, the staff concluded that it is appropriate for BWR licensees to implement timely inspections and/or repairs, as appropriate, at their BWR facilities. 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.

The NRC staff received all of the BWR licensee submittals in response to GL 94-03 by September 1994. The staff completed its evaluations of these licensee responses, and transmitted the safety evaluation reports (SERs) to the appropriate BWR licensees. The staff concluded that, for all cases, BWR licensees provided sufficient justification to operate their facilities until core shroud inspections or repairs could be implemented. The staff's conclusions were based on the following factors:

(1) No 360° through-wall core shroud cracking has been observed to date in any U.S. BWR that has performed a shroud inspection.

(2) All analyses performed by U.S. licensees to date indicate that, even if cracking did exist in a particular BWR core shroud, sufficient ligaments would remain in the shroud such that structural integrity of the shroud would be ensured for the remainder of the plant's operating cycle.

(3) No U.S. BWR has exhibited any of the symptoms (power-to-flow ratio mismatch) that would indicate significant leakage through a 360°, through-wall shroud crack.

(4) Main steam line or recirculation line breaks are both considered to be low probability events.

(5) Only short durations remained until core shroud inspections or repairs would be implemented by the individual BWR licensees.

To date, all licensees owning BWRs with shrouds that are highly or moderately susceptible to IGSCC have performed comprehensive inspections or have implemented modifications (repairs) of their core shrouds. To date, core shroud modifications have been made in Brunswick Unit 1 (North Carolina), Hatch Units 1 & 2 (Georgia), FitzPatrick (New Jersey), Oyster Creek (New Jersey), Quad Cities Unit 2 (Illinois), Nine Mile Point Unit 1 (New Jersey), Dresden Unit 2 (Illinois), and Pilgrim (Massachusetts). Shroud modifications will be made in additional plants if inspection results and flaw evaluations indicate that such modifications are necessary, or at the discretion of the licensee. These modifications are designed to ensure the structural integrity of the core shrouds based on an assumption that the shroud circumferential welds are completely cracked, and are being reviewed by the NRC staff on a case-by-case basis.

In spring 1994, the industry formed a new organization, known as the BWR Vessel and Internals Project (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 provided submittals addressing an integrated safety assessment of the issue, guidelines on performing non-destructive examinations (NDE) 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 BWRVIP has recently submitted a comprehensive safety assessment of the BWR internals listed in NUREG/CR-5754 as having the potential to undergo age-related degradation. In addition, the BWRVIP has revised its guidelines and recommendations for performing and qualifying NDE techniques, and has submitted its proposed guidelines regarding standardized submittal formats. The staff is currently reviewing these submittals.

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 identified in the staff's "Fire Protection Reassessment Report" might also exist in the NRC EQ Program. The EQ TAP is intended to resolve these concerns through meetings with industry, a program review of EQ, data collection and analysis, a risk assessment, and research on aging and condition monitoring. Additional background information regarding the TAP was provided in the 1993 and 1994 Annual Reports.

Since the development of the EQ TAP, the staff has met several times with the NEI, the Nuclear Utility Group on Equipment Qualification, the EPRI, and licensees to discuss activities under the EQ TAP.

In June 1995, the staff completed the EQ program review which involved a look back at the basis for having different EQ requirements, as well as a review of the adequacy of the requirements and their implementation. During the program review, the staff also conducted surveys, met with industry representatives, and conducted an extensive document research effort. The staff is currently preparing a final report to categorize the issues, set priorities for staff action, and summarize the results of the program review. The report will be placed in the public document room upon completion.

Data collection and analysis activities are continuing, and the review of operating experience was completed in 1994. As a result of that review, the staff concluded that there are relatively few EQ problem reports, that degradation of EQ equipment was more frequent inside containment, and that moisture intrusion was a significant contributor to degradation of EQ equipment. Information on replacement of EQ equipment, compiled in 1994, led to the conclusion that cables, connectors, and penetrations should be included in aging reviews. In early 1995, the staff issued a report on the impact of the revised source term (from NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants") on environmentally qualified equipment at operating power plants. Brookhaven National Laboratory (BNL), under contract to the Office of Nuclear Regulatory Research (RES), identified and evaluated 260 documents related to EQ of class 1E electric cables. This literature review resulted in a NUREG/CR report scheduled to be published in early 1996. BNL has also developed a database of EQ literature on class 1E cables, and will develop a database of cable materials.

In August 1994, RES issued its EQ Research Program Plan, which provides for a cable condition monitoring program and a cable testing program in support of the EQ TAP. BNL has developed cable testing and cable acquisition programs, and has found several sources of naturally aged cable for the program. BNL also plans to test new, naturally aged, and artificially aged cables, and to evaluate condition monitoring techniques that could give insights into methods for determining how equipment is actually aging and performing in plants.

In early 1996, the staff will evaluate the results of the program review, data collection and analysis, other information collected to date, and the current status of the EQ TAP to focus the research efforts on the most critical issues. On the basis of this evaluation the staff may adjust the scope and schedules for research in the areas of accelerated aging, condition monitoring techniques, and accident testing.

ECCS STRAINER BLOCKAGE IN BWRS

Unresolved Safety Issue (USI) A-43 dealt with concerns regarding the performance of safety-related pumps during an emergency. The principal concern was the potential loss of net positive suction head (NPSH) resulting from clogging of the suction strainers by fibrous debris dislodged during a loss-of-coolant accident (LOCA). Based on an evaluation of low risk significance, the issue was resolved in 1985 without backfitting operating plants or plants under construction. However, more recent operational experience in the United States and abroad indicates that the potential for strainer clogging may be more significant than was perceived at the time USI A-43 was resolved. For example, on July 28, 1992, at the Barsebäck 2 plant in Sweden, the strainers on the suction side of the containment spray system became clogged with fibrous insulation material dislodged by a stuck-open relief valve. Similarly, in January and March 1993, the ECCS strainers at Perry Unit 1 (Ohio) became clogged with particulates and fibrous material.

The NRC staff has issued information notices (INs) regarding the Barsebäck event (IN 92–71) and the Perry events (IN 93–34). In addition, the staff issued NRC Bulletin 93–02, "Debris Plugging of Emergency Core Cooling Suction Strainers," on May 11, 1993. All operating reactor licensees were requested to identify fibrous air filters, or other temporary sources of fibrous material not designed to withstand a LOCA, which are installed or stored in their primary containment. In addition, the staff requested that licensees take prompt action to remove any such material, and implement any immediate compensatory measures that may be required to ensure the functional capability of the ECCS. The responses to NRC Bulletin 93–02 indicate that all licensees either do not need, or have already performed, necessary corrective actions. In addition, in June 1993, the staff initiated a program to systematically evaluate the larger implications of the Barsebäck and Perry experiences.

In January 1994, the preliminary results of the analytical program indicated that there was a high probability of strainer clogging and NPSH loss for a LOCA in a U.S. BWR. In response to this finding, as well as the results of international research studies, the staff issued Supplement 1 to NRC Bulletin 93–02, requesting that licensees take interim compensatory actions to limit the risk from this failure mechanism. The interim actions include operator training, enhanced awareness of the potential event, and procedures to mitigate the effects of strainer clogging.

On September 11, 1995, Limerick 1 (Pennsylvania) experienced an event in which a stuck-open safety relief valve led operators to initiate two trains of the residual heat removal system to provide suppression pool cooling. Approximately 30 minutes into the event, the operators observed flow and electrical current oscillations on the "A" train. As a result, the pump was shut down and subsequently restarted, and the shutdown of the unit proceeded with no further complications. The licensee subsequently determined that the flow oscillations were caused by flow blockage and reduction in NPSH 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. To do so, the bulletin requested that licensees examine and evaluate suppression pool cleanliness, suction strainer cleanliness, and the effectiveness of their foreign material exclusion (FME) practices. In addition, the bulletin requested that licensees implement appropriate procedural modifications and other actions (e.g., suppression pool cleaning), as necessary, to minimize foreign material in the suppression pool, drywell, and containment. Finally, the bulletin requested that licensees verify their operability evaluation through appropriate testing and inspection. The staff is currently evaluating licensee responses to this bulletin.

Throughout 1994 and 1995, the staff worked with the BWR Owners' Group (BWROG) to quantify the factors contributing to the phenomenon, and to evaluate potential remedies. This effort led to the development of a draft bulletin entitled, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors," and a draft regulatory guide (RG) DG-1038 (proposed revision 2 to RG 1.82) entitled, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident." The draft bulletin and RG detail the staff's proposed resolution for this issue, and were issued on July 31, 1995, for a 60-day public comment period. The draft bulletin outlines three options for resolving this issue, although licensees are free to propose alternative means of resolution:

(1) Install large strainers of sufficient capacity to prevent the strainers from clogging.

(2) Install a self-cleaning strainer with the capability to remove debris from the strainer surface, thereby preventing clogging.

(3) Install a backflush system.

Each of these options would require additional supporting measures to ensure compliance with 10 CFR Part 50.46. For example, for backflush, an analysis would be required to demonstrate that operators have sufficient time and system capability to operate the backflush in a timely fashion and for as many times as might be needed during an accident. The current schedule for resolving this issue calls for issuance of a final bulletin by early 1996.

CLEANUP AT THREE MILE ISLAND

During 1994, the damaged reactor at Three Mile Island Nuclear Station (TMI) Unit 2 (Pennsylvania), was placed in post-defueling monitored storage (PDMS), a passive, monitored state similar to the SAFSTOR decommissioning alternative. GPU Nuclear, the TMI licensee, plans to maintain Unit 2 in PDMS until TMI Unit 1 permanently ceases operation. At that time, the licensee will decommission both units simultaneously. The NRC staff continues to monitor TMI Unit 2, and requires the licensee, to submit quarterly PDMS reports summarizing ongoing Unit 2 activities.

LOSS OF SPENT FUEL POOL COOLING FUNCTION

The staff has completed its site-specific evaluation of a 10 CFR Part 21 report, which was filed on November 27, 1992. That report contends that the design of the Susquehanna Steam Electric Station (SSES) (Pennsylvania) failed to meet numerous regulatory requirements with respect to a postulated sustained loss-of-cooling function in the spent fuel pool mechanistically resulting from a LOCA. The 1993 and 1994 NRC Annual Reports provide background regarding the postulated event sequence and early NRC review activities. In general, the staff concluded that suitable modifications had been made to SSES to address postulated seismically induced design-basis events within the facility's licensing basis. The staff further concluded that other postulated events leading to a sustained loss of spent fuel pool cooling were outside the licensing basis for SSES, and the potential for occurrence was remote. The staff presented its findings before the Advisory Committee for Reactor Safeguards (ACRS) on December 8, 1994, and documented its conclusions in a safety evaluation report for SSES, which was issued to the Pennsylvania Power and Light Company (the licensee) on June 19, 1995. The staff also issued NRC Information Notice (IN) 93-83, Supplement 1, on August 24, 1995, to summarize the conclusions for the nuclear industry and members of the public.

The staff is currently implementing a generic plan to address the concerns identified in the 10 CFR Part 21 report, as well as separate concerns related to spent fuel storage pools identified during a special inspection at a permanently shutdown reactor facility. The generic plan includes the following actions:

- search and analysis of information regarding spent fuel storage pool issues

- assessment of spent fuel storage pool operation and design at selected reactor facilities

- evaluation of the assessment findings for safety concerns

- selection and execution of an appropriate course of action based on the safety significance of the findings

The staff has identified particular issues related to spent fuel storage pools and completed onsite assessments of spent fuel pool operations at four sites in addition to SSES. The staff has documented the findings from these assessments, which focused on design features and administrative controls, in reports for these sites. In addition, to address concerns that the sites selected for the assessments may not be representative of all reactor sites, the staff has expanded the scope of the technical review to include a design and licensing document review, which is currently underway. On the basis of the nature and significance of the findings from these technical reviews, the NRC staff will develop criteria for specific spent fuel pool operations for potential use in formulating generic communications, revisions of regulatory guidance, and other appropriate regulatory actions.

REACTOR ENGINEER INTERN PROGRAM

The NRC established the Reactor Engineer Intern Program in 1988 to train new engineers in anticipation of the agency's future workforce requirements. The program seeks recent engineering graduates, recruited primarily from colleges and universities with reputations for strong engineering programs. Through individually tailored assignments at Headquarters, Regional Offices, and plant sites—coupled with extensive formal training in nuclear reactor technology—reactor engineer interns are given wide exposure to the activities of the NRC. As a result, they have the opportunity to acquire a broad grasp of the various concerns, roles, and tasks of the agency. Upon completing the rigorous 2-year program, interns are given permanent technical professional assignments based on their educational background, personal and career preferences, and the needs of the agency.

A total of 80 entry-level engineers have successfully completed the Reactor Engineer Intern Program since its inception in 1988. In June 1995, seven reactor engineer interns were honored at a joint ceremony recognizing the graduates of intern programs established by the NRC's program offices. Currently, 14 additional Headquarters-based interns are pursuing the requirements of the program.

ANTITRUST ACTIVITIES

As required by law since December 1970, the staff has conducted prelicensing antitrust reviews of all construction permit and operating license applications for nuclear power plants and certain commercial nuclear facilities. (See NUREG-0970, "Procedures for Meeting NRC Antitrust Responsibilities," May 1985.) In addition, applications to amend construction permits or operating licenses resulting from a proposed transfer of ownership interest or operating responsibility in a nuclear facility are subject to antitrust review. Over the past several years, the staff has concentrated its antitrust activities in the areas of license amendment reviews (usually associated with proposed new owners or operators resulting from mergers or acquisitions involving licensees, or proposed corporate reorganizations) and compliance proceedings initiated by requests to enforce antitrust license conditions.

During FY 95, the staff completed the following reviews activities associated with the NRC's antitrust responsibility:

- three reviews associated with requests by licensees to restructure their utility operations

- a "No Significant Antitrust Change" evaluation and subsequent reevaluation in conjunction with the merger of Gulf States Utilities Company and Entergy Corporation

- termination of the review concerning the proposed merger agreement between El Paso

Electric Company and Central & Southwest Corporation (CSW)

- review of the competitive implications associated with a proposed sale/leaseback arrangement involving the Vermont Yankee Nuclear Power Station (Vermont)
- a decision by the director of NRR issued pursuant to a request for enforcement of antitrust license conditions associated with Unit 2 of the St. Lucie nuclear plant (Florida)

Each of these is discussed in the following paragraphs.

The staff also conducted restructuring reviews of the competitive implications associated with the requests of San Diego Gas & Electric Company (San Onofre 2 and 3), Detroit Edison Company (Fermi 2), and Pennsylvania Power & Light Company (Susquehanna) to reorganize each of their operating units under a separate holding company framework. In each of these reviews, the staff determined that the change in ownership or control associated with the restructuring did not adversely affect the relevant bulk power services market served by each of the facilities. Consequently, in each of its reviews, the staff concluded that the restructuring did not represent a significant change from the previous antitrust review of the facilities.

As a result of an appeal to the Eleventh Circuit by Cajun Electric Power Cooperative, Inc., regarding the staff's initial "No Significant Antitrust Changes" finding, the staff completed another significant change evaluation of the merger between Gulf States Utilities Company and Entergy Corporation. After further review, the staff again found no basis upon which to conclude that any changes in the licensee's activities would tend to create or maintain a situation inconsistent with the antitrust laws. Cajun requested reevaluation of the staff's finding, and the staff affirmed its finding of no significant antitrust changes.

The staff reviewed testimony and filings provided by El Paso Electric Company (the licensee of Palo Verde Nuclear Generating Station) in conjunction with the company's proposed merger with CSW. However, when CSW cancelled the merger agreement in early June 1995, the staff terminated its review of the proposed change in ownership of Palo Verde.

The staff also reviewed the competitive implications associated with the proposed sale or leaseback of a significant portion of Vermont Yankee. After analyzing the proposed arrangement, the staff determined that the new owner could not exercise control over power or energy produced by Vermont Yankee; the staff therefore approved the sale/leaseback arrangement.

The Director of NRR issued a decision denying the request by Florida Municipal Power Agency (FMPA) to initiate compliance proceedings against the Florida Power & Light Company (FPL). FMPA alleged that FPL was in violation of certain antitrust license conditions attached to Unit 2 of the St. Lucie nuclear plant. The Director's decision stated that there was no basis to initiate a compliance proceeding because FMPA received adequate relief in a parallel proceeding at the Federal Energy Regulatory Commission.

INDEMNITY, FINANCIAL PROTECTION, AND PROPERTY INSURANCE

1995 INSURANCE PREMIUM REFUNDS

The two private nuclear energy liability insurance pools—American Nuclear Insurers and the Mutual Atomic Energy Liability Underwriters—paid policyholders a 29th 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 1995 (for the period from 1985 through 1995) totaled $19,300,000, which is approximately 46 percent of all premiums paid on the nuclear liability insurance policies issued in 1985. The refunds represent about 62 percent of the premiums placed in reserve in 1985.

PROPERTY INSURANCE

The 13th annual property insurance reports submitted by power reactor licensees indicated that, of the 73 sites insured, 59 are covered for at least the $1.06 billion required in the revised property/accident recovery insurance rule, published on April 2, 1990, and 31 of those sites carry the maximum $2.62 billion currently available. The remaining 14 sites have sought or been granted exemptions from the full amount of required coverage, because of their small size or their operating status.

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 Commission 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 specifically requested by the Department of Energy. 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 generic safety issues.

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 membership is drawn from scientific and engineering disciplines and includes individuals experienced in conducting safety-related reviews of nuclear plant design, construction, and operation.

During FY 95, 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 Regulatory Reform Initiatives and National Performance Review Phase II, and on the following design certification related matters:

- General Electric Nuclear Energy test and analysis program for the Simplified Boiling Water Reactor Design.
- NRC test and analysis program in support of AP600 Advanced light water passive plant design review.
- Proposed Commission Paper on staff positions on technical issues pertaining to the Westinghouse AP600 standardized passive reactor design.

The committee also provided reports on topics related to NRC training programs and the safety of operating reactors:

- Potential for BWR ECCS strainer blockage due to LOCA generated debris.
- NRC Technical Training Center programs.
- Loss of spent fuel pool cooling following a LOCA at the Susquehanna Steam Electric Station.

- Reactor Water Cleanup System line break for operating Boiling Water Reactors.
- Development of improved nondestructive examination techniques.

In addition, the committee provided advice to the NRC on proposed rules, policy matters, and regulatory guidance related to the following:

- Revisions to 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
- Proposed Final Draft Regulatory Guide DG–1023, "Evaluation of Reactor Pressure Vessels with Charpy Upper-Shelf Energy Less Than 50 Ft.-Lb."
- Proposed Final Revision 3 to Regulatory Guide 1.118, "Periodic Testing of Electric Power and Protection Systems."
- Proposed Final Amendment to 10 CFR 50.55a to Incorporate by Reference Subsections IWE and IWL, Section XI, Division 1, of the ASME Boiler and Pressure Vessel Code.
- Proposed Amendment to 10 CFR Part 54 "Requirements for Renewal of Operating License for Nuclear Power Plants."
- Proposed Rulemaking—Revision to 10 CFR Parts 2, 50, and 51 related to decommissioning of nuclear power reactors.
- Proposed Rulemaking on reporting reliability and availability information for risk-significant systems and equipment.
- Proposed Final Rule Change to 10 CFR 50.36, "Technical Specifications."
- Proposed Final Generic Letter 95–XX, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes."
- Proposed Final Rule and Regulatory Guide for fracture toughness requirements for Light Water Reactor pressure vessels.
- Proposed Final Revisions to Appendix J of 10 CFR Part 50, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors."
- Proposed Final Policy Statement on the use of probabilistic risk assessment methods in nuclear regulatory activities.
- Proposed resolution of Generic Issue 24, "Automatic ECCS Switchover to Recirculation."
- Health effects valuation.
- The Nuclear Energy Institute Petition for Rulemaking to Amend 10 CFR 50.48, "Fire Protection."
- Review of best-estimate models for evaluation of emergency core cooling systems performance.

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

CHAPTER 3

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

The Office for Analysis and Evaluation of Operational Data (AEOD) was created in 1979 to provide 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 events through the collection, review, analysis, and evaluation of 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's role was strengthened and expanded in 1987 to include responsibility for diagnostic evaluations conducted under the Diagnostic Evaluation Program, incident investigations conducted under the Incident Investigation Program, the Incident Response Program, and the Technical Training Center. The Diagnostic Evaluation Program, which has been discontinued, provided independent assessments of selected licensees to supplement information from other NRC programs. The Incident Investigation Program provides a structured NRC investigative response to significant operational events according to their safety significance. The Incident Response Program provides a coordinated NRC emergency response to ongoing events through the NRC Operations Center. The Technical Training Center provides initial and continuing technical training for NRC staff and contractors. AEOD also provides administrative and technical support to the NRC's Committee to Review Generic Requirements.

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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 (NMSS) 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. Part 1 of NUREG-1272 addresses power reactors, Part 2 covers nuclear materials, and Part 3 presents the NRC's technical training activities. The latest issue of NUREG-1272 is Volume 9, published in June 1996. This report provides greater detail on all the AEOD programs described below.

ANALYSIS OF REACTOR OPERATIONAL EXPERIENCE

Data Sources

AEOD collects, analyzes, and evaluates a wide range of operational data and publishes periodic Performance Indicator (PI), Accident Sequence Precursor (ASP), and Abnormal Occurrence (AO) reports, as well as technical studies on a variety of subjects. The 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;" licensee event reports (LERs) submitted to the NRC in accordance and 10 CFR 50.73, "Licensee event report system;" monthly operating reports submitted in accordance with plant Technical Specifications; and the data base of component failures in the Nuclear Plant Reliability Data System (NPRDS), a system managed by the Institute of Nuclear Power Operations (INPO). Other operational data include 10 CFR Part 21 reports, "Reporting of Defects and Noncompliance," NRC regional inspection reports, preliminary notifications of events or unusual occurrences issued by the NRC, and allegations.

AEOD employs foreign event data in its comparative studies of reactor operational experience. Reports of operational events received from the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development, from the International Atomic Energy Agency, and from bilateral exchange programs with over 20 countries supplement the domestic data. AEOD continues to review and assess foreign operational experience for applicability to nuclear power plants in the United States.

During fiscal year 1995 (FY 95), the AEOD staff and contractors reviewed about 40 reports of foreign events submitted to the NEA/Incident Reporting System (NEA/IRS). The NRC continued to participate in the NEA/IRS to share U.S. reactor operational experience with the world nuclear community. In FY 95 AEOD submitted 28 reports to the NEA/IRS (see Chapter 8, "International Cooperation").

Nuclear Reactor Safety Performance Trends

A subset of the information AEOD collects is used in the NRC Performance Indicator (PI) Program: (1) automatic scrams while critical, (2) safety system actuations, (3) significant events, (4) safety system failures, (5) forced outage rate, (6) equipment forced outages per 1000 commercial critical hours, (7) collective radiation exposure, and (8) cause codes. Industry-wide annual averages of the first seven of these indicators are used to monitor industry safety performance.

Since 1987 AEOD has monitored trends in overall safety performance of power reactors through the PI program. The PIs show a substantial reduction in safety-significant operational events since then. In 1995, the industry average number of scrams, safety system actuations, and significant events continued to decline slightly. Also, in 1994 and 1995, the number of safety system failures began to decrease after many years with no improvement. The 1995 data show, also for the first time, an indication that the industry average forced outage rate may be starting to improve. In contrast, there has been a leveling off of what had been steadily improving trends in the equipment forced outage rate and collective radiation exposure. And while average unit availability has improved considerably over the past nine years, this has been due not to fewer forced outage hours (which remained essentially constant until 1995), but to greatly reduced scheduled outage hours. This is a consequence of longer fuel cycles, which result in greater intervals between refueling outages, and of shorter refueling outages. These changes are in part the industry's response to the need to become more competitive. While the industry has made significant improvement in operational safety, problems with equipment failures continue, as evidenced by the percentage of scrams caused by equipment failure (the leading cause of all scrams), the leveling off of equipment forced outages per 1000 critical hours in 1994 and 1995, and the sustained high forced outage rate through 1994. 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 both the number and duration of forced shutdowns.

REACTOR SCRAMS

AEOD monitors automatic reactor scrams that occur while the affected reactor is critical. Reactor scrams can result from initiating events that range from relatively minor incidents to precursors of accidents. The annual industry average number of scrams has decreased each year since 1985. Equipment failures continue to be the leading cause of scrams. Of the scrams caused by equipment failure during FY 95, over half were initiated by problems in four systems: feedwater, main turbine and control, main generator, and electrical. Over half of all scrams in FY 95 occurred during normal plant operation, while most of the remainder occurred during testing and maintenance.

SAFETY SYSTEM ACTUATIONS

AEOD monitors a subset of engineered safety features actuations as safety system actuations (SSAs) in the PI Program. The SSA PI includes manual or automatic actuations of certain emergency core cooling systems, actuations of the emergency AC power system in response to low voltage on a vital bus. The annual industry average number of SSAs has declined steadily since 1991, with continued slight improvement in 1995.

SIGNIFICANT EVENTS

Significant Events (SEs) are those events that the NRC staff identifies for the PI Program as meeting one or more of the following criteria: (1) degradation of important safety equipment, (2) a major transient or an unexpected plant response to a transient, (3) degradation of fuel integrity, the primary coolant pressure boundary, or important associated structures, (4) a reactor trip with complications, (5) an unplanned release of radioactivity exceeding the Technical Specifications (TS) or regulations, (6) operation outside the TS limits, or (7) other events considered significant. The annual industry average number of significant events decreased in 1995.

SAFETY SYSTEM FAILURES

The Safety System Failure (SSF) PI includes any actual event or condition that could prevent the fulfillment of the safety function of any of 26 safety systems, subsystems, or components. For a system that consists of multiple redundant subsystems or trains, inoperability of all trains constitutes an SSF. Safety System Failures may be indicative of a plant's readiness to respond to anticipated events and postulated accidents. SSFs include unconditional failures (those events or conditions which render the system incapable of performing its safety function in all situations), and conditional failures (conditions that could, in certain specific situations, e.g., high energy line break or seismic event, prevent the system from performing its safety function). The annual industry average number of SSFs dropped by about one-third in 1994, and declined further in 1995, after remaining essentially constant for the previous three years. This decrease is attributed to several factors, including an improvement in the SSF definition, a reduction in the number of events reported in LERs, and a decline in SSF events discovered during design basis reconstitution efforts.

FORCED OUTAGE RATE

The Forced Outage Rate (FOR) PI is calculated by dividing the number of forced outage hours in a period by the sum of the generator online hours and the forced outage hours. Forced outages are defined as those outages required to be initiated by the end of the weekend following the discovery of the off-normal condition. The trend in FOR can provide a perspective on overall plant performance. The annual industry average FOR remained relatively constant from 1988 to 1994. The decrease in 1995 may be an indication that the FOR is beginning to improve, or it may simply be a reflection of variability in the indicator.

EQUIPMENT FORCED OUTAGES PER 1000 COMMERCIAL CRITICAL HOURS

The Equipment Forced Outage (EFO) PI is the number of forced outages caused by equipment failures in each 1000 hours that the reactor is critical after entering commercial operation. The EFO rate is the inverse of the mean time between forced outages caused by equipment failures. AEOD monitors the EFO rate as an indicator of the effects of equipment problems on overall plant performance. The annual industry average EFO rate improved from 1991 through 1993, but has leveled off since then.

COLLECTIVE RADIATION EXPOSURE

Although the NRC receives radiation exposure data on an annual basis, INPO routinely collects the data on a quarterly basis. AEOD uses the INPO data in the Performance Indicator Program to avoid duplication of effort. The annual industry average collective radiation for 1995 was unchanged from 1994.

Reactor Operational Experience Feedback

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 FY 95, 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 ACTIVITIES TO IDENTIFY AND ADDRESS SAFETY ISSUES

AEOD uses a systematic process to nominate, prioritize, and select safety issues to be studied, with emphasis on broad-based, programmatic issues and the industry's follow-up 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 operating 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 operating experience.

AEOD staff also continued efforts to more effectively communicate the lessons of operating 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.

AEOD REPORTS

Based on its review and analysis of operational data, AEOD issued five reports during FY 95 that were broadly distributed within both the NRC and the regulated industry. These reports, which are publicly available, are listed in Table 1 and summarized in the following paragraphs.

Table 1. AEOD Reactor Reports Issued During FY 95

Date	Title	No.	Author
Special Studies			
10/94	Operating Experience Feedback Report—Reliability of Safety-Related Steam Turbine-Driven Standby Pumps	NUREG–1275, Vol. 10 [AEOD/94–01]	J. Boardman
03/95	Reactor Coolant System Blowdown at Wolf Creek on September 17, 1994	S95–01	J. Kauffman S. Israel
Engineering Evaluations			
07/95	Operating Events With Inappropriate Bypass or Defeat of Engineered Safety Features	E95–01	J. Kauffman
Technical Reviews			
12/94	Potential for Boiling Water Reactor Emergency Core Cooling System Strainer Blockage Due to Loss-of-Coolant Accident Generated Debris	T94–04	J. Boardman
03/95	Major Disturbances on the Western Grid and Related Events	T95–01	M. Wegner

Operating Experience Feedback Report—Reliability of Safety-Related Steam Turbine-Driven Standby Pumps (NUREG–1275, Vol. 10, [Special Study Report AEOD/S94–01]). This study was conducted to review operational failures of auxiliary feedwater (AFW), high pressure coolant injection (HPCI), and reactor core isolation cooling (RCIC) pump turbine assemblies installed in U.S. commercial nuclear power plants. The purpose of the study was to gather and review available data on failures of standby turbine-driven pumps (TDPs) to identify failure mechanisms and corrective actions for feedback to the NRC staff and to industry. There have been recurring problems with the reliability of these turbine assemblies despite 71 NRC and industry generic communications and studies on the subject in the past 16 years, Institute of Nuclear Power Operations (INPO) seminars in February 1981 on inadequate TDP reliability, and a February 1990 Nuclear Management and Resources Council letter to the NRC Executive Director for Operations which included these standby turbines on a list of problem components.

Most HPCI, RCIC, and AFW TDPs have as their drivers Terry steam turbines designed to reach their required speed in 60 to approximately 120 seconds from cold shut-down. This is called a "cold quick-start." Leaking steam inlet valves aggravate the situation by allowing condensed steam to contaminate the turbine lubricating oil (frequently used as the hydraulic fluid for the governor and actuator, for which a primary failure cause is water-contaminated oil). These conditions can cause accelerated deterioration of turbines and governors in a standby mode, resulting in failures that are not identifiable until startup.

The results of this study confirmed the continuing validity of earlier NRC and industry studies which have shown that the most significant factors in failures of standby TDPs have been the failures of the turbine drivers and their controls. Turbine failures during cold quick-start transients appear to be due primarily to governor response, the coordination of the opening of governor valves and steam inlet valves, and condensate in turbine steam supply lines. These recurring problems have as their apparent cause the failure to perform the preventive maintenance identified at the INPO seminars and in manufacturers' guidance, including specified periodicities. Enhancement of standby turbine reliability appears to be achievable by better industry-wide implementation of existing requirements and guidance for design, maintenance and operation of the turbine assemblies.

AEOD staff found that the demand failure probability for the AFW TDP was 6.5×10^{-2}, excluding maintenance unavailability, compared with a value from the Surry probabilistic risk assessment in NUREG–1150 of 1.1×10^{-2} for AFW. Failures were caused primarily by turbine overspeed trips. The staff found demand failure probabilities of 1.9×10^{-2} for the HPCI TDP pump and 1.3x10-2 for the RCIC TDP, again excluding maintenance unavailability. Failures were due to a turbine overspeed trip and a failed flow controller. The demand failure probability for both HPCI and RCIC at Peach Bottom in NUREG–1150 was 3.0×10^{-2}.

Reactor Coolant System Blowdown at Wolf Creek on September 17, 1994 (Special Study Report AEOD/S95-01). On September 17, 1994, with the reactor in Mode 4 on RHR cooling (350 psig and 300° F) and the pressurizer nearly solid, there was an inadvertent blowdown of about 9200 gallons of reactor coolant through the residual heat removal (RHR) system to the refueling water storage tank (RWST) at the Wolf Creek Nuclear Generating Station. This event occurred because of incompatible, concurrent activities involving borating one train of RHR and testing a valve in the other RHR train while cooling down to begin a refueling outage. The event was terminated in one minute by operator intervention; however, if the blowdown had continued unabated, RHR cooling could have failed in 3.5 minutes and the RWST header line would have filled with steam in 6 minutes. The licensee estimated that the core would have uncovered in 30 minutes if the flow path had not been isolated.

All of the emergency core cooling system (ECCS) pumps take their suction from the RWST header line. If the ECCS pumps were turned on after six minutes to mitigate an unabated blowdown through this path, there could be a common-mode failure of the pumps to operate caused by a steam-filled RWST header line. The ECCS pumps could also fail due to pressure pulses caused by cold RWST water collapsing the steam in the RWST header line. These pumps are the normal means of mitigating such a blowdown. If they all failed, successful mitigation of the event would depend on the control room operators' cognitive abilities to establish an alternate mitigation scheme. If core damage did occur, there would be a potential for significant offsite doses because the blowdown path bypassed the reactor containment.

The staff attributed this event to three causes:

(1) *An unrecognized design vulnerability*—an RHR-RWST connecting line was designed for operational convenience for refilling the RWST after a refueling outage, not for safety purposes.

(2) *Inappropriate use of the RHR–RWST connecting line*—The licensee inappropriately used the RHR-RWST connecting line to increase the boron concentration of an RHR train. (Other boration paths existed that would not have exposed the plant to this hazard.)

(3) *Inadequate work control*—The licensee was deficient in the control of maintenance and operational evolutions by allowing incompatible activities to occur simultaneously while in a degraded safety mode on RHR cooling.

The NRC issued Information Notice No. 95-03, "Loss of Reactor Coolant Inventory and Potential Loss of Emergency Mitigation Functions While in a Shutdown Condition," to inform all reactor licensees of the circumstances and potential consequences of the Wolf Creek event. The event was characterized by the Accident Sequence Precursor methodology as the most risk-significant event of 1994, with a conditional core damage probability of $3.0x10^{-3}$, and was reported to Congress as an abnormal occurrence.

Operating Events With Inappropriate Bypass or Defeat of Engineered Safety Features (Engineering Evaluation Report AEOD/E95-01). AEOD staff evaluated events involving operator control of engineered safety feature (ESF) equipment. Appropriate control of ESFs is an essential element of reactor safety, as evidenced by the Three Mile Island Unit 2 and Chernobyl Unit 4 accidents, in which operators defeated ESFs that could have prevented or mitigated the accidents. The accidents and literature on human error show that operator recovery from an inappropriate ESF defeat is not certain.

For the nine events included in this study, recovery from operator defeat of the ESF occurred prior to any serious safety consequences. If any of these events had continued, the recovery guidance in emergency operating procedures would likely have led operators to attempt to restore the ESF function. Nevertheless, these events are precursors to more serious events and indicate weaknesses in operator control of ESFs. Strengthening these weak areas offers the opportunity for better operator control of ESFs.

The AEOD staff review indicates that there continue to be instances where management has not consistently determined, communicated, and implemented a policy defining when it is and is not appropriate to bypass, defeat, or turn off a safety system. This is evidenced by the following findings:

1. Procedures and other written guidance sometimes did not provide clear, consistent guidance to address situations where safety systems should be throttled, bypassed, turned off or reconfigured, and when they should be reset or reinitiated.

2. Operators were not consistently fully knowledgeable of emergency operating procedures, their bases, and appropriate ESF control practices in that some operators had difficulty in using procedures during routine, uncomplicated events.

3. Poor watchstanding practices in the areas of communications, shift turnovers, control board walkdowns, verification of automatic actions, and response to alarms contributed to inappropriate ESF defeats and delayed their recognition and recovery.

Potential for Boiling Water Reactor Emergency Core Cooling System Strainer Blockage Due to Loss-of-Coolant Accident Generated Debris (Technical Review Report AEOD/T94-04). This report addresses the status of the issue of blockage (clogging) of BWR emergency core cooling system strainers following a loss-of-coolant accident which was previously addressed in Unresolved Safety Issue (USI) A-43, "Containment Emergency Sump Performance," January 1979. AEOD performed an independent review of events and activities (including the event at Barsebäck in 1992) which have occurred since the closure of USI A-43, to determine if additional or more expeditious actions are needed. Based on that review, and the present estimated core damage frequency attributed to this issue of between $4.2x10^{-6}$ and $2.5x10^{-5}$ per plant year, the staff found that progress toward resolution of this issue appeared to be commensurate with other complex safety issues of the same relative risk, such as station blackout, loss of shutdown cooling, and motor-operated valve operability. The NRC issued Bulletin 95-2, "Unexpected Clogging of Residual Heat Removal (RHR) Pump Strainers While Operating in the Suppression Pool Cooling Mode," prepared a proposed Bulletin, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris," and prepared a proposed Revision 2 of Regulatory Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident."

Major Disturbances on the Western Grid and Related Events (Technical Review Report AEOD/T95-01). Shortly after midnight on December 14, 1994, a line fault, caused by a contaminated insulator flashing over in a heavy fog in Idaho, tripped a major 345 Kv transmission line. The parallel 345 kV line opened and a third 345 kV line in the area opened shortly afterward. Some seconds later, the three 500 kV lines from Midway to Vincent stations in California tripped on overload. Diablo Canyon Units 1 and 2 saw undervoltage on the reactor coolant pump buses and the reactors automatically tripped. After the loss of about 2169 MW from Diablo Canyon, 30 high voltage lines and 29 generating plants tripped. More than 4800 MW of load was lost and the Western grid split into four islands, each of which experienced frequency disturbances.

Palo Verde experienced a five minute transient that the licensee called "a roller coaster ride," during which the frequency increased to 60.4 Hz then dipped to 59.3 Hz before it recovered. Information from Washington Nuclear Power Unit 2 indicated that the main generator output voltage, frequency, and power fluctuated. The reactions of the Western grid in response to the transient appear to have been appropriate to the transient.

ALLEGATIONS

The NRC receives allegations from individuals or organizations who assert some impropriety or inadequacy in activities regulated by the NRC. Allegations received from nuclear power plant 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 alleger. Each allegation may contain one or more individual concerns, and no differentiation is made in the data for the varying levels of safety significance of the allegations.

ANALYSIS OF NUCLEAR MATERIALS EXPERIENCE

AEOD conducts an independent review and evaluation of the operational experience of programs involving the use of materials licensed by the NRC and the Agreement States, such as reactor-produced isotopes, natural and enriched uranium, and other special nuclear materials. The primary concern with the use of these materials is the potential for overexposure which can cause cancer or, in severe cases, death.

Nuclear Material Events Data Base

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, as required by Title 10 of the Code of Federal Regulations (10 CFR), comparable Agreement State regulations, or license conditions. NRC licensees submit reports directly to 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. In addition, the NRC obtains reports of events from other sources, such as NRC inspection reports, and occasionally from non-licensees, including members of the public.

Reportable nuclear materials operating events include (1) medical misadministrations of radiation or radiopharmaceuticals to patients, (2) personnel 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 transportation of licensed material, (8) problems in fuel cycle facilities, and (9) problems at nonpower reactors.

In 1993 AEOD developed a new database called the Nuclear Materials Events Database (NMED). In developing the data base structure, AEOD solicited and received substantial input from the NRC Headquarters Offices of Nuclear Materials Safety and Safeguards (NMSS) and Nuclear Regulatory Research (RES), the regional offices, and the Agreement States. The NMED contains about 12,480 detailed records of reported events. (Agreement State data are available only from 1991 on.) The NMED contains records of materials events for all categories of materials licensees, including non-power reactors. Radiation overexposure events for commercial power reactors are also maintained in the NMED.

In previous annual reports, nuclear materials data were presented for the prior calendar year because of the delay in obtaining the data from the Agreement States. For example, the FY 94 NRC Annual Report included data for calendar year 1993. The NMED now provides the capability to maintain nuclear materials data current, with regular, periodic updates from Agreement States. Therefore, this annual report contains data for calendar year 1994 and the first nine months of 1995, to cover the time period from the FY 94 report. Future reports will include data for the then current fiscal year.

Nuclear Materials Performance

In 1994 and the first nine months of 1995, the NRC received reports of 1058 events from nuclear materials and nonpower reactor licensees—614 from NRC licensees and 444 from Agreement States. (Each report may result in more than one event; for example, an equipment problem may cause an overexposure, in which case, two events would be assigned to that report. The number of reports is therefore smaller than the number of events.) Because licensees submit revisions, late reports, or retractions, minor changes may occur in the data published from year to year.

MEDICAL MISADMINISTRATIONS

The NRC regulates approximately 2000 licensees in 21 states, the District of Columbia, and U.S. territories, that use radionuclides in radiation therapy and nuclear medicine applications. These licensees include hospitals, clinics, and physicians in private practice. Such facilities submitted reports of 49 events that resulted in misadministrations during 1994 and the first nine months of 1995. The 29 Agreement States, which regulate about 5000 medical licensees, submitted reports of 20 events that involved misadministrations during the same period. Misadministration events that demonstrate a major failure of the radiation safety program or result in an adverse health effect to a patient are reported to Congress as Abnormal Occurrences. Of the 69 misadministration events, 26 were reported by the NRC to Congress as Abnormal Occurrences (two of these events were reported with the same Abnormal Occurrence number because they involved the same type of error at the same facility within a week of each other).

For both NRC and Agreement State licensees, the majority of the reported medical misadministrations involved brachytherapy treatment. Sodium iodide events are the second most frequent type of misadministration among NRC licensees and the third most frequent among Agreement State licensees. Misadministrations involving brachytherapy and sodium iodide most often result in overdoses rather than underdoses.

The primary causes of the reported misadministrations were (1) the use of an incorrect factor in calculating a therapeutic dose, (2) misunderstanding of the physician's request, (3) source migration, (4) not following the Quality Management plan, (5) incorrect entry of data into the automated equipment, and (6) sources improperly loaded into the applicator. As part of the response to medical misadministration events, the NRC issued nine Information Notices to inform licensees of these events.

RADIATION OVEREXPOSURE

NRC and Agreement State licensees reported 28 events during 1994 and the first nine months of 1995 that resulted in overexposures to 57 people. NRC licensees reported 9 events which overexposed 11 people, and Agreement State licensees reported 19 events which overexposed 46 people. Four of the 28 events resulted in multiple overexposures; three of the four caused multiple overexposures to members of the public, and the fourth was a radiography event in which two workers exceeded their annual exposure limit. Four overexposure events (only one of which was a multiple overexposure) met the criteria for reporting to Congress as Abnormal Occurrences.

Among NRC licensees, research/commercial users reported the most overexposure events and individuals overexposed. Agreement State industrial radiography licensees reported the most overexposure events, but research/commercial users reported the most individuals overexposed. (Agreement States have approximately three times as many industrial radiography licensees as does the NRC.)

The primary causes of the overexposures to both medical/academic and research/commercial licensees included failure to ensure that adequate dosimetry was issued and monitored, and failure to wear adequate protective clothing in areas containing radioactive particles. There were several direct causes of overexposure events involving industrial radiographers, including failure to conduct the required radiation surveys, failure to set up or monitor posted radiation boundaries, failure to follow established emergency procedures, and the lack of supervision of untrained assistants. As a part of the response to overexposure events, the NRC issued four information notices to inform licensees of these events.

OTHER NUCLEAR MATERIALS EVENTS

Other nuclear materials events included loss of control of licensed material, leaking sources, release of material, transportation events, equipment problems, fuel cycle facility events, and test, research, and training reactor events. In 1994 and the first nine months of 1995 the NRC received reports of 556 such events from NRC licensees and 405 events from Agreement States. One equipment problem, one loss of control of material, and one transportation event resulted in overexposures which met the criteria for reporting to Congress as Abnormal Occurrences. Another equipment problem resulted in a misadministration which met the criterion for reporting as an Abnormal Occurrence. A third equipment problem caused a release of material which was also reported to Congress as an Abnormal Occurrence.

Nuclear Materials Operating Experience Feedback

Based on its review and analysis of operational data, AEOD issued two reports on nuclear materials issues during 1995 that were distributed within the NRC and the industry. These reports, which are publicly available, are summarized below.

Human Performance Evaluation of Industrial Radiography Exposure Events (INEL-95-0387). AEOD contracted with the Idaho National Engineering Laboratory (INEL) to perform a human factors review of radiography overexposure events using data in the NMED. The purpose of the study was to develop better information on the causes, and ways to minimize the occurrence, of radiation overexposures. The data show that industrial radiography overexposures account for a significant number of the overexposures reported to the NRC and for most of the acute overexposures that have resulted in physical injury. This is especially significant because radiography licensees account for less than 10 percent of all NRC and Agreement State licensees. While the direct cause of most radiography overexposures generally can be ascribed to "failure to use survey meters," underlying causes of radiographer overexposures are not always documented.

The major findings from the study are the following:

(1) The primary factors contributing to radiography overexposures are procedural errors, equipment problems, and external factors, such as supervision and area control.

(2) Errors were found to commonly occur in the setting-up of equipment before the radiograph.

(3) Reported data describing radiography exposure events are sparse and lack many of the details needed for rigorous human factors evaluation.

Misadministrations and Other Medical Events Caused by Computer Errors. The NRC sponsored a study at the Lawrence Livermore National Laboratory of events involving computer errors that resulted in misadministrations. The lab analyzed the 22 events involving 172 patients that were reported to the NRC by NRC licensees and Agreement States. The analysis addressed treatment planning and dose delivery systems. The patient risk associated with these types of misadministrations was determined to be about the same as for those not involving computer errors. The major findings of the study are as follows:

- The number of computer-based misadministrations per year has been increasing, based on the number of events reported to the NRC from 1981 through 1993.
- The number of reported misadministrations involving the treatment planning process has been higher than that associated with the dose delivery process.
- Events resulting in reported misadministrations to multiple patients occur more often

in computer-based radiation therapy processes than in manual therapy.

- Nearly three-quarters of the computer error-related medical misadministrations of byproduct material are directly linked to human errors and procedural deficiencies.
- Nearly one-half of the events have involved user interface deficiencies.
- In none of the events evaluated did the software or the hardware limit the consequences of a misadministration.

The NRC issued an NMSS News Letter article in NUREG/BR-0117, No. 95-4, Dec. '95/Jan. '96 informing licensees of the findings of the study.

RADIATION EXPOSURES FROM REACTORS AND NONREACTORS

According to the National Council on Radiation Protection and Measurements, the average total effective dose equivalent to a person in the United States is approximately .36 centiSieverts (cSv) (360 millirem [mrem]) per year, mostly from natural sources of radiation. The average person in the United States receives an effective dose equivalent of about 0.05 cSv (50 mrem) per year from medical applications. The entire fuel cycle, including operation of reactors, contributes less than 0.001 cSv (1 mrem) per year. All other human-controlled sources of radiation combined add up to an effective dose equivalent of approximately 0.006 cSv (6 mrem) per year.

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, low-level radioactive waste disposal, and independent spent fuel storage and processing, 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.

Almost all radiation doses from nuclear power plants are occupational doses, that is, doses to nuclear power plant 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 nuclear power plant personnel have annual exposures far below NRC regulatory limits specified in 10 CFR Part 20. The mean value of occupational radiation exposure has been reduced from .94 cSv (940 mrem) per worker in 1973 to .29 cSv (290 mrem) per worker in 1994. This reduction is 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.

Nonoccupational doses from operation of nuclear power plants have declined faster than occupational doses. In 1975, nonoccupational collective exposures were approximately 6.5 percent of occupational doses. By 1990, the nonoccupational collective doses were less than 0.2 percent of occupational exposures. The calculated annual offsite dose commitments are reported annually in NUREG/CR-2850, "Population Dose Commitments Due to Radioactive Releases From Nuclear Power Plant Sites."

Exposure data for 1994 show that, of the six categories of licensees that are required to report collective exposures for monitored individuals, reactor licensees, by virtue of the large number of employees, had the highest annual collective exposure, followed by radiographers, fuel fabrication licensees, and manufactures and distributors. Low-level waste disposal and independent spent-fuel storage licensees had relatively low collective doses. On a dose-per-worker basis, however, industrial radiographers received the highest exposure.

Nevertheless, for all categories of licensees including radiographers, the dose-per-worker is far below the allowable limits established in 10 CFR Part 20.

ABNORMAL OCCURRENCES

The NRC prepares periodic reports to Congress of abnormal occurrences (AOs) involving facilities and activities regulated by the NRC. (In December 1995, Public Law 104-66 changed the AO reporting frequency from quarterly to annually.) An AO is defined as an unscheduled incident or event that the Commission determines to be significant from the standpoint of public health or safety. AEOD is responsible for preparing the NRC's "Report to Congress on Abnormal Occurrences" (NUREG-0900). (These reports may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Post Office Box 37082, Washington D.C. 20420-9328, or the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161. Copies are also available for public inspection or copying for a fee at the NRC Public Document Room, 2120 L Street (Lower Level), N.W., Washington D.C. 20555, or at local public document rooms throughout the country. See Appendix 4 for a list of local public document rooms.)

The five AO reports published in FY 95 (NUREG-0090, Vol. 17, Nos. 3 and 4, and Vol. 18, Nos. 1, 2, and 3) described 3 AOs at nuclear power plants, 15 AOs at other NRC licensees, and 10 AOs reported by Agreement States (see Table 2). The reports also provided updates of certain AOs previously reported as well as descriptions of Other Events of Interest.

RISK AND RELIABILITY ANALYSIS

Accident Sequence Precursor Program

The Accident Sequence Precursor (ASP) Program uses probabilistic risk assessment (PRA) techniques to evaluate the conditional core damage probabilities associated with nuclear power plant events or conditions. The principal objectives of the program are to quantify and rank the safety significance of operating reactor events, to determine their generic implications, to characterize risk insights, and to document and disseminate the evaluations for feedback to plant operators to promote learning from experience.

An accident sequence precursor is an operational event or plant condition that is an important element of a postulated accident sequence associated with inadequate core cooling, a sequence which would be expected to result in core damage. The ASP methodology evaluates disparate elements of operational experience, with random failure probabilities used for other branches of the event tree models. The figure of merit for ASP analyses is conditional core damage probability (CCDP). Events with CCDPs greater than $1x10^{-6}$ are considered accident sequence precursors.

The results of the ASP analyses are considered indications of the level of risk associated with operating nuclear power plants based on direct assessment of actual operating experience. The precursor events from the ASP Program comprise a unique database of historical system failures, multiple losses of redundancy, and infrequent core damage initiators. Several of the recorded precursor events involved equipment failure caused by factors, conditions, or phenomena that affected the ability of safety equipment to perform its function. These mechanistic failures are different from "random" failures or unavailabilities of equipment.

The results of the ASP analysis of 1994 operational events are shown in Table 3. There were 11 precursors in 1994, as a result of 9 events or conditions (11 different units were affected). Consistent with current practice in the ASP Program, the preliminary ASP analyses of 1994 operational events were reviewed by the affected licensees, the NRC staff, and an independent NRC contractor, Sandia National Laboratories. Based on the comments received from these reviewers, the analyses were revised as necessary to provide more accurate risk assessments of the events. Details of the analyses may be found in NUREG/CR-4674, Volumes 21 and 22, published in December 1995.

Table 2. Abnormal Occurrences Reported During FY 1995

NRC LICENSEES

94–15	Sodium Iodide Event	03/09/94	Welborn Memorial Baptist Hospital Evansville, IN	Moderate exposure to radioactive material.
94–16	Teletherapy Misadministration	07/21–22/94	Medical Center Hospital Chillicothe, OH	Irradiation of wrong part of the body.
94–17	Sodium Iodide	07/06/94	St. Joseph Mercy Hospital Pontiac, MI	Overdose to treatment site.
94–18	Multiple Teletherapy Misadministrations	07/28–08/03/94	Sinai Hospital Detroit, MI	Irradiation of wrong part of the body.
94–19	Brachytherapy Misadministration	07/29/94	University of Massachusetts Medical Ctr. Worcester, MA	Underdose to treatment site.
94–20	Core Shroud Cracking	10/93–Present	Boiling Water Reactors; Intergranular stress corrosion cracking of core shrouds.	Although no adverse consequences are expected at currently observed levels of shroud cracking, it has been postulated that a 360-degree through-wall core shroud crack in concert with a loss-of-coolant accident has the potential to lead to core damage.
94–21	Radiopharmaceutical Diagnostic Misadministration	10/88–6/93	Ball Memorial Hospital Muncie, IN	Recurring incidents of administering higher doses than procedurally allowed for diagnostic imaging.
94–22	Radiopharmaceutical Diagnostic Misadministration	08/09/94	Veterans Medical Center Long Beach, CA	Administering the wrong radiopharmaceutical for a diagnostic study.
94–23	Brachytherapy Misadministration	08/03/94	N. Memorial Medical Center Robbinsdale, MN	Irradiation of wrong part of the body.
95–1	Brachytherapy Misadministration	11/18/94	Welborn Memorial Baptist Hospital Evansville, IN	Overdose to treatment site.
95–2	Reactor Coolant System Blowdown	09/17/94	Wolf Creek Nuclear Generating Station Burlington, KS	Inadvertent blowdown which could have uncovered the core, disabled the emergency core cooling system pumps, and led to core damage.

Table 2. Abnormal Occurrences Reported During FY 1995 (continued)

NRC LICENSEES (continued)

95–3	Previously Unidentified Containment Bypass Path	12/06/94	Millstone Nuclear Power Station Unit 2 New London, CT	Identification of a condition which established a potential path for the release of radioactivity to the atmosphere.
95–4	Brachytherapy Misadministration	03/14/95	University of Virginia Medical Center Charlottesville, VA	Irradiation of wrong part of the body.
95–5	Radiopharmaceutical Therapeutic Misadministration	05/09/95	Massachusetts General Hospital Boston, MA	Overdose to treatment sites.
95–6	Brachytherapy Misadministrations	02/94–05/95	Madigan Army Medical Center Fort Lewis, WA	Overdoses or underdoses to treatment sites.
95–7	Brachytherapy Misadministration	06/08/95	Marshfield Clinic Marshfield, WI	Overdose to treatment site.
95–8	Brachytherapy Misadministration	07/25/95	Providence Hospital Southfield, MI	Irradiation of wrong part of the body.
95–9	Ingestion of Radioactive Material	06/28/95	National Institutes of Health Bethesda, MD	Ingestion of radioactive material by 27 research employees from an unknown cause.

AGREEMENT STATES

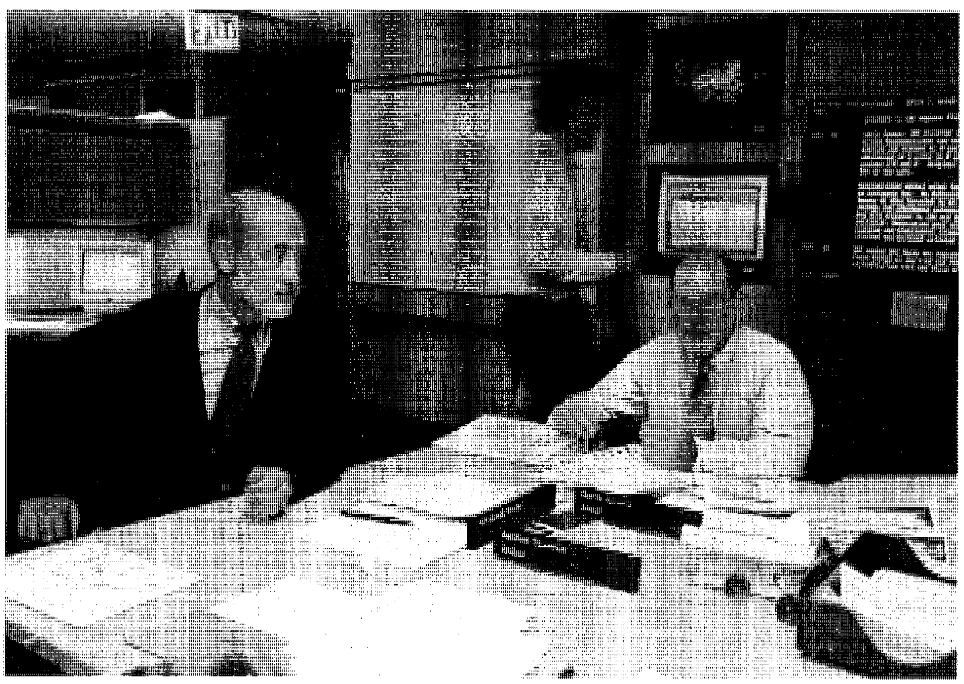
AS 94–6	Loss of Management and Procedural Control of a Radioactive Source	01/93–04/93	Georgia–Pacific Paper Mill Palatka, Florida	An incident with implications for similar facilities that created a major safety concern. A series of events, recurring incidents, and incidents with implications for similar facilities that create a major safety concern.
AS 94–7	Breached Source	04/21/94	Kay–Ray/Sensall, Inc. Mount Prospect, IL	Major contamination event.
AS 94–8	Brachytherapy Misadministration	10/17/94	St. Joseph's Hospital, Orange, CA	Irradiation of wrong part of the body.

Table 2. Abnormal Occurrences Reported During FY 1995 (continued)

AGREEMENT STATES (continued)

AS 94–9	Brachytherapy Misadministration	12/07/93	University of California's Long Hospital San Francisco, CA	Overexposure was due to data entry error.
AS 94–10	Teletherapy Misadministration	05/10/93	New York State Department of Health "Unspecified Licensee" (Information omitted by State Law)	Irradiation of wrong part of the body.
AS 95–1	Teletherapy Misadministration	05/23–26/93	"Unspecified Licensee", New York, NY (Information omitted by State Law)	Irradiation of wrong part of the body.
AS 95–2	Brachytherapy Misadministration	03/14/95	Irvine Medical Center, Irvine, CA	Irradiation of wrong part of the body.
AS 95–3	Overexposure of Personnel Involved in Brachytherapy Treatment	04/06/95	Gwinnett Medical Center, Lawrenceville, GA	Overexposure of personnel from mistake made in handling a radioactive source.
AS 95–4	Brachytherapy Misadministration	07/28/94	Southwest Texas Methodist Hospital, San Antonio, TX	Overexposure of patients was due to administering radiation from the wrong source.
AS 95–5	Importation of a Package Having Excessive External Radiation into the the United States from Republic of Korea	12/20/94	Omnitron International, Inc. Edgerly, LA	At least 32 people were exposed to high radiation because package contained radioactive material which was not secured in a shielded position.

The Executive Team and Chairman Jackson Receive a Briefing from the Protective Measures Team Director



The Reactor Safety Team Independently Evaluates the Status of the Reactor and Containment

The Wolf Creek reactor coolant system blowdown event is the first precursor with a CCDP in the 10^{-3} range since the 1991 Shearon Harris high pressure injection relief valve failure. The next previous precursor with a CCDP in the 10^{-3} range occurred in 1986. The results of the Wolf Creek analysis were strongly influenced by uncertainty in assumptions about (1) human reliability, (2) the ability of the operators to recover ECCS systems given the effort involved and the relatively short time available, and (3) the viability of the "reflux" cooling method, in which steam from a boiling core may be condensed in the steam generator tubes with the condensate draining back to the reactor. There was also significant uncertainty associated with the thermal-hydraulic behavior of the reactor coolant system under these conditions. As a result, there is large uncertainty in the estimated CCDP.

An analysis of the 1994 ASP results shows that two important trends continued. First, conditions or equipment unavailabilities are producing an ever greater share of the precursors as compared to initiating events. There were only two precursors involving initiating events at power in 1994 (down from eight in 1993), while there were six due to conditions or unavailabilities (versus eight in 1993). Second, electrical systems and components are involved in a significant fraction of the precursors. In 1994, six of the nine precursors involved electrical problems, although none involved a total loss of offsite power. For the previous four years (1990–1993), about 60% of the precursors involved electrical problems. See the following two figures showing Annual Industry Averages of events and CCDP results from the ASP program.

System Reliability Studies

The first two studies in a series of reliability and risk analysis reports were completed and issued in 1995 and early 1996. The purpose of the studies was to use operational data to determine the reliability of the risk significant systems in U.S. commercial reactors. The data are obtained from Licensee Event Reports (LERs), special reports, and monthly operating experience reports. The study period covered 1987 through 1993.

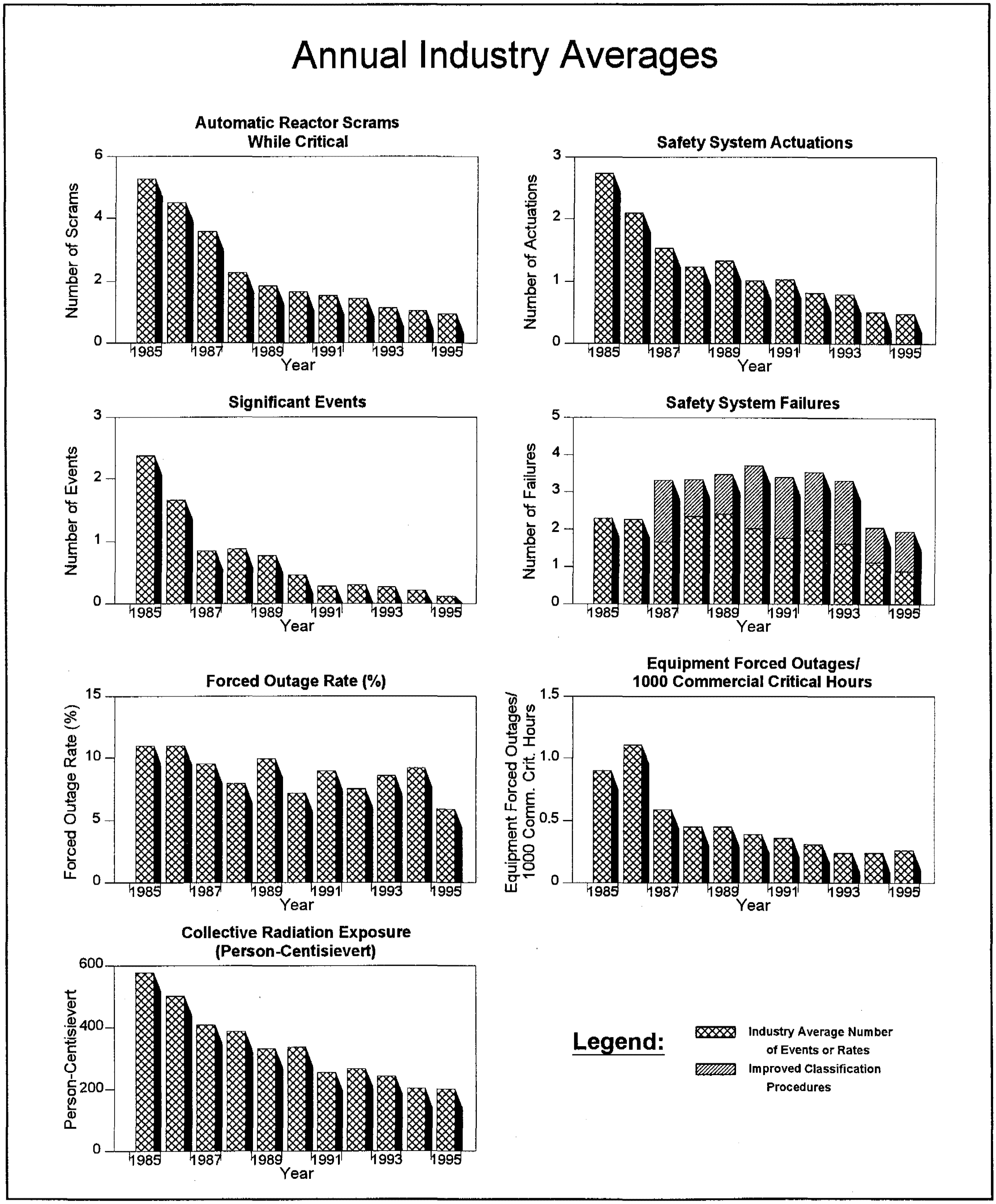
HPCI SYSTEM PERFORMANCE

This study addressed the performance of the high pressure injection (HPCI) system at the 23 operating boiling-water reactors (BWRs) which have a dedicated HPCI system. Notable findings include the following:

- The overall HPCI unreliability was determined to be just over 0.05, including credit for operator recovery. The unplanned demand and failure rates have steadily decreased while the overall unreliability has remained fairly constant (see the following figure of HPCI system trends).
- The dominant contributors to HPCI unreliability were failure to run and maintenance out of service. The failures to run were not recoverable by simple operator actions.
- The failures to start were recoverable, with a value of 0.08 before consideration of recovery, but 0.007 after recovery.
- The nature of the failures experienced during actual demands and full flow tests differed somewhat from those discovered during monthly surveillance tests, engineering and design reviews, and routine inspections.
- The observed unreliability for initial HPCI system injection is generally comparable with the values used in PRAs and IPEs. However, there were ten plants for which the PRA/IPE mean values were outside the uncertainty bounds of the means computed from operating experience.
- While some specific component age-related failures were identified, no correlation was found between the low power license date and either the plant-specific annual failure rate or the plant-specific unreliability.

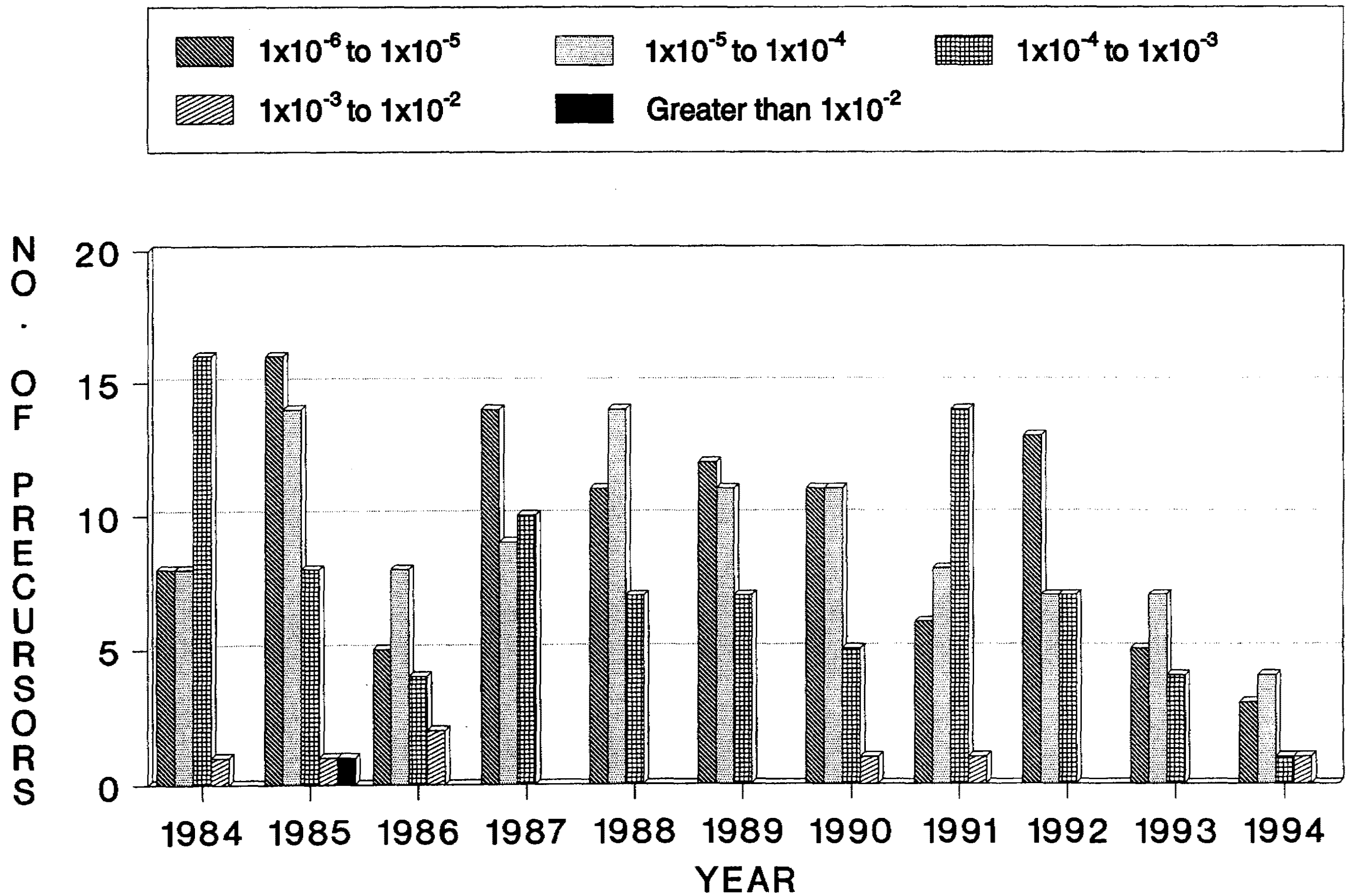
EMERGENCY DIESEL GENERATOR STUDY

The performance of the emergency diesel generator (EDG) trains was evaluated using the same techniques employed in the HPCI study. Because inconsistences exist in the available



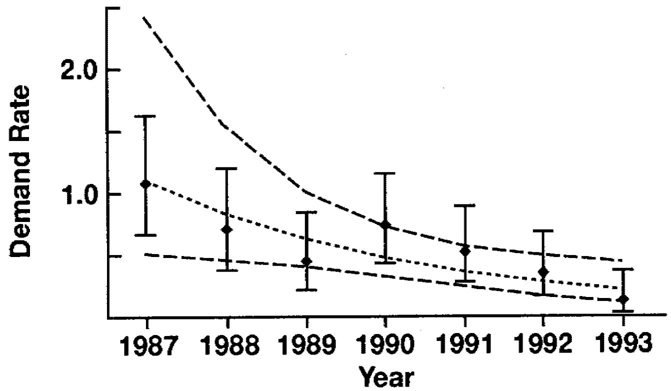
Annual Industry Averages by Calendar Year

CCDP RESULTS FROM ASP PROGRAM

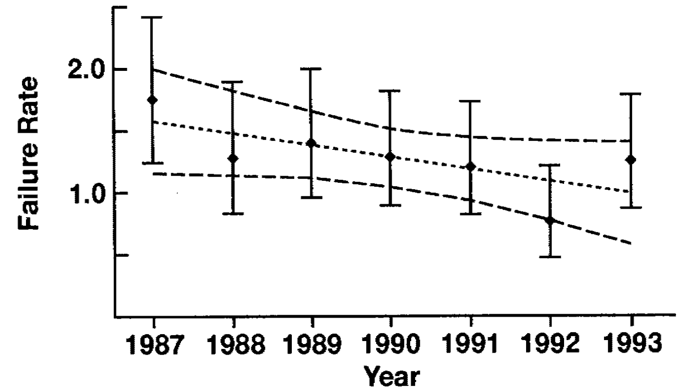


NOTE: CCDP FOR VOGTLE PRECURSOR OF 3/20/90 HAS BEEN ROUNDED UP FROM $9.7x10^{-4}$ AND PLOTTED AS $1.0x10^{-3}$.

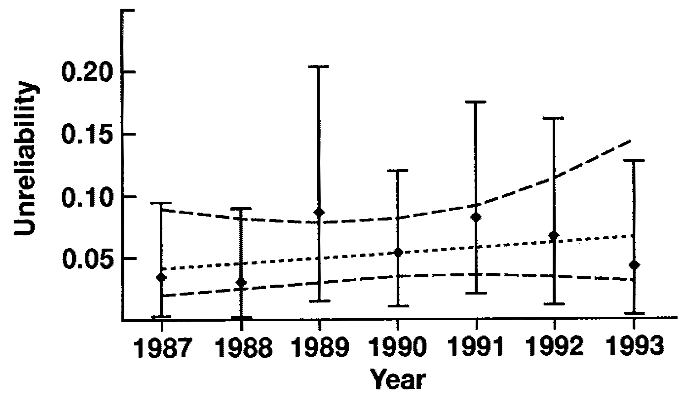
HPCI SYSTEM TRENDS



System Unplanned Demand Rate



System Failure Rate



System Unreliability

90% Interval
Fitted Trend
90% Conf. Band on the Fitted Trend

information between plants reporting under Regulatory Guide 1.108 (RG–1.108) and those that do not, this study focused primarily on the RG–1.108 plants, with limited analyses and comparisons for non-RG–1.108 plants. Notable findings include the following:

- The mean unreliability including recovery was 0.044 for the population of plants reporting under RG–1.108. The overall unreliability remained fairly constant over the 7 year study period, even though the rates of unplanned demands and failures were steadily decreasing (see the following figure of EDG train trends).

- Failures to start and maintenance out of service (MOOS) while at power were the dominant contributors to the EDG train unreliability for the plants reporting under RG–1.108, with the MOOS contribution accounting for 70 percent of the unreliability. The failures to start were not easily recoverable by simple operator actions.

- The mean failure to start unreliability, including recovery, was 0.01 and the mean failure to run unreliability was 0.004. However, the MOOS unreliability observed was four times higher than the value originally calculated in support of the station blackout rule (0.030 versus 0.007).

- No common cause failures of multiple EDG trains were observed during the unplanned demands reported by the RG–1.108 plants. In the larger population of test demands, some common cause failure events did occur.

- The observed mean unreliability was generally comparable with the values used in PRA/IPEs with mission times under 8 hours. The results indicate that PRA/IPEs may be overestimating the contribution of failure to run events for longer mission times.

- No correlation was found between the low power license date and the plant-specific unreliability for the plants reporting per RG–1.108. However, the plants licensed from 1980 to 1990 did experience higher failure rates than the plants licensed earlier, with most of these failures occurring during the first 2 years of operation.

- The nature of the failures experienced during actual demands by the plants reporting per RG–1.108 differed somewhat from those discovered during monthly surveillance tests, engineering and design reviews, and routine inspections.

Upcoming reports in this series include the isolation condenser, reactor core isolation cooling, and high pressure core spray systems at BWRs, and the auxiliary/emergency feedwater systems at PWRs. Planned future studies include the low pressure injection systems at both BWRs and PWRs. Simplified models of the various reactor protection systems for both PWRs and BWRs are also being developed to estimate their reliability based on recent actual operating experience.

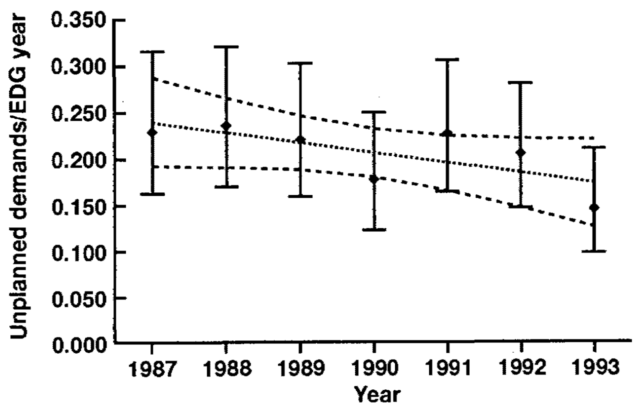
INCIDENT RESPONSE PROGRAM

Operations Center

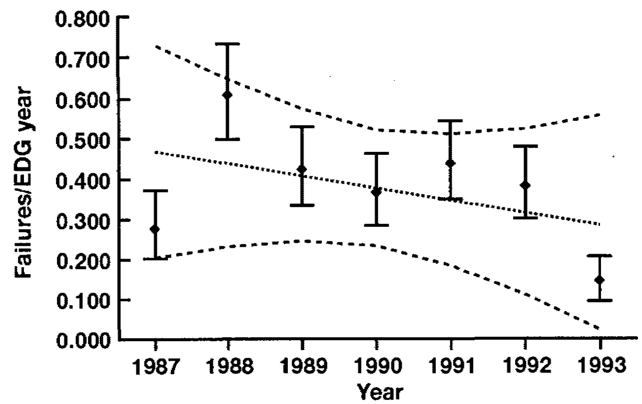
The NRC maintains an Operations Center in Rockville, Maryland, which is continuously staffed by a Headquarters Operations officer, who is a reactor systems specialist trained to receive, evaluate, and respond to all types of events. The Operations Center provides the focal point for NRC communications with Commission licensees, State agencies, and other Federal agencies regarding the events that occur in the commercial nuclear sector. The center features a state-of-the-art Operations Center Information Management System which integrates voice, video, and data subsystems to provide timely and effective information flow. In FY 95, this system received the 1994 Federal Technology Leadership Award for outstanding achievement in making government more effective through the use of information systems.

NRC licensees make telephone reports to the Operations Center of events or conditions that are required to be reported by 10 CFR 50.72, "Immediate notification requirements for operating nuclear power reactors." A few of these events meet the criteria for categorization into one of four emergency classes, as follows (in order of increasing severity): Unusual Event, Alert, Site

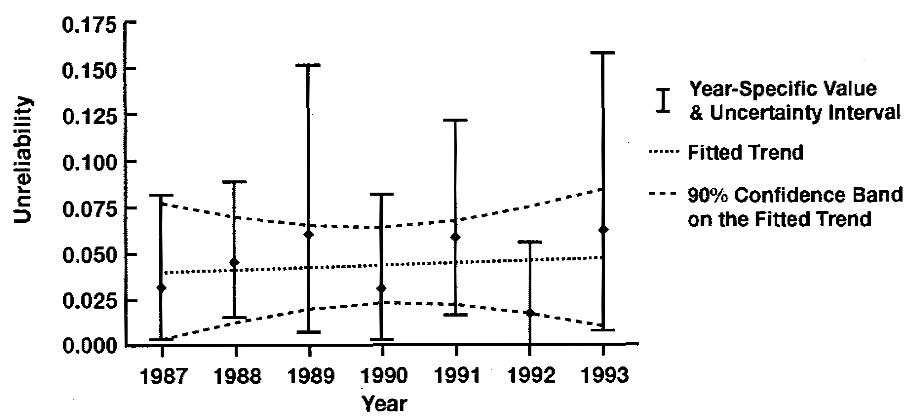
EDG TRAIN TRENDS



Train unplanned demand rate



Train failure rate



Train unreliability

Area Emergency, or General Emergency. An Unusual Event signifies a potential degradation of plant safety with no immediate threat to public health, while an Alert indicates substantial actual or potential degradation of plant safety. A Site Area Emergency or General Emergency indicates a major failure of one or more systems required for public safety or an event with the potential for a major offsite radiological release.

Actions taken by the NRC Headquarters Operations Officer in response to notifications of events ranged from computer and log entries followed by appropriate notifications, to establishing emergency conference calls among the licensee and senior NRC regional and headquarters staff. For four of the more significant events in 1995, these conference calls resulted in the employment of the Operations Center to monitor the progression of the event. These four events were an ammonia release at a chemical facility located in proximity to the Waterford Steam Electric Generating Station, high radiation levels in containment due to over-retraction of a traversing incore probe at LaSalle County Station, and Hurricanes Erin and Opal.

Emergency Exercises

Emergency exercises are held periodically to ensure that response organizations of the NRC, the licensees, the States, and other Federal agencies are proficient in dealing with each type of emergency. In 1995 the NRC headquarters and regional offices participated in full scale emergency preparedness exercises with four nuclear power plant sites. The NRC's main role in these exercises is to assist the licensee as requested, review the protective action recommendations licensees make to state and local authorities, and facilitate communications between licensees and these authorities. These exercises typically include a postulated accident scenario that goes well beyond the plant's design basis and that results in the release of some radioactivity outside the plant's boundary. During one exercise a simulated news media information center was established at the headquarters offices and senior NRC managers responded to questions regarding the event. Three limited participation emergency preparedness exercises with power reactor licensees and a table top emergency planning exercise with a uranium fuel fabrication facility were also conducted in 1995. The following two photographs show the executive and reactor safety teams as they review and evaluate plant status and licensee actions to determine the appropriate NRC response, including the appropriate guidance to offer State and local governments.

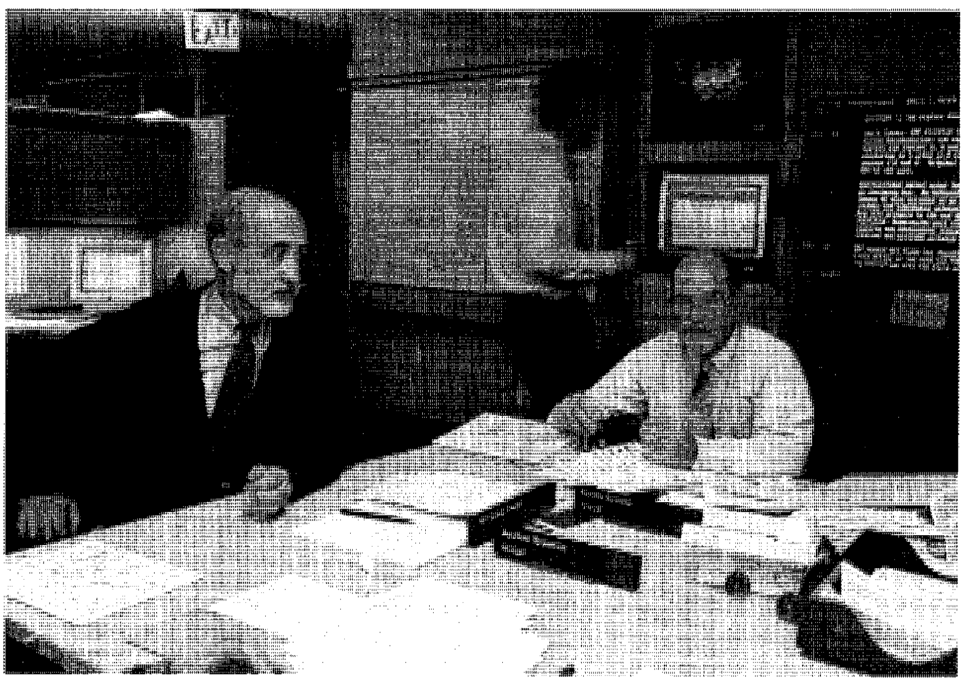
State Outreach

During 1995, AEOD conducted a State Outreach Program designed to increase and improve the NRC's interaction with States during events and exercises. It included briefings of State officials on the NRC Emergency Response Program, the Emergency Response Data System (ERDS), NRC/State liaison during an emergency, and financial assistance. The program also included eight exercises with 11 states, consistent with the goal to exercise with each State on a 3-year cycle. In addition, AEOD organized and conducted 1-1/2 day State Outreach Program training sessions in each NRC regional office, which included Federal organizations, licensees, and two representatives from each State with nuclear power plants. During 1995, the NRC negotiated an ERDS Memorandum of Understanding (MOU) with the State of Delaware, and the State of Vermont applied for an ERDS MOU. ERDS is a real time data system designed to provide direct transmission of selected plant information from licensees' onsite computers to the NRC Operations Center. These Memoranda of Understanding will enable States to receive ERDS data during events at nuclear power plants.

Coordination with Other Federal Agencies

The NRC continued to participate in the effort to revise the Federal Radiological Emergency Response Plan (FRERP). The FRERP, which is the plan that outlines the Federal response to radiological emergencies, has been undergoing a major revision by seventeen Federal agencies during the last two years. The NRC also participated in the effort to revise the Federal Response Plan (FRP), which is the master plan used by the Federal government to respond to any emergency in support of the affected States. The

The Executive Team and Chairman Jackson Receive a Briefing from the Protective Measures Team Director



The Reactor Safety Team Independently Evaluates the Status of the Reactor and Containment

FRP and the FRERP together outline the Federal response to a radiological emergency in a comprehensive manner. In addition, NRC representatives participated in meetings and working groups called for by these plans, such as the National Response Team, the Catastrophic Disaster Response Group, and the Federal Radiological Preparedness Coordinating Committee.

Gaseous Diffusion Process Activities

The President signed H.R. 776, the "Energy Policy Act of 1992," into law on October 24, 1992. Among other things, the Act amended the Atomic Energy Act of 1954 to establish a new government corporation, the United States Enrichment Corporation (USEC) for the purpose of managing and operating the uranium enrichment plants owned and previously operated by the Department of Energy (DOE). These enrichment plants are the Portsmouth Gaseous Diffusion Plant at Piketon, Ohio, and the Paducah Gaseous Diffusion Plant at Paducah, Kentucky. The Act further directed the NRC to establish a process whereby these two plants will be certified annually by the NRC for compliance with NRC standards. These standards, when implemented, will include those for emergency response to events at the plants.

During 1995, in preparation for the certification process for emergency response, AEOD participated in general gaseous diffusion process training and a round-table discussion on potential events and emergency response at the gaseous diffusion facilities. Participants included individuals from the Portsmouth and Paducah Plants, the USEC, DOE, and the NRC. Representatives from the USEC, DOE, and both the Portsmouth and Paducah Plants observed a drill in the Operations Center during October 1995. During the drill, gaseous diffusion process experts served on the NRC's Protective Measures Team.

INCIDENT INVESTIGATION PROGRAM

The Incident Investigation Program (IIP) is administered by AEOD to ensure that NRC investigations of significant operational events are timely, thorough, and systematic. The IIP includes investigations of events involving reactors and nuclear materials licensed by the NRC. The program is structured so that 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 (EDO) establishes an Incident Investigation Team (IIT) to investigate the event; for an event of less safety significance, the responsible NRC Regional Administrator may establish an Augmented Inspection Team (AIT) to investigate the event. Both IITs and AITs are tasked to determine the circumstances and causes of the event and to assess its safety significance so that appropriate followup actions can be taken. While AEOD is responsible for administration of the IIP, NRR is responsible for maintaining the procedures for AITs.

In FY 95, there were no events that were judged to have a level of safety significance sufficiently high to warrant an IIT investigation. There were, however, three AITs established to investigate the following significant incidents: (1) the operation of a bypass valve in the Reactor Water Cleanup System contrary to a procedural caution at Washington Nuclear Project No. 2, (2) a switchgear fire and loss-of-offsite power at Waterford Steam Electric Generating Station, and (3) internal contamination of 27 individuals with phosphorus-32 at the National Institutes of Health in Bethesda, Maryland.

DIAGNOSTIC EVALUATION PROGRAM

AEOD manages the NRC's Diagnostic Evaluation Program (DEP) to provide an independent assessment of licensee performance at selected reactor facilities. A diagnostic evaluation assessment augments information provided by the Systematic Assessment of Licensee Performance program, the Performance Indicator program, and the inspection program implemented by NRC headquarters and regional offices.

A Diagnostic Evaluation Team consists of a core of experienced AEOD evaluators supplemented by expert technical staff members from headquarters and regional offices, as well as contractors, if appropriate. The team managers and members will not have had recent significant involvement in the licensing, inspection, or enforcement process at the selected facility. The onsite evaluation process involves observations of plant and corporate activities, in-depth technical reviews, employee interviews, equipment walkdown inspections, and programmatic reviews in a number of functional areas important to safety. Areas evaluated generally include maintenance, surveillance and testing, management effectiveness, operations, engineering, and quality programs.

The EDO makes the decision to conduct a Diagnostic Evaluation and appoints the Diagnostic Evaluation Team. The EDO did not authorize any Diagnostic Evaluations in FY 95. In FY 97 the DEP will be terminated and replaced by the Integrated Performance Assessment Program of NRR.

INTERNATIONAL SUPPORT ACTIVITIES

The Incident Reporting System is a cooperative program of the Organization for Economic Cooperation and Development's Nuclear Energy Agency (OECD/NEA) and the International Atomic Energy Agency (IAEA) of the United Nations. The U.S. and 13 other countries are members of the NEA. The NEA member countries and the IAEA member countries submit reports of operational experience that may be applicable to other nuclear power plants. This broadens the operational experience database to include all nuclear power programs except that of Taiwan. The reports are maintained in a database managed by the NRC at the Oak Ridge National Laboratory and distributed to all member states. AEOD reviews and disseminates within the NRC reports of selected foreign reactor events of particular interest to the staff regulating the U.S. program. It identifies significant foreign events that could be applicable to U.S. plants and provides reports of these events to interested parties within the NRC.

In addition, AEOD is the principal U.S. technical representative on reactor operating experience to the NEA's Committee on the Safety of Nuclear Installations' (CSNI) Principal Working Group 1 (PWG-1), "Operating Experience and Human Factors." AEOD is also a participant in the Expert Group on Nuclear Emergency Matters, a group established by the Committee for Radiation Protection and Public Health in 1989 to improve the quality of national and international nuclear emergency arrangements.

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 intended to be 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 limits its participation in the INES to rating only events at nuclear power plants that are classified as an Alert or higher on the emergency response scale used in the United States. After a trial period of more than two years, the NRC decided to continue indefinitely its limited participation in the INES. These classifications for FY 95 are given in Table 4.

LISBON INITIATIVE ACTIVITIES

As part of the Lisbon Initiative, AEOD is assisting Russia and Ukraine in the development of their own capabilities to respond to nuclear power plant emergencies. AEOD is helping the regulatory authorities in each country to establish reliable emergency communications with each site, to prepare response plans and procedures, and to provide equipment for a basic but functional emergency response center. The staff will also train Russian and Ukrainian personnel to prepare, conduct, and evaluate exercises so that they will be able to test and improve their capabilities. When these tasks are completed,

Table 4. U.S. Events Reported on the International Scale 1995

Plant Name (Type)	Event Date	INES Level*	U.S. Emergency Classification	Event Description
Robinson 2 (PWR)	2/13/95	Out of scale	Alert	Release of a toxic gas in the auxiliary building
Waterford 3 (PWR)	3/25/95	Out of scale	Alert	Ammonia release at a nearby chemical facility
Robinson 2 (PWR)	6/20/95	Below scale	Alert	Reactor coolant system leakage in excess of 50 gallons per minute due to a charging pump relief valve failure
Waterford 3 (PWR)	7/20/95	Below scale	Alert	Ammonia release at a nearby chemical facility
Salem 1 (PWR)	10/04/95	Below scale	Alert	Loss of control room annunciators for greater than 15 minutes (NOTE: The Alert was declared on 10/5/95, after the initial event notification.)
LaSalle (BWR)	10/31/95	1	Alert	High radiation levels in containment due to over-retraction of a traversing incore probe to an unshielded location

*Events are classified on a scale of seven levels. The lower levels (1–3) are termed incidents and the upper levels (4–7) accidents. Events which have no safety significance are classified as below scale/level 0 and are termed deviations. Events which have no safety relevance are termed "out of scale."

each country will have an emergency operations center at regulatory headquarters in Moscow and Kiev, good voice and data communications with each nuclear power plant, emergency plans and procedures, essential technical tools and equipment, and agreements for coordination with other response organizations. They will also have the skills, handbooks, and experience needed to maintain, exercise, and continually improve their response capabilities after U.S. assistance ends. This effort is expected to be completed in 1997. The work is being coordinated with related assistance provided through other agencies of the United States Government, other governments, and international organizations.

AEOD is also 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. Four information exchange sessions and meetings have taken place. Training was provided by Idaho National Engineering Laboratory under contract to the NRC in September and October 1995 in probabilistic risk assessment of operating events and NRC performance indicators. Additional training in equipment and human performance reliability is planned.

AEOD is also helping Russia and Ukraine establish a comprehensive system for training and qualification of technical personnel. For Russia this also includes assistance in creating a functional training center. In addition, AEOD will provide analytical simulators to Russia and Ukraine for training of regulatory personnel, and will provide training of the Russian and Ukrainian staff who will use and maintain the simulators.

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 in 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 provided for each of the reactor vendor designs: General Electric (GE), Westinghouse, Combustion Engineering (CE), and Babcock and Wilcox (B&W). 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 FY 95 AEOD provided 66 courses in reactor technology and 90 specialized technical training courses requiring 178 course-weeks and 63,759 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.

Reactor Technology Training

The core of the reactor technology training program is an integrated series of courses consisting of a three-week systems course, a two-week advanced course, and two weeks of reactor simulator training (including one week of emergency operating procedures [EOPs]). PRA information has been added to these reactor technology course series to complement that obtained in the PRA curriculum and to give NRC staff insights, practical discussion, and exercises regarding PRA use by licensees in managing risk at the plants. In addition, a risk management module is under development for the technical issues section of the advanced technology courses. New BWR/4 course materials were developed to support integration of the BWR/4 simulator (formerly the Shoreham plant simulator), and the Westinghouse technology course materials are being revised to support the recently acquired Trojan simulator. Simulator refresher training was increased in all reactor technology areas to support staff requalification.

A variety of other stand-alone reactor technology courses are available, including new, three week cross-training courses in the CE and B&W technologies. These courses were designed to meet the needs of experienced personnel who have already completed a PWR full course series and only need training in the differences between PWR vendor technologies. These courses are relatively fast-paced with a high degree of reliance on existing knowledge and experience. The Nuclear Engineering Workstation Simulator (NEWS) was used to develop interactive plant system diagrams for the Westinghouse, GE, and B&W technologies. These diagrams are used in reactor technology courses to enhance student understanding of system dynamics and interfaces.

Specialized Technical Training

During FY 95 many new specialized technical training courses were developed. In the Engineering Support training program, a new Welding and Nondestructive Examination (NDE) Overview course provides a general familiarity with metallurgy, welding, and NDE technologies. In addition, new commercially available courses have been added to support training in digital instrumentation and controls.

Four new courses were added to the PRA training program curriculum: the Advanced Integrated Reliability and Risk Analysis System (IRRAS) course, which covers advanced features of the IRRAS software, the PRA Insights Into an IPE course, the Systems Modeling Techniques course and the Risk Assessment in Event Evaluation course. In addition, a special seminar on Poisson and Binomial Failure data was developed and presented in December 1994. Material from this seminar is being added to other courses.

In the Radiation Protection training program, three new courses were completed and presented during FY 95. The Health Physics Technology Overview course familiarizes NRC technical managers and supervisors with important radiation protection issues and hazards encountered in various areas within the nuclear industry. The Introductory Health Physics course provides a basic understanding of health physics and radiation protection principles. The Health Physics Topical Review course emphasizes new modalities in teletherapy and brachytherapy. In addition to these courses, AEOD, at the request of NMSS, coordinated the development of a new Radiological Surveys in Support of Decommissioning course.

In the Regulatory Skills training program during FY 95, at the request of the Office of the Inspector General (OIG), AEOD developed and conducted two courses for OIG and Office of Investigations personnel and assumed responsibility for coordinating the Inspection Procedures and Licensing Practices and Procedures courses. In addition, reactor and nuclear materials versions of the Inspecting for Performance course were made available, and a Root Cause/Incident Investigation Refresher Workshop was developed.

In FY 95, AEOD assumed responsibility for several new areas of training. These included training in fuel cycle technology, requested by NMSS, and training of Agreement State Personnel. In addition, work continued on the development of a training program in digital instrumentation and control.

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. In 1995, one new member from headquarters was appointed to the CRGR.

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. A CRGR member expresses an individual professional opinion about each issue. Each independent CRGR recommendation is given to the EDO for consideration.

The CRGR held 12 meetings in FY 95 in which 21 issues were reviewed. These meetings concerned Generic Letters, Bulletins, Regulatory Guides, proposed and final rules, and discussions with NRC senior managers and staff relating to power reactor and nuclear materials concerns.

OFFICE OF INVESTIGATIONS

The Office of Investigations (OI) conducts investigations of alleged wrongdoing by individuals or organizations other than employees of the Nuclear Regulatory Commission (NRC) or NRC contractors. (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.

In fiscal year 1995 (FY 95), 218 investigations were opened and 259 investigations were closed. These investigations resulted in nine civil penalties totalling approximately $260,000 (as of November 1, 1995) and in other enforcement actions.

In FY 95, the OI provided continued support to the Department of Justice and other Federal agencies in prosecuting criminal violations that were substantiated during OI investigations. Of the 259 investigations closed in FY 95, 42 cases were referred to the Department of Justice (DOJ) for prosecutorial review. During FY 95, OI supported 11 Federal grand juries, and OI investigations resulted in 5 indictments, 3 convictions, and 3 guilty pleas in Federal courts.

The following sections contain examples of significant OI investigations on which the DOJ or the Office of Enforcement took action during FY 95:

DEPARTMENT OF JUSTICE ACTIONS

An extensive investigation into the activities of the radiation safety officer (RSO) at Logan General Hospital, Logan, West Virginia, culminated in a guilty plea in U.S. District Court. The RSO falsified both training records of lab employees and required radiation survey records. He was sentenced to probation for 2 years for providing false information to the NRC.

A joint investigation of National Circuits Caribe, Inc., by the Environmental Protection Agency (EPA), the Federal Bureau of Investigation (FBI), and OI resulted in an indictment in Puerto Rico. This investigation required extensive use of the Federal grand jury in Puerto Rico and resulted in a two-count indictment of the president of National Circuits. The president was indicted on October 4, 1995, for abandoning a gauging device containing byproduct material at National Circuits' 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 on October 11, 1995.

An investigation of Ball Memorial Hospital (BMH), Muncie, Indiana, revealed that two supervisory nuclear medicine technologist (NMTs) had administered greater-than-prescribed dosages of radiopharmaceuticals to BMH patients and had also instructed subordinate NMTs to do so. Patients' records of radiopharmaceutical dosages were falsified to create the appearance that the correct prescription had been administered to the patients. Through investigation, the OI determined that these actions had begun in 1988 and continued until June 1993. This investigation was referred to the U.S. Attorney's office, Indianapolis, Indiana, for prosecution.

An investigation into the activities at Palo Verde Nuclear Generating Station (PVNGS) determined that a former contract Instrumentation and Control (I&C) employee at PVNGS was discriminated against by not being rehired for a second outage because he reported safety concerns to the NRC. On May 30, 1995, a Federal grand jury in Phoenix, Arizona, indicted a former I&C Supervisor at PVNGS, on one count of violating Title 42 U.S.C. 2273 (10 CFR 50.7). The former supervisor subsequently pleaded guilty and on August 7, 1995, was sentenced in Federal District Court, in Phoenix, Arizona, to 1 year of probation, 75 hours of community service, a $50 fine, and court costs for "discrimination against an employee of a nuclear power plant."

ENFORCEMENT ACTIONS

An investigation involving an Agreement State licensee, Quality Inspection Services, Inc. (QIS), disclosed that QIS had performed work in Pennsylvania without NRC authorization for an extended period, and continued to do so after being notified by the State of New York, Department of Labor, that NRC authorization was required. The investigation also disclosed that a QIS quality control field supervisor deliberately provided false information to an NRC inspector. On the basis of the investigation, on June 28, 1995, the NRC assessed a $13,000 civil penalty against QIS and issued a Notice of Violation to the individual.

An investigation involving Carlisle Hospital disclosed that the licensee had knowingly permitted unauthorized physicians to utilize its cobalt-60 teletherapy equipment for the treatment of patients without the required oversight. Specifically, a hospital vice president, the radiation safety officer, and the Radiation Safety Committee Chairman knowingly condoned the unauthorized activity. The investigation further disclosed that the vice president had made false statements to an NRC Region I representative concerning the unauthorized use of the teletherapy equipment. On the basis of the investigation, on August 7, 1995, the NRC assessed a $5,000 civil penalty against the licensee, having previously issued Notices of Violation to two of the individuals.

As a result of the investigation referenced previously regarding the Logan General Hospital radiation safety officer, an $8,000 civil penalty was assessed and paid.

An investigation into activities at Washington Nuclear Project, Unit 2 (WNP–2), determined that on April 9, 1995, during plant heatup and startup, a reactor water cleanup system (RWCU) valve was improperly manipulated by a control room supervisor in violation of plant procedures. The investigation concluded that the control room supervisor did not deliberately violate plant procedures when he initially opened the RWCU valve, but did deliberately violate procedures after discussing them with a reactor operator and then failing to close the RWCU valve or direct that it be closed. On August 17, 1995, on the basis of the OI investigation and special inspections conducted by the NRC, the NRC issued a Notice of Violation and assessed a civil penalty of $50,000. The control room supervisor was terminated by WNP–2.

An investigation into activities at Mattingly Testing Services, Inc., determined that Mattingly's owner and/or other employees deliberately (1) failed to amend its NRC license to reflect a work and storage location in Billings, Montana; (2) failed to conduct required field audits of radiography personnel; (3) allowed a radiographer's assistant to work without proper training and/or supervision; (4) failed to post high radiation areas; (5) failed to ensure the radiographic device was locked after each exposure; and (6) failed to perform a required survey. On May 5, 1995, the NRC issued a Notice of Violation and assessed a civil penalty of $15,500. The NRC also issued an Order Modifying License requiring Mattingly to retain the services of an independent consultant to assess the licensee's radiation safety program and conduct semiannual audits for the next 2 years.

An investigation into activities at Blackhawk Engineering determined that the President of Blackhawk deliberately used gauges containing NRC-licensed material although she knew Blackhawk's NRC license had expired. The president also made a false statement to an NRC inspector by telling him that she had not used the nuclear gauges. On August 3, 1995, the NRC issued an order to Blackhawk's president prohibiting involvement in NRC-licensed activities and requiring certain notification to NRC. The order prohibited her from becoming involved in NRC-licensed activities for 1 year and, for 1 year after the first year, required that she notify the NRC within 20 days of becoming involved in NRC-licensed activities.

An investigation into activities at Atlas Uranium Mill determined that Atlas' radiation control coordinator deliberately failed to conduct complete and accurate surveys and obtain wipe test results to ensure that material contaminated by radiation above the NRC release criteria was not released from the Atlas mill site. As a result of these actions, radiation-contaminated scrap metal and equipment were not properly identified and were subsequently released from the site as uncontaminated materials. On June 15, 1995, the NRC issued a Notice of Violation and assessed a civil penalty of $5,000.

An investigation into activities at Western Industrial X–Ray, Inc. (WIX), determined that (1) a WIX radiographer deliberately allowed a radiographer's assistant to perform radiographic operations without proper supervision, (2) the WIX president and Radiation Safety Officer deliberately failed to conduct an evaluation of a potential overexposure incident, and (3) a radiographer and a radiographer's assistant deliberately prepared and submitted false reports about the potential overexposure incident to the licensee. From this investigation the OI further determined that the licensee deliberately failed to provide calibrated alarm ratemeters to a radiographer and a radiographer's assistant, which was a recurring violation. On the basis of the investigation, on September 27, 1994, the NRC issued an order revoking the WIX license, and an order prohibiting involvement in NRC-licensed activities for 5 years to the president of WIX. On October 31, 1994, the NRC issued an order prohibiting involvement in NRC-licensed activities for 1 year to the radiographer.

OFFICE OF ENFORCEMENT

The Commission has developed an enforcement program and Enforcement Policy to support the NRC's overall safety mission in protecting the public and the environment. The NRC Office of Enforcement is responsible for managing the Commission's enforcement program. The office is subject to oversight by the Deputy Executive Director for Nuclear Reactor Regulation, Regional Operations, and Research for enforcement actions related to reactor licensees, and by the Deputy Executive Director for Nuclear Materials Safety, Safeguards and Operations Support for enforcement matters for enforcement actions involving all other licensees.

On June 30, 1995, the Commission published a revised Enforcement Policy in the *Federal Register* that became effective on that date (60 FR 34381). The Commission also announced that the Enforcement Policy was being removed from the Code of Federal Regulations where it has traditionally resided as Appendix C to 10 CFR Part 2, because it is a policy statement and not a regulation (60 FR 34380). To provide widespread dissemination, the Enforcement Policy is now published as NUREG–1600, "General Statement of Policy and Procedure for NRC Enforcement Actions."

The changes that are reflected in this revised Enforcement Policy result from the efforts of a review team established in 1994 to assess the NRC's enforcement program. The team conducted a thorough program review, including solicitation of comments from within the NRC, from other Federal agencies, members of industry, and the public. In its report (NUREG–1525, "Assessment of the NRC Enforcement Program," April 5, 1995), the review team concluded that the existing NRC enforcement program, as implemented, is appropriately directed toward supporting the agency's overall safety mission. However, the review team found that the existing enforcement program at times provided mixed regulatory messages to licensees, and room for improvement existed in the Enforcement Policy. The review suggested that the program's focus should be clarified to—

- Emphasize the importance of identifying problems before events occur, and of taking prompt, comprehensive corrective action when problems are identified.
- Direct agency attention at licensees with multiple enforcement actions in a relatively short period.
- Focus on current performance of licensees.

In addition, the review team found that the process for assessing civil penalties could be simplified to improve the predictability of decision-making and obtain better consistency between regions.

The major changes to the Enforcement Policy include—

- Clarified purpose.
- Elimination of Severity Level V categorization.
- Modified threshold and criteria for renamed "predecisional" enforcement conferences.
- Continuation of a trial program for opening approximately 25 percent of conferences to public observation.
- Elimination of responses to certain Notices of Violation.
- Revision of Base Civil Penalty Tables.
- Streamlined civil penalty assessment process.
- Preservation of the ability to exercise discretion.

The Commission expects that the changes to the Enforcement Policy should result in an increase in the protection of the public health and safety by better emphasizing the prevention, detection, and correction of violations before events occur with impact on the public. The Commission intends to review the Enforcement Policy after it has been in effect for about 2 years. In that regard, it is expected that in about 6 months prior to that time, an opportunity will be provided to receive public comments on the implementation of this Policy.

Appendix 7 provides a listing and brief summary of the civil penalties proposed, imposed, and/or paid during fiscal year 1995; and a listing and brief summary of the 22 orders issued during fiscal year 1995. Recognizing that enforcement actions can sometimes span several fiscal years, there were a total of 63 civil penalties acted upon in fiscal year 1995 for a total of $2,838,450 in proposed penalties. Of these, 56 were proposed in fiscal year 1995 for a total of $2,263,950. Fourteen cases were imposed for a total of $620,750, with 11 of the cases imposed in fiscal year 1995 for a total of $615,250. Forty-seven cases were paid (including the total amount for those civil penalties being paid over time) for a total of $2,265,949. A total of 76 cases were issued as escalated enforcement actions without a civil penalty for reasons unique to each case.

In addition, an overview of the NRC's enforcement program follows:

OVERVIEW OF NRC ENFORCEMENT PROGRAM

The Commission has developed an enforcement program and Enforcement Policy to support the NRC's overall safety mission in protecting the public and the environment. Consistent with that purpose, enforcement action should be used as a deterrent to emphasize the importance of compliance with regulatory requirements, and to encourage prompt identification and prompt, comprehensive correction of violations.

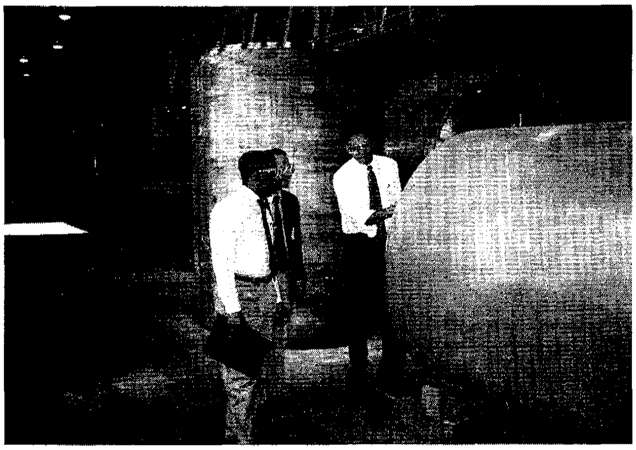
Violations are identified through inspections and investigations. All violations are subject to civil enforcement action and may also be subject to criminal prosecution. After an apparent violation is identified, it is assessed in accordance with the Commission's Enforcement Policy. The Policy is published as NUREG-1600, "General Statement of Policy and Procedure for NRC Enforcement Actions," to provide widespread dissemination. Because it is a policy statement and not a regulation, the Commission may deviate from this statement of policy and procedure as appropriate under the circumstances of a particular case.

There are three primary enforcement sanctions available: Notices of Violation, civil penalties, and orders. A Notice of Violation (NOV) summarizes the results of an inspection, identifies a requirement and how it was violated, and formalizes a violation pursuant to 10 CFR 2.201. A civil penalty is a monetary fine issued under authority of section 234 of the Atomic Energy Act. That section provides for penalties of up to $100,000 per violation per day. NOVs and civil penalties are issued based on violations. Orders may be issued for violations, or in the absence of a violation, because of a public health or safety issue.

The Commission's order issuing authority is broad and extends to any area of licensed activity that affects the public health and safety. Orders modify, suspend, or revoke licenses or require specific actions by licensees or individuals. As a result of a rulemaking in 1991, the Commission's regulations now provide for issuing orders to individuals who are not themselves licensed.

The first step in the enforcement process is assessing the severity of the violation. Severity Levels range from Severity Level I, for the most significant violations, to Severity Level IV for those of more than minor concern. Minor violations are not subject to formal enforcement action. Severity levels may be increased for cases involving a group of violations with the same root cause, repetitive violations, or willful violations.

A predecisional enforcement conference is normally conducted with a licensee before making an enforcement decision if escalated enforcement action (i.e., Severity Level I, II, or III violations, civil penalties or orders) appears to be warranted, and if the NRC concludes that it is necessary or the licensee requests it. If the NRC concludes that a conference is not necessary, it will normally provide a licensee with an opportunity to respond to the apparent violations before making an enforcement decision. The purpose of the conference is to obtain information that will assist the NRC in determining the appropriate enforcement action, such as (1) a common understanding of facts, root causes and missed opportunities associated with the apparent violations, (2) a common understanding of corrective action taken or planned, and (3) a common understanding of the significance of issues and the need for lasting comprehensive corrective action. The decision to hold a conference does not mean that the agency has determined that a violation has occurred or that enforcement action will be taken. In accordance



NMSS Inspector (from left) D. Reid, K. Leu, and S. O'Connor perform safety inspection of the primary containment vessel of the VSC-24 dry spent fuel storage system.

MATERIALS LICENSING AND INSPECTION

NRC Headquarters and Regional Offices currently administer approximately 6500 licenses for the possession and use of nuclear materials in medical and industrial applications. (This represents a reduction of about 200 licenses in the past year.) Table 1. shows the distribution of licenses by Region. The 29 Agreement States administer about 15,000 additional licenses.

Table 1. Distribution of NRC-Administered Nuclear Materials Licenses (as of October 11, 1995)

Region I	2285
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The NMSS Materials Licensing and Inspection Program is designed to ensure that activities involving use of radionuclides do not endanger the public health and safety. During FY 95, the NRC regional staff completed 2112 inspections of materials facilities. 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 by the NRC Headquarters.

During FY 95, the NRC completed 4630 licensing actions, of which 293 were new licenses, 2882 were amendments, 1054 were license renewals, and 401 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, in order to identify ways to improve the process. During this examination, the staff found that licensing was being accomplished using a complex process involving anywhere from 54 to 94 exchanges of information among individuals and computer systems during a routine license review. On average, the NRC took 84 days to complete a licensing action, although only 2 days were actually needed to complete the technical safety review of a typical licensing request. During the remaining 82 days, paper was either in transit or in the queue. The staff proposed to reduce the licensing process to an average of four days.

Therefore, consistent with the goals of the National Performance Review and the Paperwork Reduction Act of 1995, the staff initiated an innovative approach to improve management of information collections. As directed by the Commission, the staff held various meetings and workshops to gather input from Agreement States, licensees, and the public. The selected approach, called Business Process Reengineering (BPR), fundamentally changes the way work is performed, to achieve significant improvements in speed, cost, and quality. This new process BPR, will also most likely lead to more clear, consistent, and timely regulatory guidance, ensuring that its

CHAPTER 4

NUCLEAR MATERIALS REGULATION

Together with the NRC's four regional offices, the NRC Office of Nuclear Material Safety and Safeguards (NMSS) regulates the safe use of nuclear materials. Materials regulation involves three broad programs: materials safety discussed in this chapter; fuel facility safety and safeguards, discussed in Chapter 5; and waste management activities, discussed in Chapter 6.

This chapter addresses licensing, certification, inspection, and other regulatory activities concerned with materials safety. Specifically, these activities regulate (1) storage of spent reactor fuel; (2) transportation issues associated with fuel and radioactive materials, and (3) production and use of reactor-produced radioisotopes (byproduct material).

During fiscal year 1995 (FY 95), the NMSS completed the following activities related to nuclear materials regulation:

- nearly 90 reviews of transportation and spent fuel storage packages, and 6 route approvals for transporting special nuclear material and spent fuel

- safety inspections of 7 transportation packaging and dry spent fuel storage system suppliers, and observations of 3 Department of Energy (DOE) audits of multipurpose canister (MPC) contractors

- more than 4600 licensing actions on applications for new byproduct materials licenses, as well as amendments and renewals of existing licenses, and reviews of sealed sources and devices

- approximately 2100 materials licensee inspections

STORAGE AND TRANSPORTATION

Regulatory activities related to materials storage and transportation of nuclear materials have historically been conducted by the Division of Industrial and Medical Nuclear Safety (IMNS) within NMSS. In April 1995, however, the NRC established the Spent Fuel Project Office (SFPO), and transferred to it the duties of the former Storage and Transportation Safety Branch. Creation of this new organization and its charter are discussed later in this section.

INTERIM SPENT FUEL STORAGE

Under the Nuclear Waste Policy Act of 1982, licensed utilities are responsible for storing their spent fuel until a Federal repository or centralized interim storage (CIS) facility is available. All utilities have either installed or are planning to install high-density racks in their existing spent fuel pools. However, even with these modifications, pools are reaching capacity. To provide for "full-core" reserve, many utilities are constructing independent spent fuel storage installations (ISFSIs), which generally consist of a passive storage system using dry cask technology.

Utilities have two options for licensing ISFSIs—a site-specific license or a general license. At this time, six utilities have applied for and received site-specific licenses. The most recent ISFSI license was issued to Northern States Power for Prairie Island, and fuel at this site was loaded into dry casks during summer 1995.

A general license, issued to a 10 CFR Part 50 licensee, allows the storage of fuel in casks that have been reviewed and certified by the NRC before use. Such cask designs are given a Certificate of Compliance (CoC), and are listed in Subpart K to 10 CFR Part 72. At present, seven systems designs hold CoCs. Only one utility, Consumers Power—Palisades, is currently storing fuel under the provisions of a general license. Four additional utilities are planning to load spent fuel into dry casks under a general licenses in early 1996.

During 1995, the SFPO finalized and issued regulations regarding emergency preparedness plans for ISFSIs. Related requirement included in 10 CFR Part 72 became effective on September 20, 1995.

CERTIFICATES OF COMPLIANCE

As previously indicated, the general license is very attractive to utilities because it permits the use of an approved cask design without the need for additional licensing action. In FY 95, the Standardized NUHOMS Horizontal Modular Storage System for Irradiated Nuclear Fuel, designed by Vectra Technologies Incorporated, received its CoC and was incorporated into the list of approved storage cask designs by rulemaking.

In FY 95, the NRC completed its review of the topical report for the Nuclear Assurance Corporation Storage and Transport Cask (NAC STC); however, the NRC has not yet received a request to add this cask to Subpart K. The NAC STC already holds a transportation CoC, and is the first approved cask design to meet both transportation and storage requirements. Two additional dual-purpose cask designs, the Vectra MP-187 and the HOLTEC International HI-STAR 100, are currently being reviewed. In addition to new licensing actions, the staff is currently reviewing amendments to existing certificates and safety analysis reports for approved casks.

CREATION OF SPENT FUEL PROJECT OFFICE

In calendar year 1995, the Department of Energy (DOE) stated its intent to submit a storage and transportation system known as the Multipurpose Canister (MPC) to the NRC for certification and licensing as part of its high-level waste program. The MPC was envisioned as a key element in DOE's solution for spent fuel storage, and would provide a standardized system for transporting spent fuel to a monitored retrievable storage (MRS) facility. The MPC system includes four canister designs, each of which require a detailed NRC review before approval. To effectively support both DOE's spent fuel programs and ongoing NRC reviews of transportation and spent fuel storage systems, the NRC created the Spent Fuel Project Office (SFPO) within NMSS in April 1995. The SFPO is responsible for regulating and certifying transport containers, package designs, and interim storage of spent fuel, whether at reactor sites or at separate consolidated sites. The new office serves as the Agency's focal point for design adequacy and safety direction for spent fuel storage and transportation packages. The SFPO is also responsible for formulating and implementing transportation safety and interim storage policy for the agency.

DEVELOPMENT OF THE DRY CASK STORAGE ACTION PLAN

Soon after its formation, and in anticipation of increased industry activity in the area of ISFSIs, the SFPO staff evaluated past performance of both the industry and the NRC in the area of dry cask storage of spent fuel. This evaluation revealed that improvements were needed in communications both within and external to the NRC, and that NRC requirements and expectations required clarification. As a result, the NRC Office of Nuclear Reactor Regulation (NRR) and NMSS developed the Dry Cask Storage Action Plan, which identifies major issues and concerns related to storing spent fuel at ISFSIs, and suggests measures for addressing such issues. Specifically, the plan addresses concerns regarding technical near-term and long-term actions, communications, and procedural issues. One key factor in the plan is to encourage and enhance communication with the nuclear industry. Toward that end, the NRC staff has initiated discussions with members of the Nuclear Energy Institute (NEI), which subsequently formed a dry cask storage working group and will periodically inform the agency of activities to resolve issues raised in the plan. In the meantime, the NRC continues to assess utility performance in the area of dry cask storage, and will review and update the plan on a quarterly basis. The SFPO also plans to issue procedures for inspecting ISFSIs, and a standard review plan for spent fuel storage systems.

REVISION OF 10 CFR PART 71

On September 28, 1995, the NRC published revised regulations (in 10 CFR Part 71) for the transportation of radioactive materials. Effective April 1, 1996, the revisions bring the NRC's regulations into general compatibility with those of the International Atomic Energy Agency (IAEA). Specifically, the NRC adopted the following major revisions to achieve compatibility with IAEA regulations:

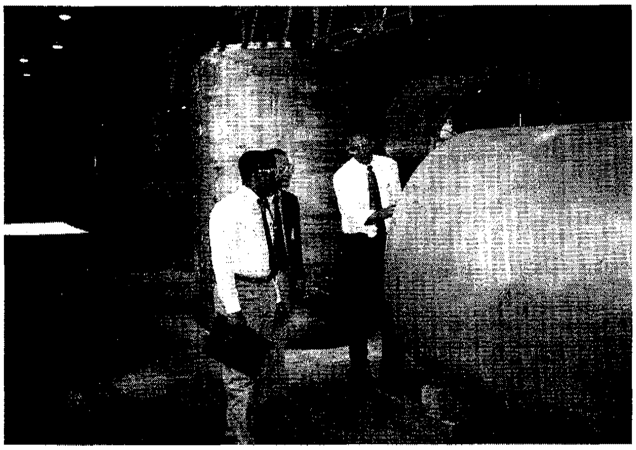
- requirements for additional performance tests for Type B packages
- adoption of IAEA provisions for shipping low-specific activity material and surface-contaminated object
- simplification of requirements for shipping fissile material
- adoption of IAEA limits on the amount of material that can be shipped in a Type A package

The final rule also incorporates criteria for packages used to transport plutonium by air under the Scheuer Amendment (Public Law 94–79).

TRANSPORTATION AND STORAGE INSPECTION ACTIVITIES

In FY 95, NMSS expanded and broadened its inspection activities to ensure that transportation packaging and dry spent fuel storage systems certified and licensed by the NRC are designed, fabricated, tested, maintained, and used in accordance with commitments made to the NRC. In prior years, for example, NMSS inspection teams examined licensees' implementations of quality assurance program commitments. This year, by contrast, NMSS redefined its inspection program to focus on performance-based inspections of activities affecting safety and reliability. The safety inspection teams consist of individuals experienced in fabrication technologies, design requirements, quality assurance practices, and other technical specialties. Safety inspectors also participated as observers on three DOE audits of MPC program contractors involved in transporting and storing dry spent reactor fuel. The objective of these observations was to verify adequate DOE oversight of contractor activities affecting the safety and reliability of MPCs.

NMSS inspections were performed at seven suppliers representing a broad spectrum of the industry, including designers, fabricators, and vendors of transportation packaging and dry storage systems. The inspection program is structured to provide information on whether suppliers comply with technical specifications and design requirements, as well as the provisions of 10 CFR Parts 71 and 72. The following photograph shows a primary containment vessel in a dry spent-fuel storage system.



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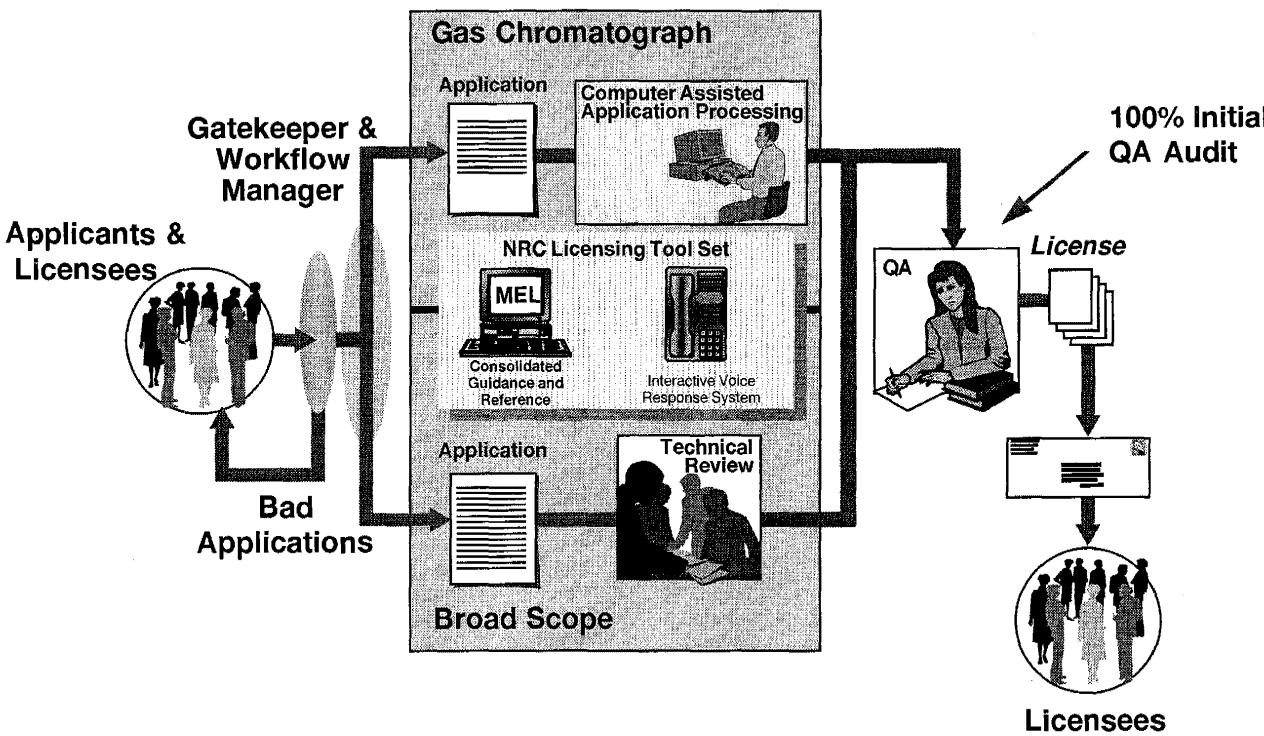
In the first BPR phase a core team of people who work in licensing, administration, and information technology developed a generalized design for a new materials licensing process. Specifically the core team proposed using a graded licensing approach that matches the safety hazards associated with a license application. The following diagram shows a more streamlined workflow for materials licensing actions that is expected as a result of the Business Process Reengineering initiative.

Graded Processing of Licenses



Applications for relatively simple actions would go through a computer-assisted process. This process would use artificial intelligence-assisted scripts to help reviewers rapidly determine if the applications conform with established NRC regulations and licensing policies. Any unanticipated circumstance or any improper or incomplete response would automatically alert reviewers and require separate action for resolution. This system would significantly alter the practice of using technical staff to review well-established and relatively low-risk uses of licensed materials.

Applications for more complex uses would be processed by trained technical reviewers, working either individually or in teams. The staff plans to develop a new set of tools to facilitate consistent, high-quality reviews. These tools will include a single, comprehensive licensing manual that consolidates all NRC regulations and guidance in one easily accessible form. This licensing manual will be made available to the Agreement States, the public, and licensees in both hard copy and electronic media (e.g., a bulletin board), when it is completed.

During the second BPR phase, which began in November 1995, the team began the detailed design, and testing of the NRC's new materials licensing process. Implementation of this new process is scheduled to begin in 1996.

HUMAN FACTORS

NMSS participated in developing the NRC's "Human Performance Program Plan," which was published in August 1995. The plan identifies activities needed to continue the NMSS program and integrates those activities with those of other NRC offices.

In summer 1995, the NRC published two contractor reports entitled "Human Factors Evaluation of Remote Afterloading Brachytherapy" (NUREG/CR-6125) and "Human Factors Evaluation of Teletherapy" (NUREG/CR-6277). Those reports identified human factors problems in remote afterloading brachytherapy and teletherapy (tasks with a high potential for human error that could adversely affect system performance), proritizing those problems in terms of their safety consequences. In addition, the reports identified factors that contribute to those given human factors, and evaluated alternative means for resolving those that are safety significant.

An NRC human factors analyst made presentations based on the two contractor reports to the Staff College of the Center for Devices and Radiological Health and to the Great Lakes Chapter of the Health, Physics Society.

In addition, an NRC human factors analyst developed, coordinated, and participated in a 3-hour seminar on "Ergonomics: Identifying and Resolving System Errors." This seminar was presented at the 1995 Mid-Year Clinical Meeting of the American Society of Hospital Pharmacists, and was attended by more than 200 people. The analyst also made a presentation on "Failed Functions and Wrong Patient Misadministrations" to more than 100 people at the October 1994 Annual Meeting of the Human Factors and Ergonomics Society.

REGULATORY IMPACT SURVEY

In May 1992, the staff submitted to the Commission a plan to conduct a regulatory impact survey of fuel facility and materials licensees (SECY 92-166). The survey was intended to determine if the licensees believed that there is an appropriate balance between the burden imposed by NRC requirements and the level of safety achieved as a result. In Phase I of the plan, the staff conducted a pilot series of nine onsite interviews at selected fuel cycle and major materials facilities between August and October 1992.

On the basis of the results of those interviews, the staff submitted a report a report (SECY 93-130) recommending a number of changes to staff practices and a plan for obtaining a broader range of licensee views. The Commission instructed the staff to present a plan for obtaining additional information from licensees, and for evaluating and incorporating that information into the regulatory program. The Commission approved the plan, recommended by the staff in SECY 93-268, to conduct a survey of several hundred licensees through mail questionnaires.

Respondents to the questionnaires identified a number of issues. Most significantly, respondents noted timeliness of licensing actions, the need for updated and clear regulations and guidance, costs of compliance and fees, licensee reluctance to disagree with reviewers and inspectors, and the perceived safety significance of enforcement actions. Although these matters are all addressed in current initiatives, the survey helped to focus staff activities. In a subsequent Commission Paper (SECY-95-198), dated July 27, 1995, the staff informed the Commission of the results of the mail survey (reported in more detail in NUREG/CR-6330) and of the staff measures to deal with issues identified in that survey. For example, the survey findings provided important licensee feedback to NRC staff involved in the Materials Licensing BPR endeavor.

INTEGRATED MATERIALS PERFORMANCE EVALUATION PROGRAM

In January 1994, the NMSS staff prepared a Commission Paper (SECY 94–011), which presented an approach for the use of common performance indicators in reviewing Agreement State and NRC regional materials programs. The Commission subsequently approved the use of five programmatic indicators as part of a pilot program in 1994-1995. These indicators allowed a team comprised of technical staff from NMSS and the Office of State Programs to evaluate a region or State based upon the status of its materials inspection program, its technical staffing and training, the technical quality of its licensing and inspection programs, and its responses to incidents and allegations. After conducting a 1-week onsite evaluation, the team issued draft reports for regional or State comment, considered the comments, and prepared final reports for approval by a senior-level NRC Management Review Board (MRB).

During the pilot phase of this Integrated Materials Performance Evaluation Program, the team used this process to review two regions and three Agreement States, each of which had volunteered to participate. Following the evaluations, the team held a separate MRB meeting with each region or State before issuing of final findings.

At the conclusion of the pilot program, the staff prepared another Commission Paper (SECY–95–047), 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 issued Management Directive 5.6 in final form in September 1995; this directive was subsequently published in the *Federal Register* in October 1995. Based on that directive, a series of nine Agreement State and two regional reviews are scheduled for FY 96.

INDUSTRIAL USES

Industrial Radiography

As described in the *1994 NRC Annual Report* (p. 90), the NRC staff has been involved for some time with an initiative to develop a certification program for industrial radiographers. During FY 95, the staff continued to support the American Society for Nondestructive Testing (ASNT) in implementing the ASNT "Industrial Radiography Radiation Safety Personnel" certification program. The staff also worked toward completing a final rule that would mandate radiographer certification. This rule was combined with a rulemaking that would result in an overall revision of 10 CFR Part 34. The combined rule was published for comment on February 28, 1994. The NRC staff anticipates publishing the final rule sometime in 1996.

In a separate action, on May 31, 1995, the staff published a final rule (60 FR 28323) to permit the use of an alternative value for the torque test of drive cables. This amendment to 10 CFR Part 34 was needed because the existing regulation cited a value from the American National Standards Institute (ANSI) standard for radiographic equipment that was not practical to meet, given the design of the equipment. In addition, the amendment also permits the use of an engineering analysis to demonstrate that a modest change in a previously approved design is acceptable without the need to perform prototype tests.

Source and Device Registration

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

The NRC maintains a nationwide registry, including registration certificates issued by both the NRC and the Agreement States. This registry consists of a hard-copy file of all registration certificates, two database systems containing information commonly found on the first page of a registration certificate, and background files containing supporting information for the registration certificates issued by the NRC. The NRC also maintains a tracking system to facilitate the retrieval of information regarding requests for new registration certificates or for amendments to existing certificates. The NRC also undertook the following initiatives in support of these products evaluations:

- A Bulletin Board System (BBS) created on the FedWorld System contains current information and documents related to the registration of sealed sources and devices. This information includes electronic copies of guidance documents, the Radiography Cross-Reference Program (RADXREF), the PC-based Registry database system, and the *Sealed Source and Device Newsletter.* Information on the BBS is updated frequently and can be downloaded remotely.

- A workshop on sealed source and device safety evaluations, was presented to participants from the NRC and other regulatory agencies. The topics included guidance on what is required to perform a safety review, engineering and technical skills required to perform the review, and the use of agency and industry standards. The workshop was intended to provide additional guidance and information regarding the registration process, and to form a basis for the standardized application of review principles and procedures throughout the regulatory agencies.

- The number of pending requests for review was reduced to less than 200, thereby decreasing the total time required to issue a registration certificate. To accomplish this goal, the staff completed more than 400 sealed source and device reviews—more than double the number completed in previous years.

Sealed Sources, Devices, and Other Radioactive Materials Retrieved by the DOE

Several thousand NRC licensees possess material that exceeds 10 CFR Part 61 Class C limits and will need to be stored for an extended time until the DOE provides a disposal facility, or for which control cannot be assured because of the licensees' financial or other difficulties. The NRC has negotiated with the DOE to assist with managing such radioactive material when these cases threaten the public health and safety. On two occasions during FY 95, the NRC requested DOE assistance to retrieve, control, dispose of material that had become a threat to the public health and safety because of a licensee's loss, or potential loss, of control of the material. In each case, the DOE provide the required assistance.

A number of Agreement States have noted similar problems with their respective licensees. The NRC/DOE agreement has been extended to include licensees located in Agreement States in which the State is unable to manage the material and requests assistance from the NRC. During FY 95, the NRC requested DOE assistance on behalf of an Agreement State on two occasions.

The NRC staff has defined procedures for determining if DOE assistance is appropriate, and for making the request. In addition, the NRC and DOE staffs have formalized the agreement under which the NRC requests DOE assistance. A Memorandum of Understanding (MOU) has been drafted for this purpose, approved by the NRC, and sent to the DOE for approval. The NRC and DOE staffs have also explored options to resolve the issues involved with licensees that have limited or no disposal options and for which materials control cannot be assured.

Sealed Source and Device Design Safety Testing Contract

The NRC has in place a contract for securing third-party examinations of products containing radioactive material for which safety evaluations have been performed. As needed, the NRC may request that the contractor examine a product, along with information supplied in support of the application for safety review and approval. Through that examination, the contractor evaluates 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 NRC has requested that the contractor evaluate products that (1) have known or suspected generic design defects; (2) are suspected to be inadequately designed or constructed for their intended conditions of use, and (3) have failed and for which the failure mode needs to be determined. In FY 95, the contractor performed and issued final reports on three such evaluations.

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. Of the 24 reports, 16 occurred at steel mills. In 1994, a 14-GBq (330-mCi) unshielded cesium-137 source was found buried in soil at a metal scrap processing plant in Illinois, and in 1995, a shredder at a processing plant in Kentucky separated a 12-GBq (330-mCi) cesium-137 source from its shielded holder. Although no significant radiation doses have been documented as a result of these or other events in the United States, 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, including devices held under both specific licenses and general licenses. The Working Group will determine whether the current regulatory programs provide an adequate level of assurance in each of the following criteria:

- The devices are properly controlled and accounted for by licensees.
- The devices do not present unacceptable levels of risk of radiation exposure to workers or the public.
- The devices do not present unacceptable financial risk to the metal recycling industry.

The Working Group will also examine regulatory alternatives, including their costs, and expects to complete a report containing its recommendations during FY 96.

MEDICAL USES

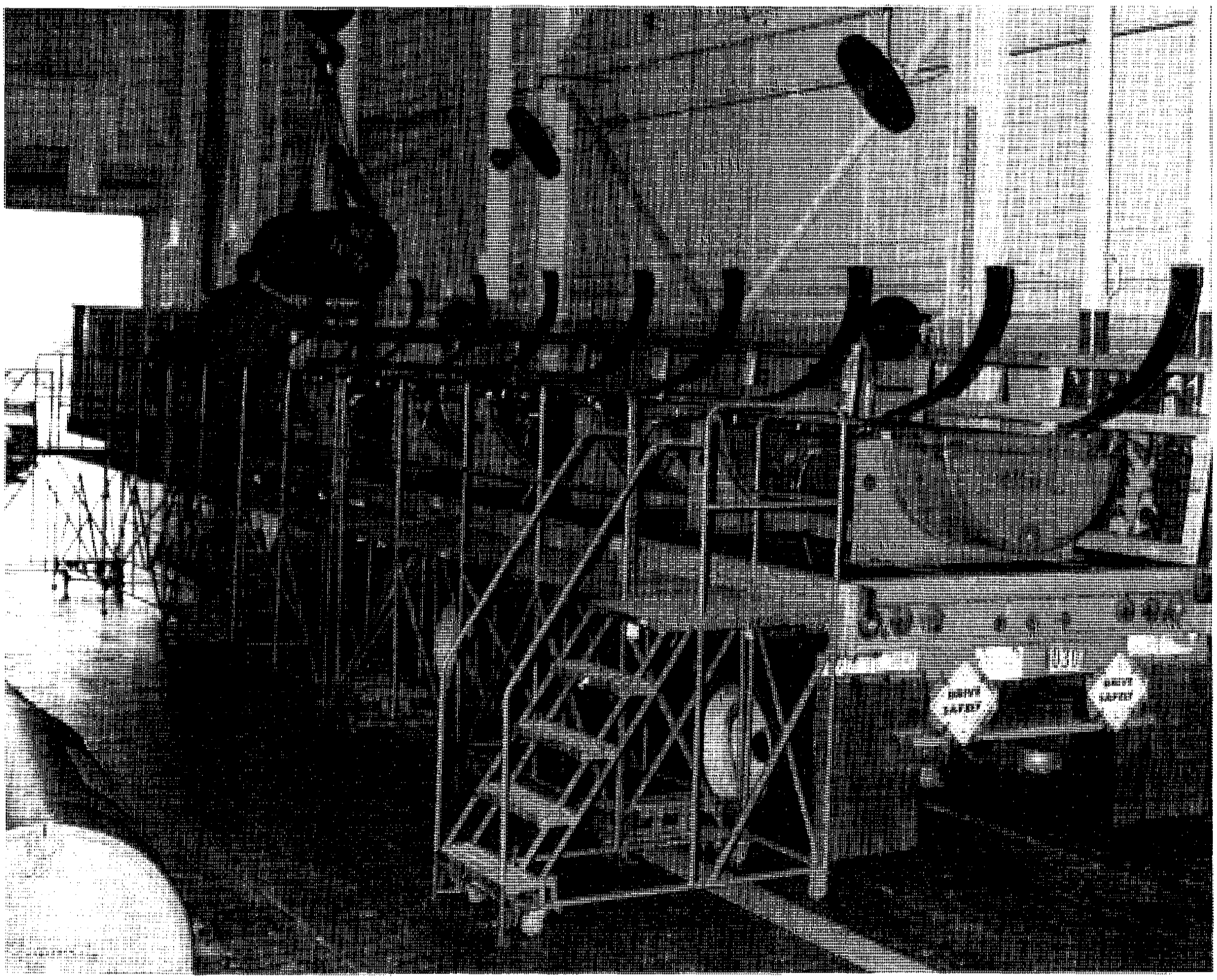
Status of Medical Management Plan

The Medical Management Plan (MMP) is a 5-year plan, which began in October 1994. It contains more than 90 action items categorized in 9 major program areas, including such areas as licensing and inspection, rulemaking, misadministration policy, enforcement, and research studies. Approximately 70 percent of the action items identified in the MMP are considered closed, while others are either partially closed or not yet addressed because they depend on the closure of precursor items. The staff continues to address both short- and long-term action items to resolve policy issues and specific tasks, while adjusting program priorities in response to unforeseen events and changing needs.

Quality Management Rule Implementation

On January 27, 1992, regulations became effective that required NRC medical licensees to establish and implement a quality management program (QMP) in compliance with 10 CFR 35.32. On January 25, 1995, the regulations became effective for Agreement State licensees. This performance-based regulation focuses on therapeutic applications of byproduct material, and any patient dosage of sodium iodide-125 or -131 in quantities greater than 30 microcuries. During FY 95, implementation activities included developing a standard reviewing plan and inspection guidance, reviewing licensee-submitted quality management plans, resolving enforcement issues, tracking inspection findings, and developing staff recommendations on the regulation.

The NRC, under contract with Lawrence Livermore National Laboratory (LLNL), reviewed the 1709 QMPs submitted by applicable licensees, and provided each licensee with a letter outlining the review findings. A Temporary Instruction (TI) regarding the inspection of implemented QMPs



Loading Customer Cylinder on Transport Vehicle

The Energy Policy Act of 1992 provides that the NRC shall regulate safety and safeguards at the GDPs operated by the USEC. In consultation with the EPA 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. In addition, the NRC is to establish a certification process to ensure that the USEC complies with the regulations, and the USEC is to apply to the NRC for an annual certificate of compliance with NRC standards. This certification process is to be in lieu of any requirement for a license.

The Energy Policy Act of 1992 also makes provision for the DOE to prepare a plan for bringing the plants into compliance with any unsatisfied provisions of the NRC regulations. This plan would be submitted to the NRC together with the USEC's initial application for certification.

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

CHAPTER 5

FUEL CYCLE SAFETY AND SAFEGUARDS

The regulation of nuclear fuel cycle safety and safeguards in the United States is the responsibility of the 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 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 facilities.

NMSS develops and continually evaluates the NRC's "design-basis" threats, and assesses threats to the domestic environment as a result of all NRC-licensed activities. The 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 US/IAEA Safeguards Agreement and technical support to strengthen IAEA safeguards. NMSS also coordinates its activities with the NRC's Office of Nuclear Reactor Regulation (NRR) to ensure consistent implementation of these activities with respect to the safeguards program for nuclear power reactors.

FUEL CYCLE LICENSING AND INSPECTION

FUEL CYCLE ACTION PLAN

Action Plan for Regulating Fuel Cycle Facilities

The Commission has directed the staff to implement a fuel cycle facility action plan to enhance the rigor of the regulatory base for the fuel cycle facility safety program, and to improve the timeliness of the license renewal program. The commission further directed the staff to make numerous program improvements identified by various sources, such as the "Proposed Method for Regulating Major Materials Licensees" (NUREG–1324) and the "Regulatory Impact Survey for Fuel Cycle and Materials Licensees." To accomplish these objectives, the action plan focuses on improvements in the regulatory base, as well as licensing, inspection, and training.

Staff activities to clarify and improve the rigor of the regulatory base include a major revision of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material" (SNM). The objectives of this revision are to clarify and refine existing requirements, to develop requirements that are performance-oriented rather than prescriptive (where possible), grade those requirements according to risk, and to reduce unnecessary and burdensome regulatory requirements. This activity could realize many of the improvements to the fuel cycle regulatory program recommended in NUREG-1324. In the course of this activity, the NMSS has initiated a series of public meetings with industry and other major interested parties. Through these meetings, the parties discussed the grounds for revising 10 CFR Part 70, the improvements in regulation sought by the staff, and the different revision approaches the staff might take to achieve the stated objectives.

Another high priority for the staff is to develop a standard review plan (SRP) to be used in reviewing fuel fabrication license amendments and renewal applications. Along with the SRP, the staff is preparing a conformant revision of the Standard Format and Content Guide (SF&CG) and a document to guide licensees in selecting integrated safety analysis (ISA) methodologies. The SRP will be useful to the NRC staff in reviewing the applications and amendments, as well as to applicants and licensees in understanding the intent of the new performance-oriented requirements. NMSS has initiated public meetings with fuel cycle facility licensees to obtain input regarding the development of the ISA and the SRP, and preliminary drafts of these documents have been made publicly available.

While contributing to the development of the SRP, the licensing staff has continued to review pending license renewal applications, adhering to the accelerated license renewal schedule. Until a revision to 10 CFR Part 70 becomes effective, the SRP now in development is being used in the review of license renewal and amendment applications.

Upgrading the inspection program through staffing of the Headquarters Inspection Section has permitted more efficient use of limited technical expertise for performing nuclear criticality and chemical process safety inspections, along with ongoing Headquarters material control and accounting (MC&A) inspections. Headquarters staff will provide the technical expertise to address difficult design, integration, and adequacy concerns.

An enhanced training program is being developed for the NRC licensing and inspection staffs. Of eight courses under development, six have been presented to date.

FUEL CYCLE LICENSING ACTIVITIES

By the end of FY 95, the NRC had completed 121 fuel cycle licensing actions. Table 1 shows these licensing actions by category.

Table 1. Fuel Cycle Licensing Actions (Safety/Safeguards) Completed in FY 95

Category	No. of Actions
Fuel Fabrication and Conversion	73
Critical Mass Materials	6
Fuel Research, Development, Pilot, and Fresh Fuel Storage	6
Other Source Materials	3
Material Control and Accounting	24
Physical Security	4
West Valley Demonstration	4
Department of Energy Waste Processing	1

FUEL CYCLE SAFETY

FUEL CYCLE SAFETY LICENSING

IRT Corporation

On March 2, 1995, the NRC terminated IRT Corporation's license, SNM–1405, following the disposition of all nuclear material stored at its Arjons Road facility (San Diego, California) and after decommissioning was completed at the facility. IRT, which filed for bankruptcy in July 1994, was purchased out of bankruptcy by Thermo Instrument Systems with the understanding that Thermo would not assume responsibility for the nuclear material held under IRT's license (hence, the necessity for material disposition and decommissioning before the takeover by Thermo). All of the stored nuclear material was transferred to the Department of Energy (DOE) and shipped to Hanford, Washington, and Los Alamos, New Mexico. Following acceptable decommissioning, as verified by the NRC through independent confirmatory measurements, the IRT facility was released for unrestricted use.

Allied-Signal, Inc. License Renewal

On June 13, 1995, the NRC issued a 10-year renewal of Material License SUB-526, which authorizes Allied to convert uranium ore concentrates to uranium hexafluoride at the Allied conversion plant in Metropolis, Illinois. This action followed an environmental assessment (EA) in May 1995, and publication of a "Finding of No Significant Impact" in the *Federal Register* on May 17, 1995.

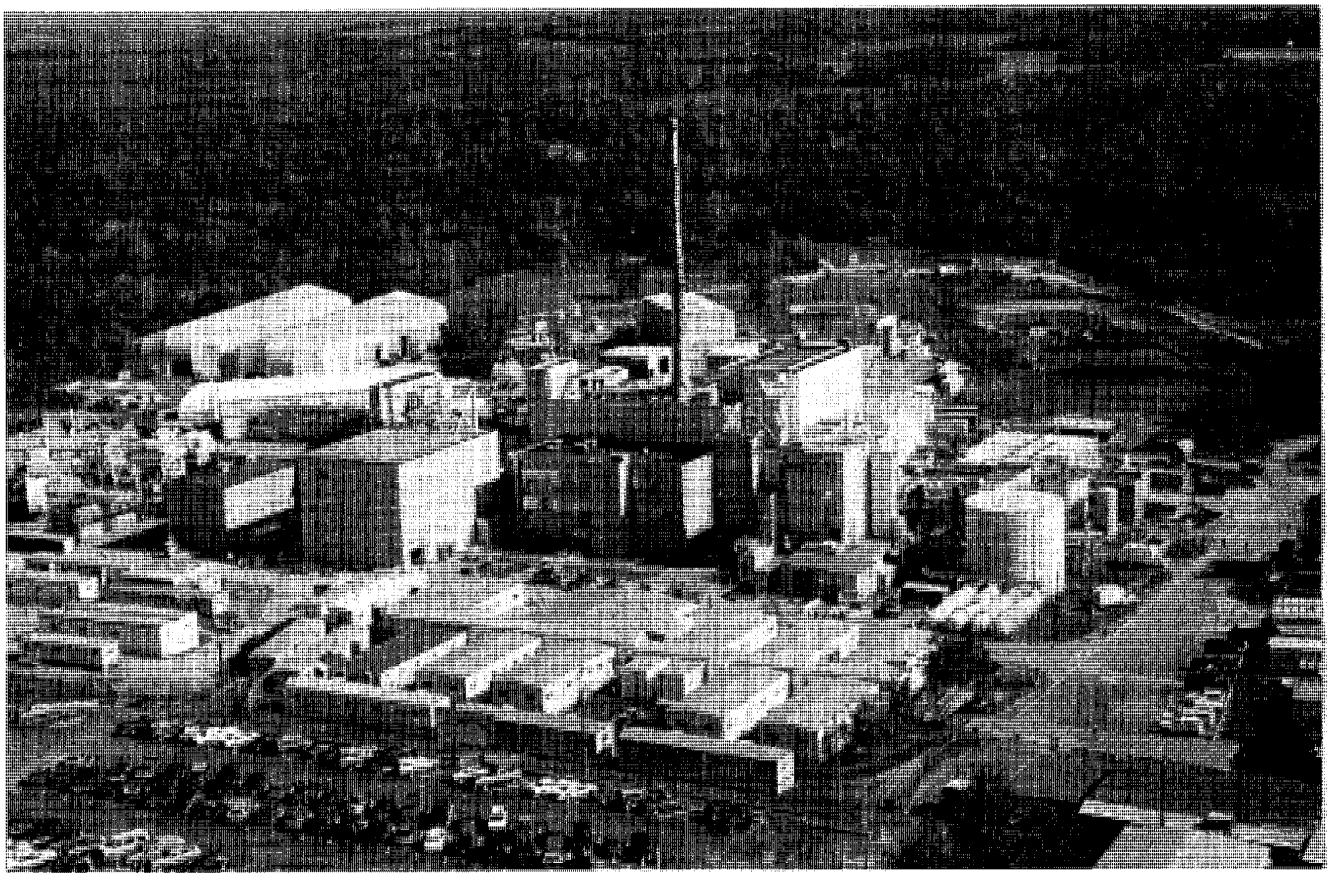
Babcock & Wilcox Company, Pennsylvania Nuclear Services Operations, Parks Township, Pennsylvania

The B&W Parks Township's 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* on 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. The renewal is expected to be issued in October 1995.

West Valley Demonstration Project Oversight

Throughout FY 95, the NRC staff continued its safety oversight at the DOE West Valley Demonstration Project (WVDP) near Buffalo, New York, as shown in the following photograph. 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 comprised of plutonium/uranium recovery extraction waste and thorium recovery extraction (THOREX) waste. A minimal amount of cesium-coated zeolite from preprocessing activities is stored in a separate carbon steel tank, and is currently being combined with the remainder of the wastes. Beginning in 1996, the combined wastes will be solidified (vitrified) in borosilicate glass.



Aerial Photograph of the DOE West Valley Demonstration Project

The NRC staff monitors public health and safety aspects of the WVDP through inspections at the WVDP site and the review of safety analysis reports (SARs) submitted for each process by the DOE. The staff reviews each submittal and issues a corresponding safety evaluation report (SER), stating the NRC's conclusions on the public health and safety implications of the process segment. In FY 95, the DOE submitted its latest SAR for vitrification operations, as well as a new SAR, for low-level waste processing and support activities, which combined previously issued SARs into a single volume.

In FY 95, the staff continued to monitor the ongoing construction and installation of equipment for the vitrification process building. The staff also continued to assess data from cement produced through the completion of "sludge washes" and "THOREX washes." The NRC issued an SER stating that the vitrification process, as described in the submitted SAR, was not expected to have a significant impact on the health and safety of the public or the environment. The NRC also reviewed and commented on THOREX waste transfer, which was subsequently completed safely, and the combined SAR on low-level waste processing and support activities. The NRC continued discussions with the DOE to develop decommissioning criteria to be addressed by the DOE for various aspects of the WVDP. However, the NRC determined that a draft environmental impact statement (EIS) for site termination, scheduled for publication by the DOE and the State of New York in late 1995, would not provide an acceptable basis on which to develop the criteria. Consequently, the NRC suggested that these criteria be discussed as part of a decommissioning plan to be submitted in 1996 or 1997.

Shieldalloy Metallurgical Corporation (SMC)

Since 1955, SMC has operated a manufacturing facility located in Newfield, New Jersey, where it has manufactured specialty steel and super alloy additives. Under License SMB-743 the NRC licenses activities at the site related to processing a mineral concentrate (pyrochlore) to recover niobium. The pyrochlore contains 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.

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 1993, SMC's regulatory counsel informed the staff that *in-situ* disposal of the material is the only alternative that SMC could reasonably afford, given its financial condition. In October 1993, the staff began developing an EIS to evaluate the proposal for *in-situ* disposal, and completed the scoping process in July 1994. In December 1994, SMC submitted to the NRC an application to export a test quantity of the slag for use in steel processing in a foreign country. SMC expects that characteristics of the slag would allow steel manufacturers to produce a higher quality steel at lower cost. SMC has successfully provided similarly produced slag, which does not require NRC licensing, to the domestic steel industry. In cooperation with the Department of State, the NRC is awaiting agreement of the foreign nation involved before issuing the license to SMC. Because the success of this process could significantly affect the scope of the EIS, the staff postponed further development of the EIS until a decision is reached concerning the acceptability of the export license.

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 95, the staff completed data collection and expects to issue an environmental assessment before the end of 1995. However, completion of the renewal process may be delayed because SMC's financial condition is having a significant adverse effect on the company's ability to meet decommissioning financial assurance requirements.

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 issued a confirmatory order in June 1994 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 using special segregation equipment. A new groundwater 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.

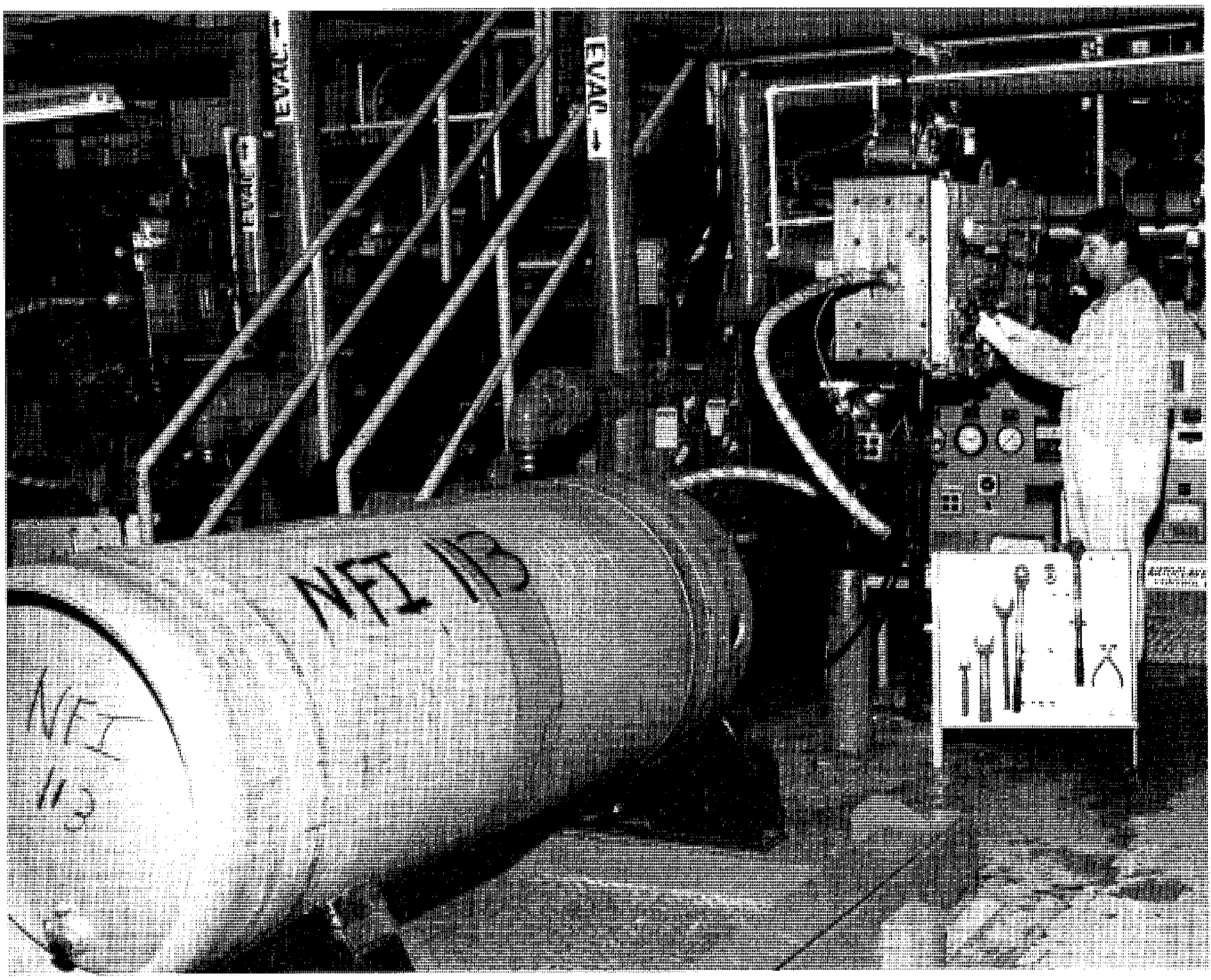
In addition to these measures, the licensee is preparing proposals for potential business ventures such as decontaminating equipment from other facilities, and possible downblending of Russian high-enriched uranium (HEU), under the Russia-U.S. Government-to-Government Agreement.

Chem-Nuclear Systems, Inc. (CNSI) License Amendment

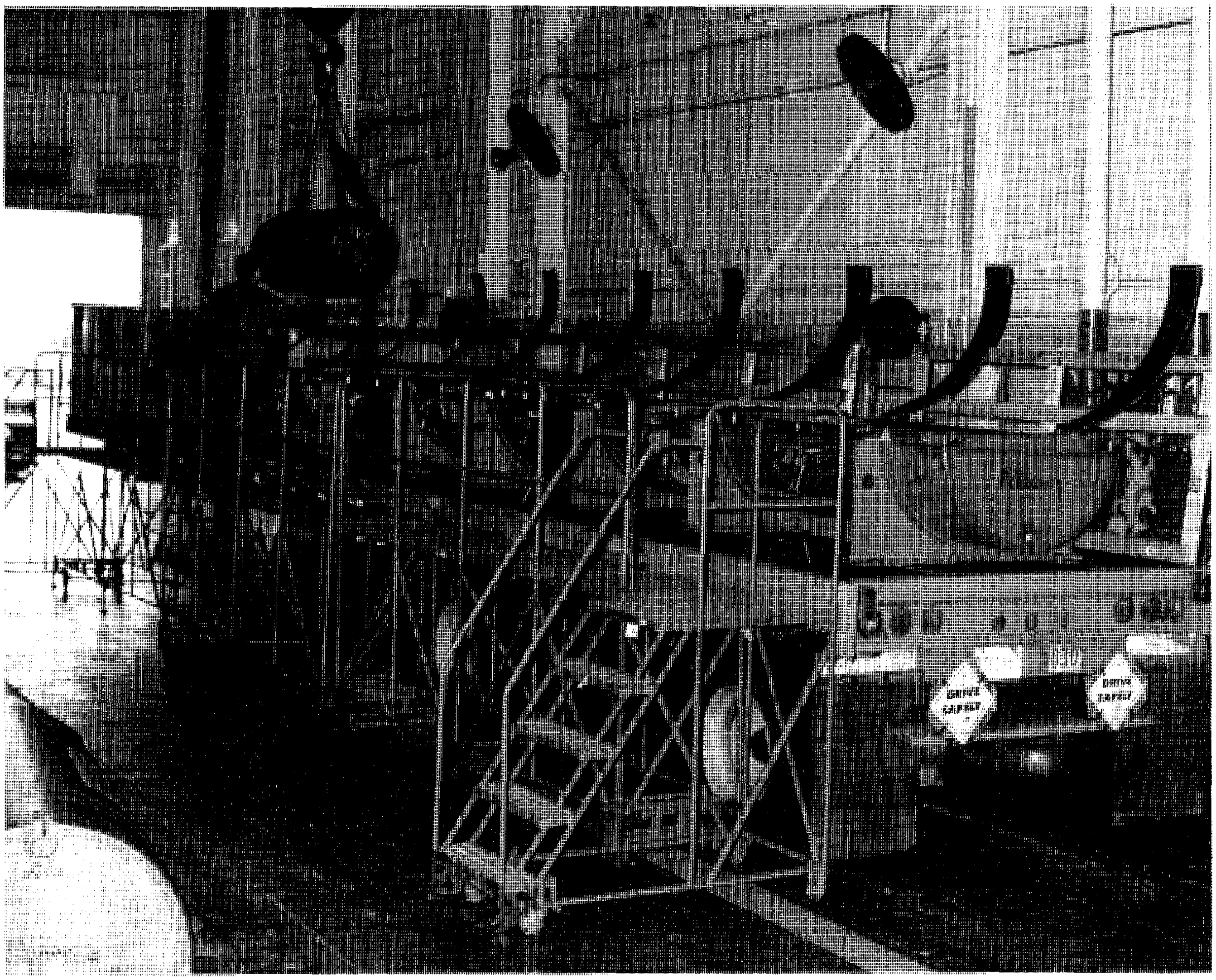
On June 21, 1995, the NRC amended CNSI's Service License 39-23004-01 to increase the possession limit for uranium-235 to 30,000 grams. This increase will facilitate processing operations in which CNSI, under contract to the Fernald Environmental Restoration Management Corporation, will neutralize and solidify approximately 100,000 gallons of uranyl nitrate hexahydrate waste solution located at the DOE's Fernald Facility.

Gaseous Diffusion Uranium Enrichment

In October 1992, Congress enacted the Energy Policy Act of 1992, which created the United States Enrichment Corporation (USEC) and directed the 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. The USEC is also directed to negotiate the purchase of HEU offered by any State of the former Soviet Union. This uranium comes from material produced in the nuclear weapons program of the former Soviet Union. Finally, the USEC is directed to assume management of new alternative technologies for the enrichment of uranium, including the "atomic vapor laser isotope separation" technology. The following three photographs are from the Portsmouth, Ohio, plants.



Customer Cylinder Loading Facility



Loading Customer Cylinder on Transport Vehicle

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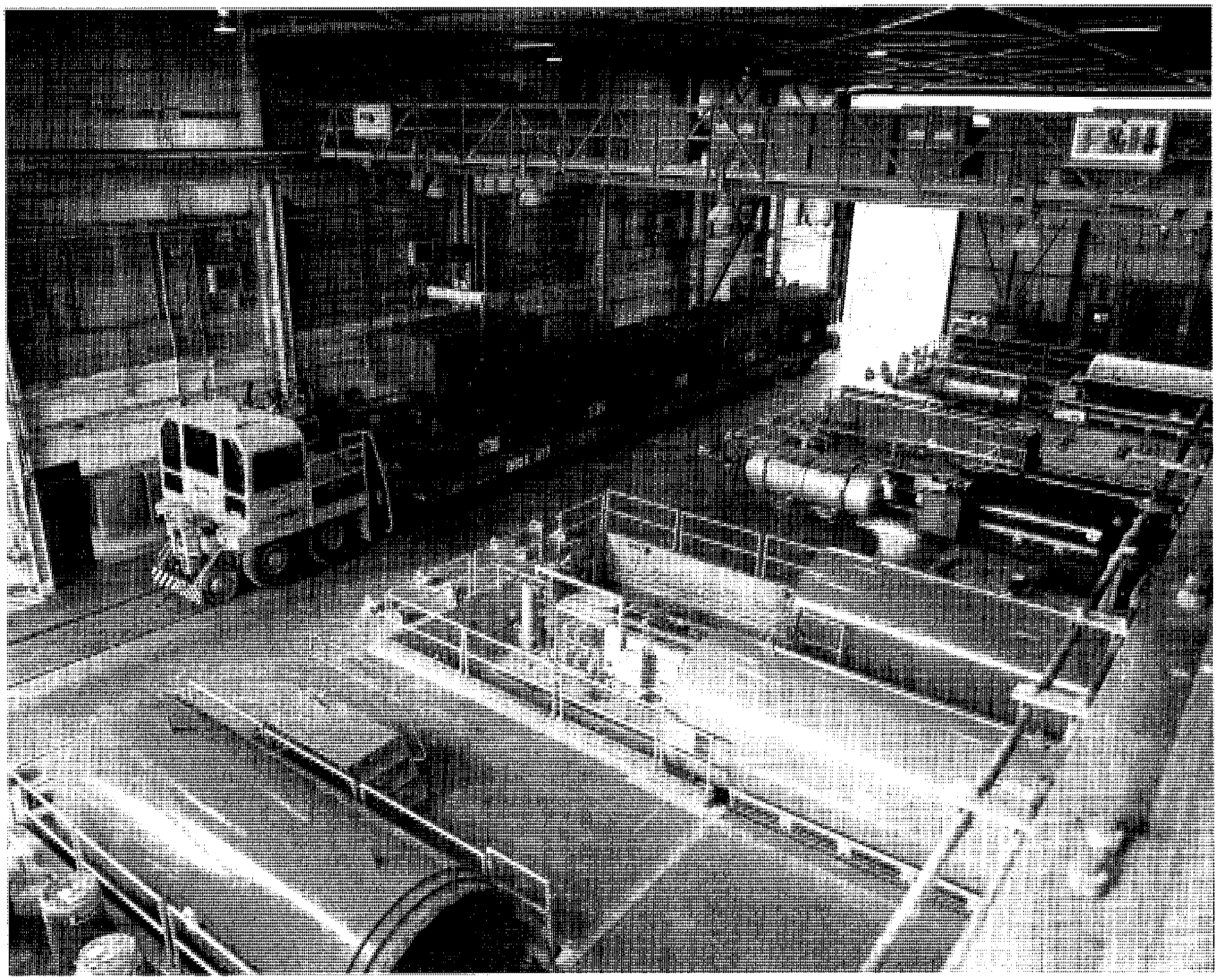


UF$_6$ Cylinder Feed Autoclaves

national security. This rule applies only to the GDPs operated by the USEC.

The USEC submitted its initial application for certification on April 18, 1995. However, the NRC determined that USEC's April 1995 submittal did not include adequate information for the NRC to assess compliance with the standards established for the GDPs. Therefore, the NRC rejected the application on May 5, 1995. The NRC's decision to reject the application did not constitute a determination that the plants were unsafe. Following the rejection, the NRC staff met several times with USEC staff to discuss the content of the USEC's application. Topics discussed included radiation protection, criticality prevention, accident analysis, and fire protection, among others.

On September 15, 1995, the USEC submitted a revised application, which the NRC accepted for review by letter dated September 21, 1995. Subsequently, the NRC issued its first request for additional information (RAI) in October 1995. Public meetings to receive public comments on the USEC's application were held in late 1995 at the Kentucky and Ohio plant sites.

Review of the USEC's application will continue into 1996, and the NRC intends to issue a certification decision around February 1996.

An important part of the certification process is the NRC's assessment of the GDPs, with regard to 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 covering security, material control and accounting (MC&A), criticality, and chemical safety at the GDPs. Results of these assessments were presented in 13 integrated inspection reports issued during FY 95.

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 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. (LES), 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 requirement of United States nuclear utilities. A draft EIS was published for comment in November 1993, and the NRC subsequently received more than 500 letters concerning the draft EIS. The final EIS (NUREG–1484) was issued in August 1994, and the SER (NUREG–1491) was issued in January 1994. As stated in the EIS and SER, the NRC staff concluded that the CEC can be constructed and operated with small and acceptable impacts on the environment, and the facility does not pose undue risk to the public health and safety. The NRC staff documents therefore support issuance of a combined construction/operating license for the facility.

The Citizens Against Nuclear Trash (CANT) oppose facility licensing for the CEC. In response to that opposition, the NRC's ASLBP held a formal adjudicatory hearing in two phases. The first phase of the hearing covered safety issues, and was held in Shreveport, Louisiana, in July 1994. The second phase of the hearing covered environmental issues and was held in Shreveport, Louisiana, in March 1995. Issues addressed included completeness of the licensee's application, decommissioning cost estimates, the need for the facility, groundwater and surface water impacts, environmental justice, analysis of the "no action" alternative, financial qualifications, and tails disposition. CANT, LES, and the NRC staff participated in the hearing and the ASLBP is expected to issue a decision soon.

FUEL CYCLE SAFETY INSPECTIONS

Headquarters-Based Inspection Activities

As part of the ongoing reorganization of fuel cycle facility activities within the NMSS, several inspection activities have been consolidated in NRC Headquarters since February 7, 1993. In particular, Headquarters staff will now conduct chemical process safety and nuclear criticality safety inspections, as well as MC&A inspections, and Headquarters developed and initiated the chemical process safety inspection program. A total of 13 criticality safety and chemical safety inspections and assessments were performed during FY 95. Of these, four chemical safety assessments at the GDPs and three chemical safety inspections at NRC licensees were conducted as a pilot program, and draft inspection procedures were prepared. A criticality and chemical safety assessment was also conducted at the WVDP.

A technical assistance contract has been awarded to support development of a complete set of criticality safety inspection procedures. 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 92 safety inspections at 18 operating and decommissioning fuel cycle facilities during FY 95. These inspections included resident inspector activities at one facility. The areas covered by the regional staff included criticality safety, radiation protection, emergency preparedness, environmental safety, and transportation. Participants in a regional NRC inspection are shown in the following photograph.

The COGEMA Irigaray uranium recovery facility in Northern Wyoming is licensed by the NRC and produces natural uranium (yellowcake) through an *in-situ* leaching process. Pictured are NRC Branch Chief Charles Cain and Inspector Vincent Everett monitoring themselves for contamination before leaving the licensee's restricted area in June 1995.

FACILITIES AND TRANSPORTATION SAFEGUARDS

FUEL CYCLE SAFEGUARDS LICENSING

A total of eight active, licensed nuclear fuel cycle facilities were subject to the NRC's comprehensive safeguards requirements during FY 95. Of the eight facilities, only one contains significant quantities of HEU, requiring extensive physical security and MC&A measures. Another of the eight facilities, NFS (Erwin, Tennessee), previously reduced the quantity of HEU material stored on site, thus substantially reducing the physical protection and MC&A measures required. NFS continues to work with the Russian Federation toward the possible conversion of HEU from the former Russian nuclear weapons program into light-water reactor fuel. However, there was no significant activity in this area during 1995.

The fully implemented physical protection requirements provide for performance testing through the use of mandated tactical drills and exercises. The single Category I facility, B&W's Naval Nuclear Fuel Division (NNFD), continues to increase performance and provide more effective implementation of physical protection measures as a result of lessons learned during performance testing. In addition, B&W's NNFD developed additional drill scenarios during calendar year 1995, to further test its physical protection program.

FUEL CYCLE SAFEGUARDS INSPECTIONS

During FY 95, the Headquarters staff conducted 24 comprehensive MC&A inspections, while the regional and resident inspectors performed six physical security inspections at major fuel fabrication facilities. Performance-based inspection procedures were used by the physical security inspectors during all of these inspections.

REACTOR SAFEGUARDS

Reactor Safeguards Inspection and Licensing

During FY 95, the four NRC regional offices conducted a total of 115 core inspections at licensed nuclear power reactor sites. In addition, the regional offices participated in reactive and regional initiative inspections as a result of unusual activities that took place at some sites.

Approximately 181 revisions to the licensee security, guard training, and contingency plans were received and reviewed by both the regional and headquarters staff. Because of changes in security technology for automated access control systems, numerous licensees have requested and been granted an exemption to the 10 CFR 73.55(d)(5) requirements that address control of site access badges.

Operational Safeguards Response Evaluations at Power Reactors

After completing the Regulatory Effectiveness Review Program in May 1991, the NRC staff initiated an Operational Safeguards Response Evaluation (OSRE) program at power reactors. An OSRE is an effectiveness review conducted by an interdisciplinary team, consisting of a nuclear engineer and physical security specialists, assisted by contractors. The team evaluates a licensee's contingency response capabilities by focusing on the interactions between operations and security personnel in establishing priorities for the protection of safety equipment, and by scrutinizing and testing the defensive strategies used. OSRE teams also conduct safety and safeguards interface reviews to ensure that safeguards do not adversely affect the safe operation of the plant. Nine OSREs were conducted during FY 95, for a total of 36 to date. These evaluations resulted in a total of 34 significant improvements at 16 power reactor sites.

Fitness-for-Duty Programs at Power Reactors

Power reactor licensees are required to implement fitness-for-duty programs under 10 CFR Part 26. Although the existing rule appears to be achieving the desired effect, the Commission is considering changes that would reflect lessons learned during the first 5 years of the program. The changes being considered would ensure compatibility with changes the Department of Health and Human Services made to its testing guidelines in 1994, and would substantially reduce burden; clarify the Commission's original intent; and enhance overall program 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 1994" (NUREG/CR-5758, Volume 5), dated August 1995. This report indicates that 163,241 tests for the presence of illegal drugs and alcohol were conducted during calendar year 1994, of which 1,372 were positive. The majority of the positive test results (977) were obtained through pre-access testing (1.22 percent positive rate). An additional 223 positive tests were obtained through random testing (0.28 percent positive rate). The positive rate also varied by worker category. For example, 0.18 percent of random tests of licensee employees were positive; for long-term contractors, the positive rate was 0.19 percent; and for short-term contractors, the positive rate was 0.54 percent. In general, positive rates, with minor exceptions, were reduced; however, the positive rates for pre-access and random tests increased in 1994. This increase may be attributable to the actions of several licensees to lower the cutoff levels for marijuana screening tests, and to increase emphasis on detecting subversion of the testing process. The decreased random testing rate also may have contributed to the increased positive rate.

Access Authorization Programs at Power Reactors

Power reactor licensees are required to implement access authorization programs under 10 CFR 73.56. These programs are intended to ensure that individuals 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. Toward that end, established access authorization programs use background investigations, psychological assessments, and behavioral observations.

The NRC conducted 16 initial access authorization program inspections under Temporary Instruction (TI) 2515/116, and found that the programs are generally effective. However, because of the number of implementation issues identified, the staff determined that initial inspections were necessary at all facilities not previously inspected. These inspections are currently being conducted under TI 2515/127.

Once a program receives its initial inspection under one of the above TIs, continuing routine inspections of the program are conducted under the NRC Core Inspection Program. The results of these inspections will be evaluated to determine if further program changes are necessary.

Nonpower Reactors (NPRs)

During FY 95, the NRC completed 16 safeguards inspections of NPRs. The program to convert 25 NPRs from HEU fuel to low-enriched uranium (LEU) fuel is continuing. Its 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. As of the end of FY 95, one license had been terminated, three licensees had received conversion or decommissioning orders, and eight licensees had converted to LEU fuel. The remaining 13 reactors are operating with HEU fuel, and two have submitted SARs. The NRC has ordered one of these two to convert from HEU to LEU, and is currently preparing the conversion order for the second one. Six of the 13 NPRs operating with HEU fuel have been funded by DOE for evaluation of the operational effects of the fuel conversion and for preparation of an SAR. However, the DOE has not funded one university reactor because of the unavailability of suitable replacement fuel, and another two commercial reactor licensees will not be funded by DOE for fuel conversion. The Commission is also reviewing two "unique purpose" applications, but there is no suitable replacement fuel for one of these reactors.

TRANSPORTATION SAFEGUARDS

Spent Fuel Shipments

During FY 95, the NRC applied safeguards requirements to 21 shipments of irradiated spent reactor fuel made over approved routes. Of these 21 shipments 13 were by rail, 2 were exports, and 1 was an import.

Strategic Special Nuclear Material Shipments

During FY 95, 12 domestic shipments of less than 5 but more than 1 kilogram of HEU were completed. No commercial domestic, export, or import shipments were made of 5 or more kilograms of HEU during FY 95.

Tracking International Shipments of SNM

NRC regulations require licensees to notify the agency of international shipments of SNM and natural uranium. During FY 95, the NRC received about 252 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. Although there are currently no NRC-licensed facilities under IAEA inspection, the United States 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 the DOE, the Arms Control and Disarmament Agency, the Department of State (DOS), and the Department of Defense.

During 1995, 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 U.S. facilities. In response to President Clinton's offer to place excess fissile material under IAEA safeguards, three DOE sites were selected for IAEA safeguards inspections. Another NRC staff member served as a member of the Subgroup on Safeguards Technical Support, which seeks to strengthen and improve IAEA safeguards through technical support. During 1995, this Subgroup supported funding of 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 the SISM which, in addition to monitoring the activities of these referenced subgroups, took an active role during FY 95 in collaborating with United States allies on international safeguards issues during multilateral meetings.

In response to concerns regarding nuclear-related activity in Iraq, the IAEA is planning to broaden its safeguards activities to include measures to detect undeclared nuclear facilities. The NRC is supporting this effort and contributing to the evaluation and implementation of new measures. In this regard, during 1992 and 1993, the IAEA Board of Governors decided, with the support of the United States, to request that Member States report certain additional information. Specifically, the request includes early provision of design information on new facilities, as well as information on major modifications and additions to existing facilities; expanded reporting of exports, imports, and production of nuclear materials; and reporting of the import or export of certain nonnuclear materials and equipment. The NRC took measures to satisfy this request during the FY 95 reporting period.

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, the DOE must consult with the 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 1995, the NRC performed 116 international safeguards technical reviews regarding export applications, agreements for peaceful nuclear cooperation, subsequent arrangements, and technology transfers.

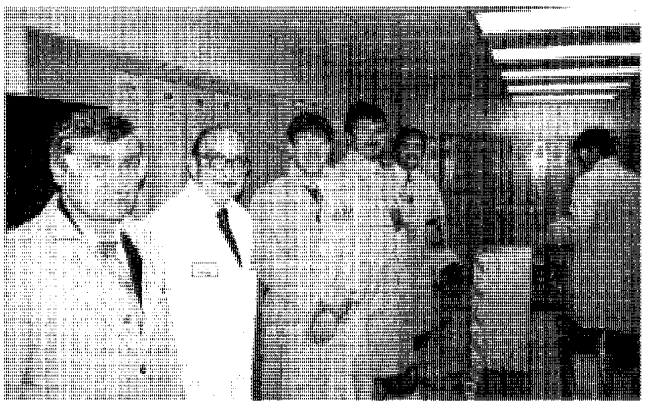
In keeping with the NRC responsibility to ensure application of IAEA safeguards to exported U.S. nuclear material, the NRC supports the improvement of effective international safeguards. The NRC also continues to contribute to U.S. Government efforts to strengthen IAEA safeguards, and to maintain the effectiveness of implemented safeguards. During 1995, the NRC continued a special study with respect to the difficult issues associated with establishing internationally acceptable criteria for terminating IAEA safeguards on nuclear materials contained in waste. Also during this reporting period, an NRC staff member continued serving 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 of IAEA safeguards.

FORMER SOVIET UNION ACTIVITIES

During FY 95, the NRC continued to support the interagency Cooperative Threat Reduction Program. This initiative coordinates support to the republics of the former Soviet Union (FSU) in dismantling their nuclear arsenals and deterring proliferation of weapons of mass destruction. The NRC's primary role is to assist these republics in establishing national regulatory systems for MC&A and physical protection.

In 1995, the NRC hosted delegations from Kazakstan and Ukraine for safeguards regulatory workshops during which the NRC staff explained the U.S. regulatory process. The NRC also coordinated a visit by a Kazakstani delegation to the Westinghouse Commercial Nuclear Fuel Division in South Carolina to discuss implementation of MC&A regulations.

The NRC has coordinated trips by several FSU safeguards inspectors to observe NRC MC&A and physical protection inspections as shown in the following photograph. NRC representatives also observed an MC&A inspection by the Russian nuclear regulatory authority at the Elektrostal nuclear fuel facility in Russia.



Steve Caudill (third from the left), FCSS International Safeguards Section, with the Delegation from Kazakstan at ABB/Combustion Engineering Nuclear Fuel Facility for Discussions on Material Control and Accounting and Physical Protection

In March 1994, the United States and the Russian Federation signed a protocol concerning transparency measures in both U.S. and Russian facilities that will process HEU extracted from former Soviet nuclear weapons. Under the HEU Disposition Agreement signed in February 1993, this material will be blended in Russia to form LEU, which will subsequently be fabricated into light-water reactor fuel by NRC-licensed facilities in the United States. The NRC's role is to ensure that transparency measures in U.S. commercial fuel fabrication facilities are practical. The first shipment of material subject to the agreement arrived in June 1995.

Part of the follow-up activities resulting from a Technical Working Group meeting in February 1994 between the NRC and the Russians included a visit to the ABB-Combustion Engineering nuclear fuel facility in Hematite, Missouri. Representatives from the Russian nuclear regulatory agency GOSATOMNADZOR (GAN) also accompanied and observed the NRC staff during an MC&A inspection.

Headquarters inspection staff participated with officials from GAN in July 1995 meetings at NRC Headquarters in accordance with the NRC/Russia Lisbon–9 initiative. Topics on the agenda included an Introduction to NRC Structure and Organizations, How NRC Regulates, Fuel Cycle Inspection, and the Regional Inspection Programs for Fuel Cycle Facilities. GAN officials requested and were given copies of publicly available Federal regulations, regulatory guides, and NUREG-series reports that pertain to regulating fuel cycle facilities. After these meetings, GAN officials accompanied and observed Region III staff as a safety inspection was performed at the ABB-Combustion Engineering facility in Hematite, Missouri.

The NRC also serves in a technical advisory capacity on an Interagency Working Group (IWG) on the Disposition of Excess Weapons Plutonium. This IWG is considering technical, economic, nonproliferation, scheduling, and environmental aspects of the disposition of surplus plutonium. The NRC staff has provided input to the IWG and 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, DOE public scoping meetings, and a meeting regarding German assistance in Russian disposition. Support to DOE on plutonium disposition alternatives is funded through a reimbursable agreement. The NRC also participates in an interagency group examining alternative safeguards approaches for excess weapons components.

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 95, the NRC visited Taiwan, Thailand, the Philippines, Spain, and Portugal. In exchange, a team from Canada visited the NRC and an NRC-licensed facility.

Substantial increases in reported incidents of smuggling and offers for sale of alleged weapons-usable nuclear materials have demonstrated the importance of ensuring a high level of physical protection on materials and facilities.

NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM

Jointly funded by the DOE and the 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 with this system. Selected data, based on NMMSS output, are then furnished to the IAEA, in fulfillment of 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 NRC successfully transferred the NMMSS system to a new contractor. The new system uses a downsized computer platform that promises to improve the efficiency of operations, while maintaining flexibility for responding to future programmatic changes. Plans to further reduce and possibly eliminate the need for paper transactions for high-volume licensee users of NMMSS are now being considered.

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. The 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.

Under Bulletin 91-01, licensees have since reported 67 "criticality" safety-related events, including 6 events reported during FY 95. The majority of these events were reported within 24 hours, and involved less-significant degradations of criticality safety controls. The NMSS Division of Fuel Cycle Safety and Safeguards uses a computer database to analyze trends and patterns in order to focus NRC inspection resources on areas of greatest criticality safety concern.

THREAT ASSESSMENT AND LIAISON/DESIGN-BASIS THREAT/INCIDENT RESPONSE ACTIVITIES

Threat Assessment and Liaison

The NRC staff continually reviews the threat environment worldwide; assesses threats to NRC-licensed facilities, materials, and activities; and prepares safeguards 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 maintains close contact with the intelligence community, including participation in regular meetings of Federal agencies that are prepared to address terrorism. During FY 95, an NRC staff member was asked to Chair an interagency counterterrorism subcommittee (the first time a non-intelligence community representative has been given such responsibility).

Liaison activities also include briefings and consultations with the representatives of other governments regarding NRC threat assessment and incident response activities. During FY 95, the NRC continued to participate in a variety of sessions to train intelligence community threat analysts and others, in order to augment their understanding of nuclear-related matters.

During FY 95, the NRC continued to work closely with the DOE and other interested agencies to investigate reported attempts to sell alleged nuclear materials. NRC activities in this area included participating in an international symposium on nuclear smuggling that was hosted by the Federal Bureau of Investigation in Quantico, Virginia. The NRC also participated 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, the multidisciplinary NRC/DOE Communicated Threat Credibility Assessment Team, was called upon periodically during FY 95, to assess attempts to sell alleged nuclear and radioactive materials.

Design Basis Threat

In response to the April 1995 bombing in Oklahoma City, the staff gave information to the Commission regarding the implications of the attack and the possible need to modify the design-basis threat for radiological sabotage and existing safeguards requirements. A Commission response to the information is pending. Also, in light of the Oklahoma City bombing, the NRC Information Assessment Team issued an information advisory in April 1995 to all power reactors, NPRs, and certain fuel cycle facilities. The staff also continued its ongoing review of the threat environment, and provided its findings to the Commission and senior NRC management on a semiannual basis.

Incident Response

During the FY 95 reporting period, the NRC reviewed and updated its fuel cycle safeguards incident response plan.

SAFEGUARDS SUMMARY EVENT LIST

During FY 95, the staff continued to analyze safeguards events related to threats and incidents in order to identify trends, patterns, and anomalies. On the basis of that analysis, the staff published the Safeguards Summary Event List (SSEL), NUREG-0525, Volume 2, Revision 3. This SSEL represents 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, 1994. Events reported before Congress established the NRC through December 31, 1989, were published in SSEL Volume 1, which was issued on December 31, 1992. During FY 95, the SSEL was distributed to members of the domestic and international intelligence community, in addition to the normal distribution in the licensed community.

SAFETY AND SAFEGUARDS REGULATORY ACTIVITIES AND ISSUES

PROPOSED RULES AND STUDIES

During FY 95, the NRC continued the following rulemaking actions and studies to determine the need for rulemakings:

- Security Plan Format Changes. On April 17, 1995, the NRC published a proposed rule to amend 10 CFR Parts 50 and 70 to eliminate submittal of physical security plans in two parts by applicants for power reactor and Category I fuel cycle licenses. The two-part format, specified by current regulations, is now deemed unnecessarily restrictive and has no regulatory advantage. Licensees whose plans 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.

- Safeguards for Spent Nuclear Fuel or High-Level Radioactive Waste. In a proposed rule published for public comment on August 15, 1995, the NRC amended its regulations to clarify safeguards requirements. Specifically, the amendment concerned requirements regarding safeguards for spent nuclear fuel or high-level radioactive waste stored at independent spent fuel storage installations, power reactors that have permanently ceased reactor operations, monitored retrievable storage installations, and geologic repository operations areas. This rule would allow general licensees the option to implement the proposed safeguards requirements for spent nuclear fuel stored in approved casks at operating power reactor sites. This action is necessary to reduce the regulatory uncertainty regarding the safeguards requirements for the storage of spent nuclear fuel and high-level radioactive waste without reducing the level of protection for public health and safety.

- Independent Spent Fuel Storage Installations Vehicle Bomb Study. A study is underway to determine whether a need exists for a regulation to require the installation of vehicle barriers around independent spent fuel storage installations. The study will examine whether the spent fuel storage casks are inherently robust enough to withstand an attack without a significant release of radioactive material.

- Safe Concentration of SNM in Soil. As a result of a petition for rulemaking, the NRC staff conducted an analysis to determine if parameters used to define critical mass could be expressed in terms of SNM concentration, instead of "total SNM mass," for very low-specific-activity soil. The staff had determined that this modification was feasible; however, based on further development of the issue, the staff is currently evaluating the need for a rulemaking to add an exemption based on a concentration limit.

- SSNM in Transit. Work continued on an initiative to upgrade physical protection of SSNM in transit. Because there are currently no licensees that would be affected by a proposed rulemaking, the NRC will handle the issue in a cost-effective manner on a case-by-case basis, instead of performing a generic rulemaking. To this end, the staff is developing interim licensing criteria that could be used as guidance for licensing an entity desiring to transport Category I quantities of SSNM.

- Safety of Fuel Cycle Facilities and Others Licensed for SNM. Work continued toward a major revision of the rule governing the possession and use of SNM, 10 CFR Part 70. The primary objective is to update and enhance the regulatory basis for facilities possessing large amounts of SNM. To further the revision of 10 CFR Part 70, the NRC initiated a series of meetings to discuss with the fuel cycle licensees and other interested parties the reasons for revising the rule, the objectives the staff wants to achieve, and the potential changes in the requirements or other aspects of staff's regulatory approach that can be made to achieve the objectives. The principal proposed changes are (1) ISA of plant processes and changes to those processes, to identify potential areas of risk and to elucidate how safety is achieved; (2) expanded focus on chemical process and fire protection safety; and (3) more specific performance requirements for management control systems for plant safety. In addition, proposed modifications to 10 CFR Part 70 would improve the organization of the regulation, and would make it easier for applicants and licensees to distinguish those requirements that apply to their activities.

GUIDANCE DOCUMENTS

- ISA of Fuel Cycle Facilities. Under the proposed changes to 10 CFR Part 70, fuel cycle facilities would be required to perform an ISA, which is a comprehensive analysis of the hazards and potential accidents at a facility, and the items and actions relied on for safety. Consequently, during FY 95, the NRC continued its work to prepare a document giving industry guidance on acceptable ways of performing an ISA. A draft of this document will be provided with the proposed rulemaking package of modifications to 10 CFR Part 70, previously discussed.

- SRP for the Review of a License Application for a Uranium Fuel Processing and/or Fabrication Facility. During FY 95, the NRC continued to develop an SRP to provide guidance for the NRC staff to use in reviewing and evaluating the health and safety, safeguards, and environmental aspects of applications for licenses to possess and use uranium to produce nuclear fuel. This guidance is also applicable to the review and evaluation of proposed amendments and license renewal applications. In addition, the guidance is useful to licensees for understanding the intent of new risk-based requirements proposed for the revision of 10 CFR Part 70, and a draft will be included among the documents to accompany that revision when it is proposed.

- Standard Format and Content Guide (SF&CG). During FY 95, the NRC continued to develop an SF&CG for applicants to use in preparing applications for licenses, license amendments, and license renewals for fuel cycle facilities. The SF&CG will describe the scope and type of information applicants should submit with their applications for review by the NRC staff. The information specified by the SF&CG will also correspond to the new SRP. The draft SF&CG will be published with the rulemaking package for the proposed revision of 10 CFR Part 70.

- Uranium Hexafluoride Vapor Cloud Model Study. During FY 95, the NRC initiated a study to assess the usefulness of various analytical source term and dispersion models to estimate the consequences resulting from inadvertent releases of uranium hexafluoride. Such releases constitute one of the most serious hazards at most NRC-licensed fuel cycle facilities. To address concerns about such hazards, NRC licensees and applicants need to be able to evaluate the consequences that would result from potential accidents involving the release of uranium hexafluoride. Such evaluations are important in three areas of regulatory interest to NRC, including ISA, emergency planning, and post-accident investigation. The assessment of various analytic models will assist the NRC in judging the acceptability of such models for use in these three areas.

- Chemical Process Safety for Fuel Cycle Facilities. The NRC is preparing a document to give industry guidance for minimizing unwanted impacts of chemicals and chemical processes on licensed nuclear materials. The issuance and continuance of specific licenses for activities involving SNM require the applicants' proposed equipment and facilities to be adequate to protect health and minimize danger to life or property. For proper evaluations to be performed, applications for a specific license should include information regarding the chemical process safety of the proposed equipment and facilities. This guide will describe to licensees and applicants the NRC's general philosophy concerning the role of chemical process safety as it pertains to NRC-licensed materials, the basic information needed for proper evaluation of chemical process safety, and the evaluation methods used to determine the adequacy of the chemical safety of the proposed equipment and facilities. This guidance is being developed concurrently with the guidance document concerning ISA and the proposed modifications to 10 CFR 70, previously discussed.

- Physical Protection for Spent Fuel Storage. A new guidance document, "Interim Licensing Criteria for Physical Protection of Certain Storage of Spent Fuel" (NUREG-1497), was published in November 1994. This document presents interim criteria to be used in licensing certain spent fuel storage installations. These criteria apply to both dry cask and pool storage at installations that store power reactor spent fuel at decommissioned power reactor sites; independent spent fuel storage installations located outside of the owner-controlled areas of operating nuclear power reactors; monitored retrievable storage installations owned by the DOE, designed and constructed specifically for the storage of spent fuel; the proposed geologic repository operations area; or permanently shutdown power reactors still holding a 10 CFR Part 50 license.

- MC&A Guidance. A revision of Regulatory Guide 5.15, "Tamper-Indicating Seals for Protection of Special Nuclear Material," is currently being developed for public comment.

CHAPTER 6

WASTE MANAGEMENT

The responsibilities of the NRC's Office of Nuclear Material Safety and Safeguards (NMSS) include regulating of all commercial high-level and low-level radioactive waste and uranium recovery facilities. This chapter deals with the NRC's high-level and low-level radioactive waste programs, decommissioning of nuclear facilities (including reactors) transferred to the NMSS from the NRC's Office of Nuclear Reactor Regulation), (NRR) and management of uranium recovery and mill tailings.

HIGH-LEVEL WASTE PROGRAM

REGULATORY DEVELOPMENT ACTIVITIES

During fiscal year 1995 (FY 95), the NRC continued to take steps to ensure that the regulations governing the safe disposal of high-level waste (HLW) (10 CFR Part 60) are clear and complete. On March 22, 1995, the NRC published in the *Federal Register* a proposed rule, "Disposal of High-Level Radioactive Wastes in Geologic Repositories; Design-Basis Events." This proposed rule clarifies the relationship of 10 CFR Part 60 requirements to potential accident conditions, and provides consistency among NRC regulations governing similar activities. The proposed rule also addresses a petition for rulemaking (PRM–60–3), submitted by the Department of Energy (DOE) on April 19, 1990, requesting that 10 CFR Part 60 be amended to include quantitative dose criteria for a design-basis accident. Comments on the proposed rule were received from 10 parties. The NRC is reviewing these comments, and expects to publish the final rule by April 1996.

Another area of NRC rulemaking activity concerns regulations consistent with HLW standards promulgated by the Environmental Protection Agency (EPA). In the Energy Policy Act of 1992, the EPA was directed to contract with the National Academy of Sciences (NAS) to provide findings and recommendations on reasonable standards for protecting the public health and safety from releases of radioactive material stored or disposed of in a repository located at Yucca Mountain, Nevada. The EPA was also required to promulgate health-based standards that are consistent with the findings and recommendations of the NAS. The NAS study considered three questions posed by the Energy Policy Act of 1992.

- whether a standard based on doses to individuals is reasonable.
- whether post-closure oversight and active institutional controls can effectively ensure that exposures of individuals will be maintained within acceptable limits.
- whether scientifically supportable probability estimates of human intrusion into a repository over 10,000 years can be made.

The NAS released its completed report entitled "Technical Bases for Yucca Mountain Standards," on August 1, 1995. The Energy Policy Act of 1992 requires the EPA to promulgate its final standards by August 1, 1996, and the NRC must ensure that the technical criteria in 10 CFR Part 60 conform to the new EPA standards applicable to Yucca Mountain within 1 year of their promulgation.

TECHNICAL ASSESSMENT CAPABILITY FOR REPOSITORY LICENSING REVIEWS

During FY 95, NRC staff continued its work on the draft License Application Review Plan (LARP). Designated as NUREG-1323, the LARP is a comprehensive guidance document for NRC staff review of a potential DOE license application to construct and operate an HLW repository. In particular, the LARP provides guidance to the NRC staff on how to review DOE's license application to construct a mined geologic repository for the disposal of spent nuclear fuel and other HLW at Yucca Mountain, Nevada. The LARP is intended to ensure the quality and consistency of the staff's pre-licensing and licensing reviews. Because it is a public document, the LARP will also help the DOE and other interested parties to better understand the NRC staff's review process by describing the review strategies, procedures, and acceptance criteria that the staff will use.

Having completed its work to revise the draft LARP, the staff expects to publish Revision 1 in early FY 96. Revision 1 and subsequent revisions of the draft LARP are preliminary documents and are subject to change. Revision 1 will contain 10 newly completed individual review plans and revisions to 3 appendices.

During FY 95, the staff also completed the Phase 2 activities to support the development of its independent performance assessment (IPA) capability. The NRC staff plans to issue a report documenting the Phase 2 results early in FY 96. In addition, the NRC and its contractor, the Center for Nuclear Waste Regulatory Analyses (CNWRA), initiated Phase 3 IPA development activities by preparing provisional plan for Phase 3, and completing several scheduled performance assessment products.

The NRC also completed work that will lead to the publication of a draft staff technical position (STP) on the use of expert elicitation in the HLW program. The STP provides general guidelines applicable to the formal use and documentation of expert judgments, identifying circumstances that may warrant a formal process for obtaining the judgments of more than one expert. In addition, the STP describes acceptable procedures for conducting an expert elicitation when formal judgments are used to support a demonstration of compliance with the regulatory requirements of 10 CFR Part 60. The staff plans to release this draft STP for public comment in the first quarter of FY 96.

YUCCA MOUNTAIN SITE CHARACTERIZATION REVIEWS AND INTERACTIONS

During FY 95, the NRC staff continued prelicensing interactions with the DOE, and provided guidance regarding the DOE's ongoing site characterization activities. The NRC staff also conducted numerous DOE-related interactions, including 25 meetings and technical exchanges with the DOE, and one meeting with Nye County, Nevada, in which the DOE participated. There were also approximately 10 site visits to Yucca Mountain by the staff, as well as a visit by the Chairman and Executive Director for Operations. Early in FY 95, the staff had a full-time presence at the Yucca Mountain site to observe the operation of the tunnel boring machine. During this period, two new onsite representatives (ORs) were assigned to the Las Vegas office, where they assumed their duties to provide day-to-day NRC oversight of the DOE's ongoing site characterization DOE activities.

In mid-FY 95, it became apparent that the NRC staff would need to better focus its limited resources to adequately respond to the DOE program in light of budget reductions in the HLW program. The staff began by reviewing the 54 key technical uncertainties identified in Appendix E to the LARP. In addition, the staff reviewed the results of the DOE's total system performance assessments (TSPAs), the NRC IPA, and other technical interactions with the DOE. On the basis of this review, the staff identified the key technical issues it deemed most important for licensing. The staff intends to focus its resources in resolving these key technical issues using an approach consistent with the Overall Review Strategy (ORS), NUREG-1495, which was published in 1994. Specifically, for each issue, the staff intends to conduct an audit review (sometimes referred to as a vertical slice review).

INTERACTIONS WITH AFFECTED GOVERNMENTAL UNITS AND INDIAN TRIBES

During FY 95, the State of Nevada, representatives of affected units of local government, and other interested parties continued to participate in the technical exchanges and meetings between the NRC and the DOE. To facilitate this participation, these parties continued to receive notification of upcoming NRC/DOE HLW meetings, as well as meetings of the NRC Advisory Committee on Nuclear Waste. In addition, the NRC staff continued its active role in ensuring that these parties receive all correspondence and publicly available NRC reports regarding the HLW program.

QUALITY ASSURANCE ACTIVITIES

During FY 95, the NRC staff continued to review the quality assurance (QA) plans and procedures (document reviews) prepared by the DOE and its contractors. The staff had two main objectives for this review. First, the staff evaluated DOE's effectiveness in auditing its program to identify and correct problems in program implementation. Second, the staff evaluated the DOE contractors' effectiveness in implementing QA programs. As part of these evaluations, the NRC staff observed DOE audits conducted at all major DOE contractor organizations participating in the site characterization program for the Yucca Mountain Project.

One area of concern previously identified by the staff deals with the lack of an effective QA program for the DOE's lead management and operations contractor, as stated in a letter to the DOE in 1994. An effective QA program is essential to correct identified problems and ensure full integration of issues related to the design and construction of the exploratory shaft facility. During the week of April 3, 1995, the NRC staff conducted a field verification to determine if the DOE was effectively and acceptably implementing its commitments to address this issue. The NRC staff concluded that, within the scope of the field verification, the DOE's compliance with its commitments was satisfactory. However, several previously identified issues remained open. By letter to the DOE dated June 16, 1995, the NRC staff transmitted its report of the field verification. Before finally closing the open items identified in 1994, the staff will review additional documents submitted by the DOE, and will conduct another inspection.

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES (CNWRA)

On October 15, 1993, the NRC renewed its contract with the CNWRA, and the CNWRA completed its eighth year of operation in October 1995. The CNWRA provides a broad range of HLW program support to the NMSS and to the Office of Nuclear Regulatory Research (RES). CNWRA staff are located at the Southwest Research Institute in San Antonio, Texas, and at the Washington Technical Support Office in Rockville, Maryland.

During FY 95, the CNWRA continued working with the NRC staff to develop and implement a computer-assisted systems engineering approach, called the Systematic Regulatory Analysis (SRA), for the development of regulatory documents. The purposes of the SRA are to identify and reduce uncertainties, to select strategies and methods for assessing compliance with NRC regulatory requirements, and to define issues in licensing an HLW geologic repository. The NRC is using this approach to ensure that all of its HLW activities under the Nuclear Waste Policy Act (NWPA) are planned, integrated, implemented, documented, and managed as thoroughly and effectively as possible.

The CNWRA's special expertise also supports the NRC staff in such areas as review of study plans and design reports, NRC/DOE pre-licensing meetings and technical exchanges, QA observation audits, technical support to NRC rulemaking and regulatory guidance development programs, development of analysis methods (e.g., computer codes), and research. Activities in the research program include unsaturated mass transport (geochemistry), thermohydrology, seismic rock mechanics, integrated waste package experiments, stochastic analysis of flow and transport, geochemical analogs, modeling of sorption mechanisms, regional hydrology, performance assessment (PA) issues, volcanism/seismology (review), volcanism (field), and tectonic analysis.

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 (LLRWPAA) of 1985. During FY 1995, the NRC staff assessed the implications of terminating the NRC's LLW disposal program during a budget review aimed at meeting reduced targets for the agency. As part of the review, the staff identified and assessed two alternatives to complete termination of the program, including maintaining the program as is and reducing it to the legal minimum with additional activities that are essential to the national program. The staff provided its assessment to the Commission in July 1995 as a Commission Paper, SECY 95-201. In September 1995, the Commission returned the paper to the staff to obtain comments from the Advisory Committee on Nuclear Waste (ACNW) and to consider program options as part of the agency's overall strategic assessment. The staff will provide revised recommendations to the Commission in early 1996, based on the ACNW's comments, strategic assessment, and stakeholder input.

REGULATIONS AND GUIDANCE

Rulemakings

NRC staff from the Division of Waste Management (DWM) supported two rulemakings during the FY 95. First, the DWM supported the Office of International Programs in completing a final rule amending 10 CFR Part 110, "Export and Import of Nuclear Equipment and Material." These amendments bring the policies of the United States into conformance with the guidelines of the International Atomic Energy Agency (IAEA) "Code of Practice on the International Transboundary Movement of Radioactive Waste." In addition, these amendments strengthen the Commission's control over radioactive waste entering and leaving the United States by requiring a specific license for exporting and importing radioactive waste. This rule became effective on August 21, 1995.

Second, the DWM supported RES in a final rule amending to 10 CFR Part 20, "Standards for Protection Against Radiation," and 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." These amendments will improve the quality and uniformity of information contained on manifests that are required to control transfers of LLW ultimately intended for disposal at a land disposal facility. The amendments will also establish a set of forms that will allow LLW to be tracked from its origin, and will serve as a uniform national LLW manifest to meet NRC, the Department of Transportation, and State and Compact information requirements: In addition, the amendments will require LLW disposal site operators to electronically store manifest information, and to be capable of reporting the stored information on a computer-readable medium. The rule will become effective on or before March 1, 1998.

During FY 95, the DWM also supported RES in withdrawing a rulemaking that would have allowed private ownership of land disposal facilities for LLW. The NRC published an advance notice of rulemaking in August 1994, but formally withdrew the rulemaking in August 1995 after the Commission considered the proposal and related public comments in July 1995.

Guidance

During FY 95, the staff continued its program to develop LLW PA guidance and to enhance staff expertise in PA. Guidance-related staff activities focused on three main objectives:

- Review comments received on the draft branch technical position (BTP) on LLW PA, which addresses important issues in PA modeling,
- Revise the BTP as a result of these comments.
- Gaining 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 complete the BTP and the test case model in FY 96.

In January 1995, the staff completed and published a final branch technical position (BTP) on "Concentration Averaging and Encapsulation". NRC's regulations in 10 CFR Part 61 require that waste proposed for near-surface disposal be classified to ensure its suitability for disposal. Part 61 also establishes a waste classification system based on the concentration of specific radionuclides contained in the waste. In addition, the regulation states that the concentration of a radionuclide may be averaged over the volume or the weight of the waste. The BTP builds upon the requirements of 10 CFR Part 61 by defining a subset of concentration averaging and encapsulation practices that the NRC staff would find acceptable in determining the radionuclide concentrations required for waste classification.

In response to concerns from the steel industry and others, the DWM staff also developed a draft BTP on disposal of emission control dust and related materials contaminated with cesium-137 from the accidental melting of sealed sources. The NRC has closely coordinated the development of the draft BTP with EPA and State regulatory authorities, and plans to issue the draft BTP for public comment before the end of calendar year 1995. Additional guidance development activities related to mixed waste are described under the heading "Cooperation with Other Federal Agencies," in this chapter.

Topical Report Reviews

During FY 95, the staff completed its review of two topical reports that address specific technical issues regarding compliance with NRC regulations for disposal of LLW (10 CFR Part 61). After review and approval by the staff, licensees may reference the processes described in these topical reports, and may incorporate the technology for use in their operations.

The first topical report reviewed by the staff during FY 95 concerns a multi-use, high-integrity container proposed by Chem-Nuclear Systems, Inc., for use as a fundamental component of the North Carolina LLW disposal facility. The second topical report reviewed by the staff (with the support of several states) addressed a waste analysis software program called Vance 3R–STAT, which yields results that are used to determine or project the inventory of the highly mobile and long-lived radionuclides technetium-99 and iodine-129. In addition, the Vance 3R–STAT modeling results could significantly affect the technical analyses used to demonstrate that the LLW disposal facility performance objectives of 10 CFR Part 61 are met. The reviews of four other topical reports were discontinued because of the lack of progress in resolving open issues.

In April 1995, DWM staff published a notice in the *Federal Register* announcing the termination of the NRC's topical report review program in response to budget reductions and an assessment of the status of topical report reviews. In lieu of reviews by the NRC, vendors are encouraged to seek reviews, if necessary, by Agreement State regulatory authorities. The NRC will be available, however, to provide a limited amount of technical assistance to Agreement State authorities on topical report reviews, if requested.

TECHNICAL ASSISTANCE TO THE STATES

During FY 95, the DWM staff continued to support the NRC Office of State Programs (OSP) in providing technical assistance to the States as they implement their plans for LLW disposal facility development and licensing. Technical assistance to States included the following activities:

- Participate in meetings of the LLW Forum, the Technical Coordination Committee, the Council of Radiation Control Program Directors E–5 Committee, and groups of State and compact officials that meet to discuss policy and technical issues of common interest.
- Meet with State officials from New Jersey concerning LLW disposal facility licensing procedures.
- At the request of the National Academy of Sciences, conduct a technical review of the State of California's projection of plutonium-239 to be disposed of at the State's LLW disposal facility.
- Conduct a workshop on the LLW Performance Assessment BTP.
- Participate in the annual DOE National LLW Management Conference and the LLW Decisionmaker's Forum.

COOPERATION WITH OTHER FEDERAL AGENCIES

During FY 95, the DWM staff worked with the EPA in five principal areas, including risk harmonization, radioactive mixed waste, regulation of air emissions of radionuclides, development of radiological criteria for decommissioning, and LLW standards. The agencies also cooperated in evaluating groundwater protection, radioactive contamination of sewage sludge, and other issues and activities of mutual interest. The cooperative activities are generally governed by the March 1992 General Memorandum of Understanding between the agencies on regulation of radionuclides in the environment.

In FY 95, the NRC and the EPA also completed a White Paper on risk harmonization transmitted for approval by a Commission Paper designated SECY–95–249, which identifies and explains the differences between the NRC and the EPA approaches to risk assessment and risk management. In a related effort, the NRC and the EPA formed the Interagency Steering Committee on Radiation Standards (ISCORS), which also includes representatives from the DOE, the Department of Defense (DOD), the Department of Transportation, the Department of Health and Human Services, and the Occupational Safety and Health Administration. ISCORS has been meeting quarterly since its first meeting in April 1995. Discussions of the ISCORS Risk Harmonization Subcommittee resulted in a set of recommendations to resolve the differences identified in the aforementioned White Paper. These recommendations are included in a Commission Paper designated SECY–95–249.

Also in FY 95, the NRC and the EPA completed and published draft guidance on storing mixed waste and continued to develop guidance on testing mixed waste. The purpose of these guidance documents is to ensure that the storage and testing of mixed waste can be accomplished in a manner that is consistent with the regulatory requirements of both agencies. The agencies also completed development of a proposed technical position on the management of emission control dust contaminated by the inadvertent melting of licensed sealed sources. Finally, the NRC provided the EPA with specific recommendations for reforming the Resource Conservation and Recovery Act, with the goal of reducing or eliminating duplicate requirements for mixed waste.

Regarding emissions of radionuclides to the air, the NRC and the EPA continued to cooperate in determining whether the NRC's existing regulatory program under the Atomic Energy Act protects the public with an ample margin of safety, as provided under the Clean Air Act. The two agencies are coordinating rulemakings to eliminate unnecessary dual regulation of airborne effluents of radioactive materials. At present, air emissions of radionuclides from NRC-licensed facilities, other than nuclear power plants, are subject to regulation by the EPA under 40 CFR Part 61, Subpart I. (The EPA rescinded Subpart I for nuclear power plants on September 5, 1995.) In March 1995, the NRC and the EPA reached a general agreement on the mechanisms for rescinding Subpart I for licensees other than power reactors. Specifically the 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 ceiling for air emissions of radionuclides. The proposed NRC rule will be published for comment by the end of calendar year 1995. The EPA will take final action to rescind Subpart I for licensees other than power reactors as soon as practicable after the 10 CFR Part 20 rulemaking becomes final.

The NRC is also conducting an enhanced participatory rulemaking on radiological criteria for decommissioning, and the EPA plans to publish a similar proposed cleanup rule in early 1996. The NRC and the EPA have actively cooperated by exchanging information and jointly evaluating technical methods necessary to support and implement the radiological criteria in these two proposed rules. The proposed NRC rule amending 10 CFR Part 20 was published in the *Federal Register* in August 1994.

The NRC staff is also cooperating with the EPA in its development of residual radioactivity standards. The EPA circulated a pre-proposal draft of those standards in May 1994. Many of the same issues raised in the public comments on the NRC's proposed rule were raised regarding the EPA's draft standards. The objective of the interagency discussions is to allow the EPA to find that the NRC's requirements provide sufficient protection of the public and the environment. On the basis of such a finding, the EPA would exclude NRC and Agreement State licensees from the scope of its standards.

In December 1994, the EPA staff released a pre-proposal draft of its "Environmental Standards for the Management, Storage, and Disposal of Low-Level Radioactive Waste" for comment by interested parties. The EPA and NRC staffs met to discuss NRC comments on these standards. After reviewing the comments received on the pre-proposal draft, the EPA decided to exclude NRC and Agreement State licensees from the scope of its rulemaking.

Cooperation with the DOE during FY 95 was limited in waste management program areas other than uranium mill tailings and HLW. Although the NRC is cooperating in the DOE's development of its "Programmatic Environmental Impact Statement on Managing Treatment, Storage, and Disposal of Hazardous and Radioactive Waste", the NRC declined opportunities for early review of drafts because of budget limitations and higher priorities. The NRC did, however, provide cost estimates regarding external regulation of various DOE activities to the Advisory Committee on External Regulation at the end of the year. In addition, the agencies continued to share information related to remediation of radioactively contaminated sites, storage of greater-than-Class C radioactive waste, and risk harmonization activities through ISCORS.

INTERNATIONAL COOPERATION

The NRC staff assisted the IAEA in the development of preliminary guidance on LLW regulatory infrastructures for developing countries. In addition, the NRC actively participated in the IAEA's International Nuclear Waste Advisory Committee by reviewing and approving international standards, guides, and safety fundamentals as part of the RADWASS program. The IAEA Board of Governors approved the RADWASS Safety Fundamentals for radioactive waste in February 1995, and the Advisory Committee recommended approval of standards for LLW disposal in May 1995. The NRC also participated on the U.S. Government team in the planning and initial negotiations for developing an international convention on radioactive waste management. The RADWASS Safety Fundamentals provide the basis for initiating the convention, which will be negotiated over the next several years with administrative support from IAEA. 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

During FY 95, the NRC staff continued to develop the guidance that both NRC licensing staff and licensees will need to implement the Commission's regulations with respect to decommissioning nuclear facilities. The staff is also performing decommissioning reviews for both materials facilities and nuclear reactors.

REGULATIONS AND GUIDANCE

In addition to suporting development of rulemakings on radiological criteria for decommissioning and clarification of NRC's financial assurance requirements, during FY 95, the NRC staff completed the development of the draft BTP on "Site Characterization for Decommissioning." In addition, the DWM sponsored a workshop on this topic, which was attended by licensees, the DOE, Agreement State regulators, industry groups, and other interested parties. Response to the workshop was very positive.

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 (SDMP)

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 management attention. The SDMP has been effective in ensuring coordination and resolution of policy issues affecting site decommissioning. A draft revision to the SDMP was published in FY 95.

Three sites were removed from the SDMP list in FY 95. These include United Nuclear Corporation (UNC), West Lake Landfill, and United Technologies/Pratt & Whittney. A fourth site, Magnesium Elektron, was removed from the SDMP list shortly after the end of FY 95. Remediation was successfully completed at the UNC and United Technologies sites, allowing release of the sites. However, the oversight responsibility for remediation of the West Lake Landfill site was deferred to the EPA under the Comprehensive Environmental Response, Compensation, and Liability Act, commonly referred to as SuperFund. The NRC took a similar action at the E.I. DuPont site in Newport, Delaware, and declined to add the site to the SDMP. With regard to the Magnesium Elektron site in Flemington, New Jersey, the NRC determined that the site did not contain licensable quantities of source material. Consequently, Magnesium Elektron was not required to obtain an NRC license or to decommission the site according to NRC requirements.

At the close of the FY 95, the NRC terminated the special nuclear material license covering the UNC site at Wood River Junction, Rhode Island, and removed it from the SDMP. UNC had previously reduced radioactive material contamination at the site to levels acceptable for unrestricted release. However, license termination was made possible in late 1994, when UNC and the State of Rhode Island Department of Environmental Management (RIDEM) signed a consent agreement under which RIDEM, a governmental body with jurisdiction, would continue monitoring the site groundwater for nitrate contamination. The NRC staff then held a public meeting, and prepared an environmental assessment in support of license termination with a finding of no significant impact.

Decommissioning has essentially been completed at two additional sites. Specifically, these sites are the facility Babcock and Wilcox (B&W) in Apollo, Pennsylvania, and the Aluminum Company of America in Cleveland, Ohio. Limited surveys or other administrative activities need to be completed before these sites can be removed from the SDMP list. For example, at the B&W Apollo site, a 1-year period of groundwater monitoring was required after decommissioning activities were completed. This 1-year period expires at the end of CY 1995.

Portions of two other sites, Cabot (Reading, Pennsylvania) and Northeast Ohio Regional Sewer District (Cleveland, Ohio), have also been decommissioned and released for unrestricted use. Each will remain on the SDMP list until the entire site is decommissioned.

Of the 51 sites currently listed in the SDMP, 35 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, four additional sites are scheduled to be removed from the SDMP.

During FY 95, the NRC added six sites to the SDMP including AAR Manufacturing, Inc. (Livonia, Michigan), Clevite Corporation (Cleveland, Ohio), Fromme Investment Company (Detroit, Michigan), Horizons, Inc. (Cleveland, Ohio), Jefferson Proving Ground (Madison, Indiana), and Kaiser Aluminum Specialty Products (Tulsa, Oklahoma). (These additions are described in a Commission Paper (SECY 95-209) and Supplement 1 to NUREG-1444. Of these six sites, five were added as a result of the NRC's review of previously terminated licenses. (This review is discussed later in this section.)

Program Improvements

In April 1995, the U.S. General Accounting Office (GAO) issued a report entitled, "Slow Progress in Identifying and Cleaning Up NRC Licensees' Contaminated Sites." The GAO report contained no recommendations, however, it did identify several findings, concerning the SDMP including, among others, that the NRC does not precisely know the number of formerly licensed sites that contain residual contamination above current criteria, and that progress has been slow on decommissioning sites with large volumes of uranium and thorium contamination. The staff agreed with the basic findings of the report, but provided several comments to the GAO for additional information and clarification.

Concerning formerly licensed sites, the staff completed its review of all files for licenses terminated and archived before 1985. The staff is currently reviewing the files for licenses terminated before 1985, but archived in later years. The staff also plans to review files for selected licensees terminated after 1985. As a result of this review, 24 licenses at 26 sites have been identified so far as having residual contamination at levels that require further characterization and remediation. Of those 26 sites, 5 have been added to the SDMP program, and 4 have been released for unrestricted use after remediation. The NRC will determine whether additional surveys or characterizations are needed at the remaining sites and what organization is responsible for any needed work. The NRC notified the owners of the sites that had been reviewed, and were either cleared from the need for further NRC review or found to be contaminated in excess of NRC release criteria.

During FY 95, the DWM also conducted workshops to acquaint the NRC staff with requirements and guidance for financial assurance, describing the various mechanisms that the NRC has found acceptable, and summarizing NRC and other agency experience in reviewing and implementing financial assurance mechanisms.

The NRC issued Inspection Manual Chapter 2602, "Decommissioning Inspection Program for Fuel Cycle Facilities and Materials Licensees," on June 6, 1995. This new manual chapter formally establishes the general policy for the decommissioning inspection program, and provides guidance for inspections of fuel cycle and materials licensees undergoing decommissioning. The staff is currently preparing separate inspection procedures, consisting of detailed instructions for inspectors.

The DWM staff initiated plans involving the NRC's radioanalytical capabilities to support decommissioning and other agency programs. As part of the agency's independent radiochemical measurements program for nuclear power reactors, the NRC has established both fixed and mobile radiologic laboratories in each of the four regions. As a result of budget constraints, maturation of industry measurement programs, and competing priorities, the NRC is planning to reduce the need for independent radiological measurements. The DWM is working with headquarters and regional offices to develop a systematic plan to reduce current capabilities, while preparing to meet future agency needs in this area. This planning was initiated near the end of FY 95 and recommendations will be completed and submitted for management review in early 1996.

Sites contaminated with large volumes of uranium and thorium pose special problems because of the environmental impacts and costs associated with the decommissioning alternatives. Many licensees prefer to stabilize these materials on site. Under the existing program, the NRC considers such proposals through the development of an environmental impact statement (EIS) in accordance with the National Environmental Policy Act and NRC requirements in 10 CFR Part 51. The development of an EIS typically requires several years. EISs are currently under development for four SDMP-sites (Shieldalloy-Cambridge, Shieldalloy-Newfield, Babcock and Wilcox Parks Township, and U.S. Army Jefferson Proving Ground). The NRC conducted public scoping meetings on the Parks Township and Jefferson Proving Ground sites in January and April 1995, respectively. Notice of the NRC's intent to develop a fifth EIS (for Sequoyah Fuels Corporation-Gore) was issued at the close of the FY 95. In conjunction with the EISs, the NRC has initiated public information roundtable meetings to provide a sustained, meaningful opportunity for discussion of decommissioning issues in the communities around sites that have been proposed for onsite disposal of radioactive waste. These roundtable meetings have been effective in conveying information to participants and engaging their active participation in identifying and assessing decommissioning issues. Several additional EISs are anticipated in FY 1996.

The NRC is currently reviewing various policy issues related to the timely decommissioning of SDMP sites. These issues include concentration averaging, assumptions for exposure assessment scenarios, coordination with States and other parties, generic conclusions on disposal of uranium and thorium (based on the results of site-specific EISs) and greater reliance on institutional controls. Any staff proposals to significantly modify current policy in these areas will be forwarded to the Commission for consideration.

Finally, the staff undertook five initiatives to improve the effectiveness and accountability of the SDMP program, including—

(1) developing standardized Agency-wide procedures for decommissioning;

(2) revising SDMP program performance measures;

(3) coordinating with industry to develop a process for interactive resolution of decommissioning issues;

(4) developing a database, accessible to all NRC project managers, for SDMP site information; and

(5) stabilizing NRC SDMP project manager assignments.

These initiatives are discussed in greater detail in a Commission Paper, SECY 95-209, "Policy and Program Issues at Site Decommissioning Management Plan Sites," which was published as Supplement 1 to NUREG-1444.

REACTOR DECOMMISSIONING

In March 1995, NMSS and NRR completed a Memorandum of Understanding on the coordination of reactor decommissioning and spent fuel storage activities. Under the terms of the agreement, project management responsibility is transferred to NMSS once the spent fuel has been permanently removed from a reactor's spent fuel pool. The agreement also provides for NRR retention of project management responsibility for decommissioning non-power reactors.

The DWM currently has regulatory responsibility for three former nuclear power plants that are now being decommissioned, including Fort St. Vrain (Colorado), Peach Bottom Unit 1 (Pennsylvania), and Enrico Fermi Unit 1 (Michigan). The DWM exercises project management oversight for the facilities and, along with the regions, conducted regularly scheduled inspections of these facilities during 1995.

At the end of FY 95, Public Service of Colorado was completing the dismantlement of concrete structures at the Fort St. Vrain plant, performing termination surveys, and decontaminating the site. Decommissioning is expected to be completed in early 1996. The Peach Bottom and Fermi plants are currently in long-term storage (SAFSTOR decommissioning) before the facility's dismantlement.

DWM also had regulatory responsibility over the Shoreham Nuclear Power Station (SNPS) in New York, which completed decommissioning this year. Because the plant had operated the equivalent of only two effective-full-power days, the decommissioning of SNPS was confined primarily to the reactor, radwaste, and turbine buildings. Radioactive materials were eliminated from the facility by dismantlement and removal for disposal at a LLW disposal facility and by decontamination in place. Dismantlement activities were primarily confined to the reactor and radwaste buildings. Minor dismantlement and decontamination were carried out in the turbine building. Most major SNPS structures and systems were left intact. Activated portions of the reactor biological shield wall that exceeded NRC release criteria were removed. Systems and equipment removed included the reactor pressure vessel (except for the lower head) and major portions of the plant systems that were characterized as being radioactively contaminated. Reactor control rods, fuel channels, and fuel storage racks were removed intact and shipped directly to the LLW disposal facility in Barnwell, South Carolina. A majority of radioactively contaminated piping and equipment that was dismantled and removed from the facility was sent to an offsite vendor for volume reduction processing. Over four million pounds of piping and equipment were processed in this manner. This processing resulted in a significant reduction in waste burial volume from the pre-decommissioning estimate of over 80,000 cubic feet to 8,300 cubic feet (after volume reduction).

On April 11, 1995, the NRC issued an order that modified the order of June 11, 1992, which originally authorized the Long Island Power Authority to decommission the SNPS. The modifying order terminated License No. NPF-82 and released the site for unrestricted use. The environmental assessment and the finding of no significant impact were published in the *Federal Register* on April 10, 1995 (60 FR 18154), and the modifying order became effective on May 1, 1995.

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 requires the detailed health, safety, and environmental review and inspection of facilities to provide reasonable assurance of safe operation. It also requires developing the NRC's 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 27 NRC-licensed uranium recovery facilities, 19 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 the FY 95, three commercial *in-situ* mining operations were in operation, two were licensed to operate but were not operating, 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. If the market price of uranium remains low, no new conventional mills are expected to be licensed soon, and the standby mills are likely to resume operations only for short runs. However, *in-situ* solution mining facilities are expected to remain moderately active, with two applications currently under licensing review. 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 environmental assessment of such activities.

During FY 95, the NRC staff held three meetings with representatives of the industry and States to review the status of general uranium recovery issues. The NRC staff plans to continue holding such meetings three times a year, including a large workshop in spring.

REGULATORY DEVELOPMENT AND GUIDANCE

During FY 95, the NRC continued to develop regulatory guidance to implement standards dealing with groundwater. The use of alternative concentration limits (ACLs) for contaminants in groundwater has been an area of interest to both the licensed mills and the DOE inactive mill tailings remediation program. ACLs are one of three options for demonstrating compliance with EPA and NRC groundwater protection standards. The other two options are maximum concentration limits and background levels. 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, the NRC and EPA reached agreement on this issue. In January 1995, interim guidance was issued to the staff on the appropriate risk level to use in ACL reviews. The staff expects to issue the final technical position in FY 96.

In 1992, the staff published two proposed guidance documents for public comment. The first dealt with disposal, in a uranium mill tailings impoundment, of radioactive material that is similar to, but does not meet the definition of, byproduct material defined in Section 11e.(2) of the Atomic Energy Act. The second guidance document addressed the processing of material other than natural ore for its uranium content. After reviewing the many, varied comments received, the NRC published final guidance on these two issues in September 1995.

In June 1995, the NRC finalized reclamation plans, previously approved by NRC staff, to stabilize uranium mill tailings. In 1990 and 1991, the NRC staff requested that uranium mill licensees with previously approved reclamation plans evaluate their designs to determine if they complied with staff guidance related to erosion protection and radon barrier design. The staff guidance was developed to eliminate some inconsistencies in the review of erosion protection and radon barrier design. Because some sites were reviewed without the benefit of formal guidance, the staff was concerned that the reclamation plans might not meet NRC requirements. The NRC has since determined that reclamations, performed in conformance with plans approved by the staff, also meet the UMTRCA requirement that all applicable standards and requirements be met at license termination. As a result, the NRC will not revisit previously approved reclamation plans unless certain conditions (primarily related to significant public health, safety, or environmental concerns) are identified.

LICENSING AND INSPECTION ACTIVITIES

In FY 95, the NRC completed the license renewal for the Highland Uranium Project *in-situ* leach facility operated by Power Resources, Inc., near Glen Rock, Wyoming. The renewal incorporated the new performance-based license condition, which allows the licensee to evaluate and implement changes to facility operations through a Safety and Environmental Review Panel (SERP) without prior NRC approval. The licensee documents any changes made by the SERP, which are then inspected by NRC during routine facility inspections. The performance-based license condition is modeled after the NRC's regulation in (10 CFR 50.59) for reactor licensing.

In FY 95, Region IV performed 32 inspections of uranium recovery facilities; each site was inspected at least once. During the FY, the NRC issued 62 license amendments.

REMEDIAL ACTION AT INACTIVE SITES

Under UMTRCA, 24 abandoned uranium mill tailings sites have been designated to receive remedial action by the DOE. UMTRCA requires that the NRC concur with the DOE's selection and performance of remedial action, such that the action meets appropriate standards promulgated by the EPA. The DOE has established the UMTRA Project to implement the remedial actions. These sites will be held by the DOE under an NRC general license for long-term care, when all remedial work is completed.

During FY 95, the NRC staff completed 36 review actions pursuant to its responsibilities at sites under Title I of UMTRCA. These included three inspection plan reviews, two remedial action plan (RAP) reviews, six RAP modification reviews, 13 other site-specific reviews, eight completion/certification report reviews, and one review of a generic item. The staff also prepared two completion review reports documenting its review of the DOE's completion of remedial actions for sites in Riverton, Wyoming, and Canonsburg, Pennsylvania.

The submittal of a site-specific 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 95, the DOE submitted, and the NRC staff reviewed one LTSP. That review resulted in final acceptance of the LTSP for the site in Lakeview, Oregon, making that site the fourth UMTRA Project site accepted under the NRC general license for long-term care. (The site in Spook, Wyoming site was the first site subject to the general license in 10 CFR 40.27, followed by the sites in Lowman, Idaho, and Burrell, Pennsylvania.

In support of UMTRA Project casework, the staff visited many of the sites. Inspections of remedial action in progress and/or 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 95. The initial site observational work plans (SOWPs) for this phase of the UMTRA Project have been submitted for the NRC's information review. The NRC is currently reviewing SOWPs for sites in the Ambrosia Lake, New Mexico; Falls City, Texas; Riverton, Wyoming; and Spook, Wyoming. These work plans 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.

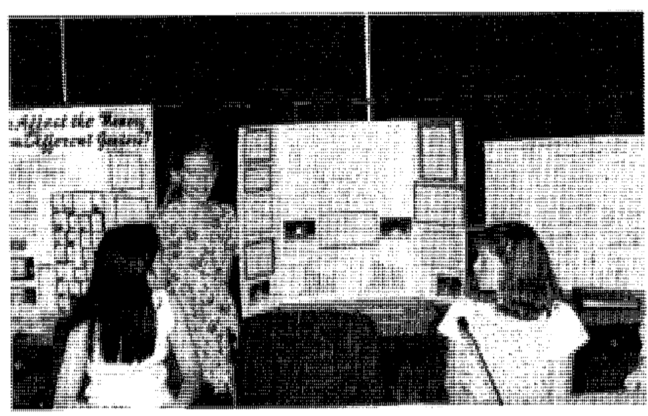
ADVISORY COMMITTEE ON NUCLEAR WASTE

The Advisory Committee on Nuclear Waste (ACNW) was established by the Nuclear Regulatory Commission (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. Activities of the committee are conducted in accordance with the Federal Advisory Committee Act, which provides for public

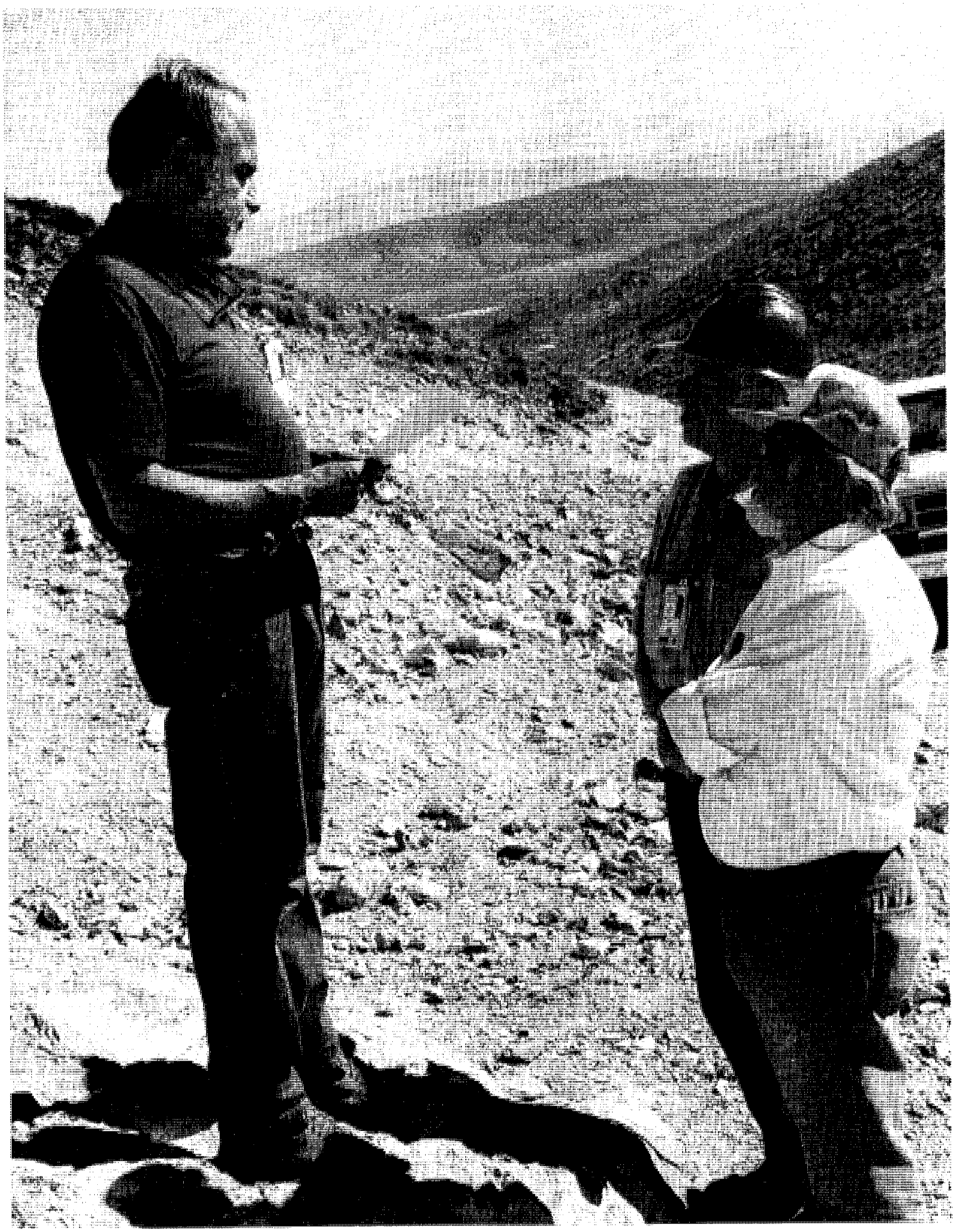
Chairman Jackson and Commissioners Rogers and de Planque enjoy students' projects at a ceremony honoring NRC Special Award Winners at the Montgomery Area Science Fair.

NRC Special Award Winners for the Fair shown seated in the NRC Commission Hearing Room, presenting their projects to the Commission.



An NRC Special Award Winner presenting her project to the Commission and fellow winners.

Hospital, PEPCO, and Bell Atlantic. At the NRC, teachers toured the Emergency Operations Center, and participated in problem-solving exercises involving the transportation of a spent-fuel cask and the sitting of a low-level waste disposal site. NRC volunteers also trained area teachers with the portable classroom kits and explained the NRC's mission and related



ACNW Members at the Yucca Mountain Site—October 1994
Left to Right—Paul W. Pomeroy, Martin J. Steindler (hard hat), William J. Hinze (cap)

ACNW Members—Left to Right—B. John Garrick, William J. Hinze, Paul W. Pomeroy, and Martin J. Steindler—68th ACNW Meeting, Las Vegas, Nevada—October 1994

CHAPTER 7

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 (see table on page 147), 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 Secretary, 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 8.)

COMMUNICATION WITH THE PUBLIC

PUBLIC RESPONSIVENESS INITIATIVES

Since its inception, the Nuclear Regulatory Commission has sought to conduct its business activities in an open and public manner. The public includes individual citizens, public interest groups, petitioners, industry groups, the Congress, and licensees. The Report of the National Performance Review placed new emphasis on Federal agencies "to put the customer first." Consistent with this recommendation, the NRC initiated a variety of activities to augment its public responsiveness. Improvements in serving the public were made in mission-related activities such as rulemaking, emergency preparedness, management of allegations, materials licensing, Agreement States and decommissioning. Administrative improvements focused on areas such as contracting, correspondence, electronic information, public meeting notices, and responses to license fee inquiries. These initiatives were documented in a draft report, "Responsiveness to the Public" (NUREG/BR-0199), published in March 1995. After assessing and responding to public comments, the final report was published in January 1996.

In a separate effort to improve the agency's responsiveness to the nuclear industry, the Commission in July 1995 endorsed a policy statement on maintaining open lines of communication between NRC staff and licensees. The Commission recognized "that honest, well-intentioned differences" of opinion between the staff and a licensee will occasionally occur and encouraged open communications for constructive and prompt resolution.

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 the public if it is convened to deal with one or more subjects specified 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 1995 (FY 95) the Commission held 69 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., 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. A "Handbook of Acronyms and Initialisms" (NUREG-0544, Rev. 2) 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 at the entrance to the Conference Room before the meeting commences. At the conclusion of each open meeting, a transcript of the meeting is placed in the PDR for inspection and copying, along with any papers made available to the public at the meeting. The public is also permitted to tape record Commission discussions at open meetings. It is also the Commission's practice to allow camera and television coverage of open meetings and briefings without prior notification. In addition, in October 1995, the Commission began to make available video tapes of staff briefings for reviewing and copying in the PDR.

In all cases, the Commission attempts to provide advance notice at least 1 week before Commission meetings. Notice of the next 4 weeks of Commission meetings is published each week in the *Federal Register*, an electronic copy is posted on the FedWorld Bulletin Board, and copies are distributed over the Internet. Notice of meetings is also 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.

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 and technical 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 the 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 lists the names 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 FedWorld Bulletin Board and in the NRC PDR. Transcripts and 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, DC 20555, or call 301-415-1968.

PUBLIC MEETING NOTICE SYSTEM

In FY 95, the NRC revised its long-standing open meeting policy to further the goal of providing meaningful opportunities to inform the public of NRC activities without unduly affecting open and candid discussions between licensees and the NRC staff or interfering with the staff's ability to exercise its regulatory and safety responsibilities without undue administrative burden. The 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 FR 48340). A toll-free telephone recording announces upcoming public meetings, and a toll-free electronic bulletin board system (BBS) contains searchable information on each meeting. The telephone recording accommodates multiple concurrent users. The telephone recording and the BBS are operational 24 hours a day. On November 1, 1994, centralized agency services became available to the public for obtaining schedules for the staff meetings that are open to the public.

More than 1020 open staff meetings were announced during the first year of the new policy. In addition, as of January 1996, Commission and Advisory Committee meetings and Atomic Safety and Licensing Board hearings that are open to the public will be announced on the Public Meeting Notice System.

People using toll-free telephone recording and the toll-free BBS can also leave messages should they need assistance accessing the public meeting database, or care to leave comments. Messages are responded to within 24 hours. In addition, the telephone recording, the BBS, and the reports posted in the PDR and 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

Serving as a bridge between the agency and the public, the Headquarters 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, as well as an online module for ordering the reproduction and delivery of specific documents. During FY 95, the Commission 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 (FedWorld). Located at 2120 L Street, N.W., Washington, D.C., 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 through dial-up 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 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 meeting notices, are posted in the Reading Room at the facility.

The wide variety of agency documents available to the public at the PDR include 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.

Through its comprehensive document release policies, the NRC has made available more than two million documents for public viewing and copying in the Headquarters PDR since its establishment in 1975. During a typical month, the PDR serves about 1300 documented users. Technical reference librarians are available to assist onsite users and those who call or write with information requests.

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 electronic mail to Internet address PDR@NRC.GOV; or write to the U.S. Nuclear Regulatory Commission, Public Document Room, Washington, DC 20555-0001. In addition, the PDR staff make the BRS database 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 either through an online tutorial or through onsite, personal instruction. The NRC segment of FedWorld may also be accessed from terminals in the PDR Reading Room.

The PDR/BRS users' group comprises members of Congressional staffs, personnel from other Government and State agencies, foreign embassies and governments, law firms, utilities, consulting firms, public interest groups and other institutions, media representatives, and individual members of the public. In addition, the PDR provides the BRS document delivery, and a general reference service to foreign nuclear regulatory organizations who participate in the agency's international safety cooperation arrangements.

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 having evening and weekend hours. The NRC's LPDR program staff has daily contact with the public and with local librarians and assists them in locating records in the collections.

Because the NRC converted the site-specific paper collections to microfiche several years ago, the public now has local access to more than 1.5 million records released by the NRC since 1981. These records include information on all NRC-licensed facilities as well as NRC staff and contractor publications, rulemaking documents, and generic issues. Online access to a database of publicly available records is currently provided to 44 power reactors 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.

COMMISSION HISTORY PROGRAM

Through the Commission History Program, 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, the personal papers of former Government officials and others involved in regulatory issues, and personal interviews. 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, appeared in 1984. The second volume, *Containing the Atom: Nuclear Regulation in a Changing Environment, 1963-1971*, appeared 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).

Office of Commission Decision Tracking System Project

In May 1994, the Commission established a temporary project staff to identify and collect key policy issues in 29 areas of interest, and to incorporate these issues into an automated, online system known as the Commission Decision Tracking System (CDTS). The purposes of the CDTS are two-fold. First, the CDTS supports the reference needs of the Commission and its senior staff by providing quick access to key documents pertaining to subjects of special interest. Second, the CDTS preserves the NRC's historical policy decisions, giving its staff and Commissioners ready access to the facts and data available to their predecessors. The CDTS contains the electronic text of 4,000 documents (80,000 pages) that have been key to Commission decisions in major policy subject areas. It also permits users to retrieve documents by subject, by issue within a subject area, or by document type.

Mr. Chilk, the Secretary of the Commission, was initially asked to direct the CDTS project staff on a full-time basis. The CDTS Project Office was later disbanded on December 31, 1995, and responsibilities for the CDTS were assigned to the Office of the Secretary.

PUBLIC INFORMATION

During fiscal year 1995 (FY 95), the Office of Public Affairs (PA) increased the availability of its press releases concerning important regulatory actions taken by the NRC. Both the news media and the public may now obtain news releases electronically for significant agency policy decisions, workshops, or rulemaking activities. On the day of issuance, PA also sends news releases to reporters by facsimile or Internet electronic mail. In addition, PA affords the public worldwide access to NRC news releases not only by mail, but also through the Internet and a toll-free electronic bulletin board that is part of FedWorld.

In addition to news releases, the agency's electronic bulletin boards enable reporters and the public to access key documents and other information. Information available from that NRC online service includes schedules of more than 1000 NRC staff meetings with licensees, proposed rulemakings, generic communications to licensees (such as bulletins and generic letters), and operating nuclear power plant information.

For responses to general inquiries, PA continues to develop and distribute fact sheets, brochures, and pamphlets that address such topics as the NRC's mission, nuclear waste disposal, licensing of nuclear power plants, radiation protection, plutonium, and the process by which the public may petition the agency to take enforcement action against violators of NRC requirements.

NEWS CONFERENCES

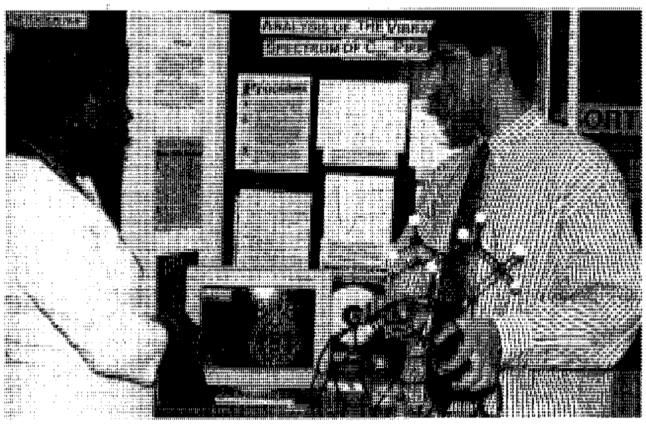
Each of the NRC's four Regional Administrators conduct special periodic briefings. During FY 95, sessions were held at Wilmington, Delaware; New York City, New York; Portsmouth, New Hampshire; Cordova, Illinois; Cleveland, Ohio; Monroe, Michigan; the Crystal River nuclear plant in Florida; the Browns Ferry plant in Alabama; the Watts Bar plant in Tennessee; and the Wolf Creek nuclear station in Kansas. Media coverage focused on the performance of nuclear power plants, contaminated sites, dry cask storage of spent fuel, and enforcement actions.

ENFORCEMENT CONFERENCES

During FY 95, PA continued a trial program that opened to the news media and the public selected predecisional enforcement conferences with material licensees and utilities operating nuclear power plants. This trial program will continue pending review in 1997.

SCHOOL VOLUNTEERS PROGRAM

During FY 95, NRC volunteers renewed and expanded their goal of enriching the quality of public education. This year, 140 employees—including chemists, engineers, geologists, and attorneys—visited approximately 70 schools in the Washington Metropolitan area. One such visit is shown in the following photograph.



Maudette Griggs from the Office of Nuclear Reactor Regulation confers with a student about his science project at the Blair-Einstein-Kennedy-Springbrook High School Science Fair.

Because of the success of the Headquarters' program, each NRC Regional Office began its own school volunteer program this year, encouraging volunteers to visit one or two schools in the vicinity of the Regional Office and perform activities being done by Headquarters employees.

The agency's program gives students an inside look at the many career paths of NRC employees, and involves hands-on science and math demonstrations, mentoring and tutoring, assisting with science projects, and judging at science and math fairs. This year, volunteers also served as mentors for a special program for learning-disabled and gifted students. Coordinated by PA, the program provides rewarding experiences for employees and students, while informing the public about the NRC's role as a regulator of nuclear safety as depicted in the following photograph.

Students at Walter Johnson High School proudly present their final project to NRC staff as part of the technology and research program.

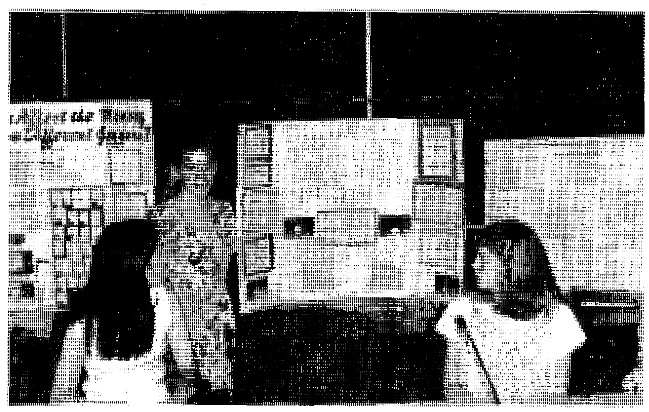
To help volunteers save time in developing presentations to students, the NRC now has 10 portable classroom kits with activities appropriate for grades 1 through 12. The kits cover a wide range of topics involving NRC activities, such as radiation (with actual household items containing minute amounts of radioactive materials), reactor operations, transportation, risk assessment, safety considerations in siting and licensing nuclear waste facilities, and many other science and math topics that apply to the NRC and its mission.

For the fifth year, NRC Special Awards were given to six science students at the annual Montgomery Area Science Fair in Gaithersburg, Maryland, shown in the first of the following three photographs. The winners were selected because their projects demonstrated scientific excellence and in some way were related to the NRC's multifaceted regulatory activities. The students subsequently presented and explained their winning projects to the Commissioners, interested NRC employees, and their own parents.

At Headquarters, the NRC also hosted and participated in a Science and Technology Program for Educators. To learn about the importance of science and technology applications in the workplace, 40 Montgomery County teachers spent 5 days teamed with scientists and other professionals from area organizations such as Holland Labs, TRW, Shady Grove Adventist

Chairman Jackson and Commissioners Rogers and de Planque enjoy students' projects at a ceremony honoring NRC Special Award Winners at the Montgomery Area Science Fair.

NRC Special Award Winners for the Fair shown seated in the NRC Commission Hearing Room, presenting their projects to the Commission.



An NRC Special Award Winner presenting her project to the Commission and fellow winners.

Hospital, PEPCO, and Bell Atlantic. At the NRC, teachers toured the Emergency Operations Center, and participated in problem-solving exercises involving the transportation of a spent-fuel cask and the sitting of a low-level waste disposal site. NRC volunteers also trained area teachers with the portable classroom kits and explained the NRC's mission and related activities. The teachers subsequently incorporated their experiences into classroom lesson plans.

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 fiscal year 1995 (FY 95), NRC witnesses testified at 11 hearings before Congressional Committees and Subcommittees, as shown in the table. Congressional Affairs staff attended and prepared summaries and reports for approximately 50 hearings and markups.

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 two-fold. First, OSP ensures that the NRC maintains effective relations and communications with these organizations. Second, the OSP promotes greater awareness and mutual understanding of the policies, activities, and concerns of all parties involved, as they relate to radiological safety at NRC and Agreement State licensed facilities. The office's activities encompass three general areas:

(1) The Agreement State Program

(2) State, Local, and Indian Relations

(3) Federal Liaison

These programs are implemented through the NRC Headquarters and Regional Offices.

AGREEMENT STATES PROGRAM

A total of 29 States have formal agreements with the NRC, under which those States have assumed regulatory responsibility over byproduct, source, and small quantities of special nuclear material (See map of The Agreement States). At the close of fiscal year 1995 (FY 95), approximately 15,000 radioactive materials licenses were administered by the Agreement States, representing about 70 percent of all radioactive material licenses issued in the United States. In addition, the States of Massachusetts, Ohio, and Oklahoma are actively working to become Agreement States. The State of Pennsylvania also is negotiating a limited agreement with the NRC, which will give Pennsylvania regulatory authority only the land disposal of byproduct, source, and small quantities of special nuclear material.

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. 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 general licensing of radioactive material and to develop implementation procedures for the Policy

Congressional Hearings at Which NRC Witnesses or Commissioner Nominees Testified or Submitted Testimony During FY 95

Date	Committee	Subject
01/19/95	Committee on Energy and Natural Resources (Senate)	North Korean Nuclear Framework Agreement
02/16/95	Committee on Environment and Public Works (Senate)	Nomination of Dr. Shirley Ann Jackson
02/16/95	Committee on Environment and Public Works (Senate)	Nomination of Mr. Dan Berkovitz
02/24/95	Committee on Commerce, Subcommittee on Energy and Power (House)	Privatization of U.S. Enrichment Corporation
03/02/95	Committee on Energy and Natural Resources (Senate)—Testimony supplied for the record	High-Level Radioactive Waste Waste Legislation
03/03/95	Committee on Appropriations, Subcommittee on Energy and Water Development (House)	NRC's FY 96 Appropriation
05/16/95	Committee on Energy and Natural Resources (Senate)	High-Level Radioactive Waste and Other Nuclear Issues
06/28/95	Committee on Commerce, Subcommittee on Energy and Power (House)	Interim Storage of High-Level Radioactive Waste
07/12/95	Committee on Commerce, Subcommittee on Energy and Power (House)—Testimony supplied for the record	High-Level Radioactive Waste Legislation
08/03/95	Committee on Environment and Public Works (Senate)	Nomination of Ms. Greta Joy Dicus
09/07/95	Committee on Science, Subcommittees on Basic Research and Energy and Environment (House)—Testimony supplied for the record	Regulation and Missions of DOE National Laboratories

Statement on Adequacy and Compatibility of Agreement State Programs.

Review of State Regulatory Programs

The Atomic Energy Act of 1954, as amended, requires the NRC to periodically review Agreement State radiation control programs. The NRC, during fiscal year 1995, conducted three kinds of reviews:

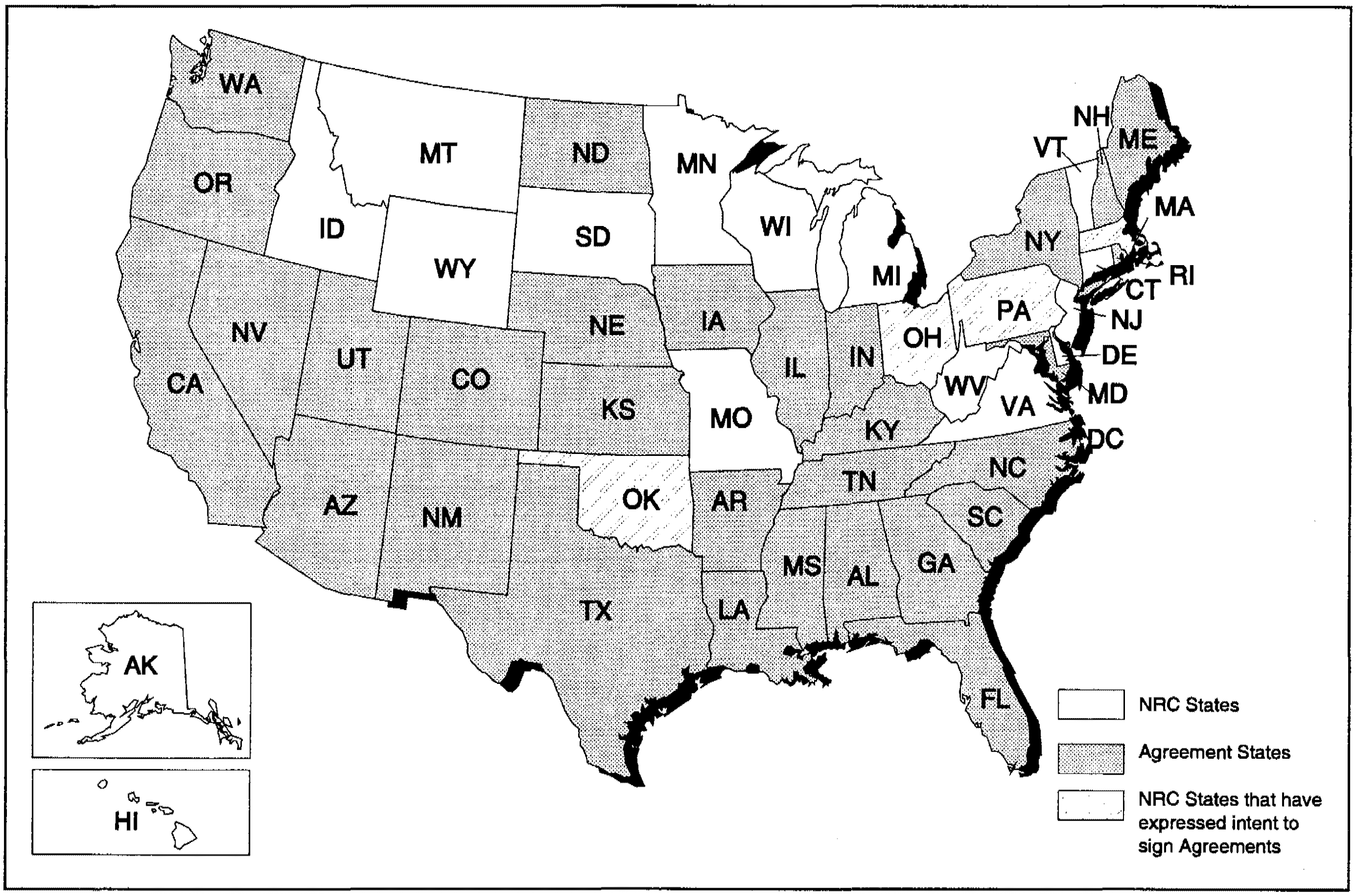
(1) routine reviews

(2) review visits

(3) follow-up reviews

Routine reviews are complete examinations of State regulatory programs, normally conducted

THE AGREEMENT STATES



every other calendar year. Review visits are usually conducted between routine reviews and serve to maintain familiarity with Agreement State radiation control programs, to provide an opportunity to discuss areas of concern on an informal basis, and to confirm the satisfactory status of the State radiation control programs. Followup or special reviews are conducted as needed, and they tend to focus on State actions in specific areas. When appropriate, multidisciplinary teams are sent to conduct reviews of Agreement State programs. The teams include NRC Program and Regional Office staff.

In fiscal year 1995, the NRC performed 11 routine reviews, 7 review visits, and 1 followup review. The results of the reviews indicated that each State was adequately protecting the public health and safety, although not all of the States that were reviewed had regulations in place that were fully compatible with those of the NRC.

The NRC technical staff accompanied State inspectors to State-licensed facilities to evaluate inspector performance, and the staff examined selected license and compliance casework in detail in connection with these reviews.

Integrated Materials Performance Evaluation Program

On June 27, 1995, the NRC approved implementation, on an interim basis, of the Integrated Materials Performance Evaluation Program (IMPEP). The IMPEP process will be used in the evaluation of NRC Regional Office and Agreement State materials licensing and inspection programs in an integrated manner, using five common performance indicators:

(1) the status of its materials inspection program

(2) its technical staffing and training

(3) the technical quality of its licensing program

(4) the technical quality of its inspection program

(5) its response to incidents and allegations

To effect this implementation, the NRC will suspend relevant portions of the May 28, 1992, General Statement of Policy, "Guidelines for NRC Review of Agreement State Radiation Control Programs, 1992." Management Directive 5.6, "Integrated Materials Performance Evaluation Program," which was approved September 12, 1995, will be used as the implementing procedure.

The NRC will implement IMPEP, on an interim basis beginning in fiscal year 1996, 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. Conforming revisions to IMPEP in connection with the completion of work on these two policy statements will be done as appropriate. IMPEP will then be implemented on a permanent basis, and the remaining portion of the 1992 policy statement on "Guidelines for NRC Review of Agreement State Radiation Control Programs" will be rescinded.

Policy Statements and Agreement State Program Policy Decisions

In 1995, the Commission approved, in principle, the policy statements entitled "Statement of Principles and Policy for the Agreement State Program" and "Policy Statement on Adequacy and Compatibility of Agreement State Programs." The Commission is deferring implementation of the policy statements until implementing procedures are developed and approved by the Commission. The NRC staff is developing the implementation procedures and any necessary changes to the two policy statements, and will resubmit the policy statements and implementation procedures to the Commission in September 1996.

The "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 "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 the public health and safety and is 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 the public health and safety within the State and must be compatible, by incorporating 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 which are essential to ensuring protection of the public health and safety, and to be consistent with the elements which will be evaluated as common and noncommon performance indicators under IMPEP.

The Commission also decided that the NRC would discontinue funding for Agreement State staff training, travel, and technical assistance, beginning in fiscal year 1997. This policy decision, made to address the inequity of NRC licensee fee funding of the Agreement State Program, will result in program revisions that will be developed jointly by the NRC and the Agreement States.

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 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 waste, site decommissioning characterization, nuclear medicine, inspection procedures, and materials licensing. In addition, special workshops on specific areas are held as needed. The NRC sponsored 32 such training courses and workshops, which were 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.

The NRC conducted three special workshops across the country this past year addressing Agreement State Licensee Wrongdoing Awareness. The purpose of the workshops was to promote awareness of wrongdoing by Agreement State regulators, to better prepare participants for identifying and handling wrongdoing issues when they surface, and to familiarize the participants with the investigative process and techniques.

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 the NRC staff.

Organization of Agreement State Managers' Workshop

A public workshop for managers of the Organization of Agreement States (OAS) was conducted April 5–6, 1995, in Rockville, Maryland. Topics for this workshop included the following:

- an open discussion of Agreement State (A/S) issues

- The Status of A/S Program Improvements (i.e., IMPEP, Adequacy and Compatibility Policy, and early and substantive involvement of A/S views)
- Federal Advisory Committee Act Update
- National Performance Review
- Status of Selected NRC Rulemakings
- Parallel Process of Federal Rule Promulgation and Suggested State Regulations for the Control of Radiation
- State Interface with Federal Agencies Relative to Incidents Involving Radioactive Material Under State Authority
- Overview of the Business Process Reengineering (BPR) Project
- Accountability of Generally Licensed Devices; Status of Electronic Communications Between NRC and A/S
- Status of the National Database for Events Reporting
- Reciprocity and Enforcement Relative to Exclusive Federal Jurisdiction

Annual Agreement States Meeting

The 1995 annual meeting of Agreement State radiation control program directors was held October 30–November 1, 1995, in Chicago, Illinois. Panel discussions and individual presentations addressed the status of the following topics:

- Development of Implementation Practices for New Policy Statements
- Selected Rulemaking Actions
- Operational Events
- Medical Issues
- NRC Support for Training and Travel for State Personnel
- IMPEP Implementation Procedures
- BPR
- Materials Licensing Issues
- The Working Group on Control and Accounting of Licensed Sources and Devices
- Reciprocity and Jurisdictional Determinations

Operational Events in Agreement States

Information on events that have occurred in Agreement States involving the use of radioactive by-product 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, the information is disseminated to the appropriate regulatory agencies and users.

STATE, LOCAL AND INDIAN RELATIONS PROGRAM

One of the 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

Deputy Executive Director Hugh Thompson, who is the NRC's representative to the Environmental Justice Interagency Working Group, opens the Environmental Justice Leadership Seminar.

Environmental Justice Leadership Seminar participants included Richard Bangart and Maria Lopez–Otin of the Office of State Programs, Marshall Cain of the EPA's Office of Federal Activities, Bradley Campbell of the White House Council on Environmental Quality, and Cathy Sheaffor, the Environmental Justice Director from the Department of Justice.

national organizations, potentially affected by, or otherwise interested in, NRC regulatory activities. Tribal interest in nuclear-related activities, including those of the 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 relative to the NRC's regulatory authority in the areas of high- and low-level 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, and also participates in EPA-sponsored interagency meetings to exchange information of potential relevance and importance to Federal and Tribal activities.

FEDERAL LIAISON

The NRC's Federal Liaison is responsible for establishing and maintaining effective communications at the policy level between the NRC and other pertinent Federal agencies. 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 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 1995, the Federal Liaison participated in the conferences and focus groups convened by the CEQ to review the effectiveness of the NEPA process. A CEQ report is expected in 1996.

As the NRC's Federal Preservation Officer (FPO) under the National Historic Preservation Act of 1992 (NHPA), as amended, the Federal Liaison maintains communication with officials at the National Park Service and the Historic Preservation Advisory Council. In 1995, the Federal Liaison coordinated and drafted 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 NWPA Section 106 process. The final rulemaking is expected in 1996.

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.

In 1995, the Federal Liaison continued to serve 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." Pursuant to the order, the NRC established an internal Environmental Justice Group (EJG), headed by the Deputy Executive Director for Operations. The Federal Liaison serves as the EJG executive officer. The EJG is responsible for the development of the NRC work products, as well as for the formulation of the NRC's environmental justice strategy. The EJG developed the NRC's Final Environmental Justice Implementation Strategy, which was submitted to the President on April 11, 1995. As called for in the Executive Order, in 1995 the Federal Liaison was named the NRC's Environmental Justice Coordinator. In this capacity, the Federal Liaison continues to represent the NRC in the interagency Environmental Justice Policy and Coordination Subcommittee.

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CHAPTER 8

INTERNATIONAL COOPERATION

The Nuclear Regulatory Commission (NRC) has long 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 and oldest civil nuclear program, the NRC has broad capabilities to contribute to international programs. These capabilities span such areas as nuclear power plant 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 from these NRC international activities.

The NRC's international program, administered by the Office of International Programs (OIP), 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 1995 ACTIVITIES

During the fiscal year 1995 (FY 95) reporting period, the NRC continued its involvement in the international arena, including the following noteworthy activities:

- Support for 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 play an important part.

- Nuclear safety cooperation with the New Independent States of the former Soviet Union and countries of Central and Eastern Europe. These activities included strengthening their regulatory organizations, training foreign inspectors, and working together in the areas of operational safety and risk reduction.

- Efforts to help countries of the former Soviet Union—particularly Russia, Ukraine, and Kazakstan—to improve their systems for protecting, controlling, and accounting for nuclear materials. These efforts focused on improving regulatory programs and enhancing facility safeguards within the framework of agreements signed by the United States with these countries in the fall of 1993.

- Continued efforts to work (in conjunction with other U.S. Government and related entities) with countries of the Former Soviet Union—specifically Russia, Ukraine, and Belarus—to study the health effects of exposure to ionizing radiation resulting from the Chornobyl accident and from Russian defense-related activities.

- Raising the priority of regulatory cooperation with several Pacific Rim areas (Indonesia, China, Korea, and Taiwan) that are embarking on, or are considering, new or expanded nuclear power programs.
- Maintaining an active information exchange with countries that have substantial nuclear programs, and with multilateral organizations promoting international nuclear safety, as well as assuming a proactive role 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 resolutions, which were submitted to the Congress in May 1995 for its advice and consent and ratification. If ratified, these resolutions could become effective during 1996. Implementation of U.S. obligations under the Convention will be carried out primarily by the NRC. A separate Convention on the Safety of Radioactive Waste Management is now in active international negotiation, with the NRC playing an active role in its development.
- Continuation of 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

The NRC formalized the information exchange program in 1974. Since that time, the NRC has conducted most of its technical regulatory exchanges under the umbrella of a growing number of general safety cooperation arrangements that have been signed and renewed over the years. These now total 33, including arrangements with 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, Russia, the Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Ukraine, the United Kingdom, and Taiwan.

These arrangements serve as communication channels with foreign nuclear regulatory organizations. They ensure prompt, reciprocal notification of reactor safety problems that could affect either U.S. or foreign nuclear facilities. They also assist in identifying possible precursor events meriting further investigation. In addition, the arrangements provide a framework for bilateral cooperation on nuclear safety, safeguards, waste management, and environmental protection, and they serve as the vehicle for NRC assistance to other countries to improve health and safety practices. The arrangements are typically 5 years in duration and may be renewed by mutual written agreement of the parties.

As a key part of the NRC's bilateral nuclear safety cooperation program in FY 95, OIP planned and coordinated visits by Commissioners to Argentina, Brazil, Canada, the Czech Republic, China, India, Japan, France, Finland, Russia, Ukraine and the United Kingdom. These visits are an important means for encouraging the exchange of information and experience on nuclear safety. They allow the NRC to gain first-hand knowledge of specific programs (through selected site visits) and to evaluate the assistance that the NRC might provide. During the year, the NRC also received high-level visitors from Armenia, Brazil, France, Germany, Indonesia, Korea, Russia, Sweden, Ukraine, and the Nuclear Energy Agency (NEA) to discuss nuclear safety matters of mutual interest.

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 95, Australia, China, France, Indonesia, Italy, Japan, Mexico, Romania, Slovenia, Spain, Taiwan, and Ukraine sent 22 people to participate in the program. Their assignments generally ranged from a few months to a year or more, during which assignees worked in the following areas:

- events analysis and assessment
- regulation of non-power reactors
- U.S. probabilistic risk assessment 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
- review of regulatory applications issues
- design certification reviews of advanced reactors and licensing procedures
- emergency preparedness
- inspections and implementation of a reactor resident inspection program
- storage and transport of spent fuel and licensing activities
- thermal hydraulic safety analysis to prepare safety evaluation reports of the Westinghouse AP600
- applications of new technical specifications
- scope and purpose of the medical use program, including the NRC's organization, function, statutory authority, and responsibility
- use of simulators in training operators
- preparation and administration of licensing examinations and the full scope of regulatory and licensing practice
- review of digital systems for operating nuclear plants and advanced light-water reactors
- development of rules, regulations, and regulatory guides, as well as other aspects of developing a regulatory program

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.

BILATERAL NUCLEAR SAFETY COOPERATION

During FY 95, the NRC carried on active nuclear safety cooperation programs with a large number of countries. Each geographical area involved reflects somewhat different needs and interests.

FORMER SOVIET UNION (FSU)

In 1995, the NRC continued to play an important role in U.S. assistance to the FSU in developing and enhancing their regulatory systems.

Russia: The Gore-Chernomyrdin Commission

The NRC continues to participate in activities under the U.S.-Russia Joint Commission on Technological Cooperation in Energy and Space, which is chaired by Vice President Gore and Russian Prime Minister Chernomyrdin. The Gore-Chernomyrdin Commission (GCC) has been an important forum for strengthening bilateral ties between the United States and Russia. At the fourth meeting of the GCC in Moscow in

December 1994, the Vice President and the Prime Minister signed an agreement that will allow the exchange of technical information in the field of nuclear warhead safety and security. This is one of the most important accomplishments of the GCC to date. Two U.S. Trade and Development Agency (TDA) grants will provide $1.6 million for feasibility studies of possible fossil-fuel power plants to replace Russian plutonium production reactors scheduled to be shut down at Tomsk and Krasnoyarsk. The two sides also agreed to support a similar analysis of possible replacement of nuclear power plants.

In late June 1995, just before assuming the chairmanship of the NRC on July 1, Commissioner Shirley Jackson attended the fifth meeting of the GCC in Moscow as Vice Chairman of the Energy Policy Committee. At this meeting, two agreements were signed between the U.S. Department of Energy (DOE) and the Russian Federal Authority on Nuclear and Radiation Safety (GAN). These agreements involve procedures for protecting, controlling, and accounting for nuclear materials and the safety of fuel cycle facilities and research reactors. Both agreements included provisions for coordinating activities with the NRC. Dr. Jackson had fruitful discussions with GAN Chairman Vishnevsky on the future of the NRC–GAN assistance program and accompanied DOE Secretary O'Leary on a visit to the Kurchatov Institute. In addition, the results of the Joint U.S.-Russian Electric Power Alternatives Study were released, with the final report presented to Vice President Gore and Prime Minister Chernomyrdin. The results of this study are intended to be provided to international banks and other financial institutions with the objective of encouraging Western investment in Russia's energy economy.

NRC Activities with Russia and Ukraine Under the JCCCNRS and the Lisbon Initiative

The Joint Coordinating Committee on Civilian Nuclear Reactor Safety (JCCCNRS) was established in 1988 by a U.S.–USSR Memorandum of Understanding. This committee provides the framework for cooperation between the United States and the former Soviet Union with regard to nuclear safety. During 1995, the committee completed 40 scheduled activities with the Russian and Ukrainian regulatory bodies, as planned. A significant proportion of these activities involved technical training covering all facets of safety regulation.

Activities included regulatory training programs at the NRC Technical Training Center in Chattanooga, Tennessee; training for licensing and inspection of nuclear power plants at the Brookhaven National Laboratory in Upton, New York; and short-term training sessions at NRC headquarters in areas such as the creation of an Emergency Response Center. This involved approximately 70 visits by regulatory personnel and included over 200 Russian and Ukrainian representatives, each of whom spent approximately 10 person-days in training provided by the NRC, using funding provided by the U.S. Agency for International Development.

Commissioner Rogers visited Ukraine and Russia in early July 1995. During that visit, he presented a paper on Opportunities for Advancement of Nuclear Safety Through International Cooperation at a nuclear conference in Kiev, and met with various officials in both countries, including the following individuals:

- Dr. Lapshin, a senior official of the Russian MINATOM organization
- Y. Vishnevsky, the Chairman of the Russian regulatory body (GAN)
- B. Gordon, Director of the Science and Engineering Center of GAN
- A. Smyshlyayev, Director of the Ukrainian Nuclear Safety Administration
- M. Pavlovsky, the Chairman of the Committee for Nuclear Policy and Nuclear Affairs of the Ukrainian Parliament
- M. Umanets, the Chairman of the Ukrainian State Committee for Nuclear Power Utilization
- A. Abagyan, Director General of VNIIAES, the Russian organization that addresses scientific and technical issues for operating nuclear power plants, and designs and fabricates simulators for such plants

- B. Antonov, the Vice President of Rosenergoatom, a technical service organization for nuclear power plants (NPPs)

- L. Bolshov, the Director of the Russian Institute of Nuclear Safety

Chairman Jackson traveled to Ukraine for several days in September 1995 to discuss issues related to the regulation of nuclear safety in Ukraine and negotiations between the G–7 (an association of seven industrialized countries: Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) and Ukraine on the closure of Chornobyl. Her travels include visits to Kiev, the Chornobyl NPP, and the nearby town of Slavutich (where plant workers live). During those visits, Chairman Jackson met with Yuri Kostenko, Minister of Environmental Protection and Nuclear Safety; his First Deputy Minister for Nuclear Safety, Alexander Smyshlyayev; top officials of the State Committee on Nuclear Energy, the Chornobyl plant, and the town of Slavutich; and the Chairman of the Parliamentary (Rada) Committee for Nuclear Policy and Nuclear Safety. The meetings on nuclear regulation covered nuclear legislation, the nuclear fuel cycle, resources for the nuclear regulator, licensing for nuclear power plants, and energy infrastructure development. The meetings on Chornobyl covered the linkage of its closure by the year 2000 to the implementation of a comprehensive energy plan. An integral part of this plan is the creation of an International Nuclear Safety and Environmental Center at Slavutich.

The U.S. chair for the JCCCNRS, Executive Director for Operations (EDO) James Taylor, met in November 1994 with Alexander Gutsalov, First Deputy Chairman of GAN, and in May 1995 with Alexander Smyshlyayev. Discussions in both meetings included a review of ongoing assistance projects and the results achieved, as well as plans for future activities.

Kazakstan

In December 1994, a small delegation from Kazakstan visited the NRC for a tour of the Operations Center and discussions with OIP concerning the NRC's assistance to the Kazak Atomic Energy Agency (KAEA) within the framework of the NRC-Kazak Agreement for Nuclear Safety Cooperation. Topics discussed included the training of KAEA personnel in NRC nuclear safety inspection practices for power and research reactors, the establishment of an early warning and incident reporting system in Kazakstan, and the NRC's radiation monitoring rules and regulations for power reactors.

Armenia

In November 1994, NRC hosted Mr. Ashot Martirossian, Head of the Armenian State Atomic Supervision Authority (ASAS) for discussions regarding possible NRC regulatory activities to assist Armenia. In May, the NRC began initial implementation of its regulatory assistance efforts with ASAS when three ASAS representatives attended a 3-week fire protection training class at Brookhaven National Laboratory. ASAS staff also received training in the areas of site security and spent fuel and waste management.

CENTRAL AND EASTERN EUROPE

During FY 95, the NRC continued its extensive program to assist the countries of central and eastern Europe (CEE) in improving safety practices at their Soviet-designed reactors. The objectives of the regulatory assistance program are as follows:

- Assist in developing an effective regulatory organization

- Advance safety culture awareness and practices

- Strengthen the legal framework and regulatory capability governing nuclear safety

- Improve analytical capabilities for performing safety analyses (computer codes)

- Strengthen inspectorates through intensive training in NRC regulatory inspection philosophy, procedures, and techniques

- Prepare training programs for safety evaluations at the NPPs

- Emphasize a regional approach by inviting representatives from all CEE countries to attend NRC training courses

During 1995, the NRC offered the following courses to members of the nuclear regulatory authorities of all five CEE countries:

- Seismic Margins Evaluation
- U.S. Commercial Nuclear Power Plant Fire Protection Practices
- Fundamentals of Inspection
- Welding and Nondestructive Examination for Technical Managers
- Risk-Based Regulations
- Decommissioning and Decontamination of NPPs
- Validation and Verification of the Applicability of NRC Computer Codes to VVER Reactors (PWR-type).

Two NRC representatives attended the Second Regular Meeting of the Association of the State Nuclear Safety Authorities of the Countries Operating VVER-Type Reactors, which was held in Slovakia. Topics covered by CEE participants included country-specific reports on the safety of nuclear facilities, information on safety-significant events, illicit trafficking in nuclear and radioactive materials, adherence to the international Convention on Nuclear Safety, decommissioning, and treatment of radioactive waste.

Czech Republic

During the FY 95 reporting period, the NRC, Idaho National Engineering Laboratory (INEL), and Lawrence Livermore National Laboratory (LLNL) continued training senior Czech regulators on how to evaluate the safety of the Temelin nuclear power plant in accordance with current NRC regulatory requirements. The Temelin plant is being backfitted with Westinghouse-provided fuel and updated instrumentation and control (I&C) systems. The Czech regulators are also being shown how to prepare a final reactor safety evaluation report (SER). Training thus far has included classroom lectures, hands-on analyses and documentation reviews, and identification of numerous areas and issues for which additional information was required from the vendor to resolve safety questions.

Chairman Jackson visited the Czech Republic in September 1995 during the IAEA General Conference. During this visit, she toured the Temelin NPP site and the Nuclear Research Institute at Rez, and held discussions with senior regulatory officials.

Slovakia

The Slovak Nuclear Safety Authority (SNSA) requested a one-week training assignment at NRC headquarters to assist their Division of International Relations in implementing its international obligations and other support functions. The Deputy and Assistant Deputy of that Division spent one week in meetings with the Office of Public Affairs, Office of Congressional Affairs, Division of Contracts, Office of the Controller, Office of the General Counsel, and the Technical Specifications Branch. They also met with OIP's Director of the Division of Bilateral Cooperation and Assistance and various OIP country officers.

Lithuania

A safety analysis was mandated by the European Bank for Reconstruction and Development (EBRD) as one of the conditions to be met before the EBRD will consider releasing nuclear safety account funds for hardware upgrades to the Ignalina NPP. The NRC recommended that a technical support organization participate in the review, but the NRC does not intend to have direct involvement with the analysis. The OIP initiated a bilateral assistance project on the basis of recommendations prepared by a consultant (Dr. Thomas Murley), who conducted a two-week survey of Lithuanian regulatory assistance needs. The project will help the regulators develop country-specific norms, standards, and related inspection guidelines.

Attorneys from the NRC's Office of General Counsel traveled to Lithuania to comment on the preparation of Lithuania's draft atomic energy law. The NRC representatives also met with members of the Lithuanian Parliament and the Director of the Lithuanian Parliament's legal staff to explore various legal issues. The NRC attorneys then reviewed the draft law and made numerous constructive comments.

Hungary

Dr. Lajos Voross, who was nominated Chief Inspector of the Hungarian Atomic Energy Commission (HAEC) on January 1, 1995, took part in a mini-fellowship with OIP and the Office of Nuclear Reactor Regulation (NRR). This mini-fellowship included two weeks at NRC headquarters and one week in Region IV, during which Dr. Voross was exposed to NRC's management techniques, organizational issues, and program tracking procedures. Dr. Voross will rely on this experience to implement changes in the way the HAEC will manage some nuclear safety activities in the future.

Bulgaria

While no specific program has been implemented for Bulgaria, the Bulgarian regulators have sent an average of two technical specialists to each of the several training courses the NRC has offered. Brookhaven National Laboratory is now helping a Bulgarian specialist to develop a RELAP5 computer code input deck for the VVER-1000 reactor, which will simulate the thermal hydraulic behavior of the plant. Bulgaria's Committee on the Use of Atomic Energy for Peaceful Purposes (CUAEPP) plans to install this deck on a simulator acquired from the United States. The NRC will assist CUAEPP in preparing licensing guidelines for this simulator.

PACIFIC RIM

This region includes a number of well-established nuclear power programs in Japan, the Republic of Korea, and Taiwan. The Pacific Rim 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

In January, a large earthquake (magnitude 7.2) occurred near the port city of Kobe in central Japan. The Ministry of International Trade and Industry (MITI), the NRC's regulatory counterpart for operating reactors, promptly notified the NRC that none of Japan's power reactors were shut down as a result of the quake and no damage was reported by any nuclear facility. A month later, an NRC team visited the quake site to gather data on the effects of the quake and its aftershocks. In addition to touring various commercial and residential sites, the team met with the Kansai Electric Power Company to discuss the overall performance of the power generating and distribution facilities, the effect of grid disturbances on the nuclear plants, design criteria used, steps necessary for recovery, and lessons learned. The team determined that the earthquake damage did not indicate a need for reevaluation of seismic design criteria for nuclear power plants in the United States. However, to address the potentially high velocities and displacements in the low-frequency range, the team decided that new measures of damage potential, such as drift, need to be investigated.

In April, former Chairman Ivan Selin visited Japan to present a keynote address to the 28th Annual Meeting of the Japan Atomic Industrial Forum. In his remarks, the Chairman discussed the crucial role that a well-developed safety culture plays in nuclear power programs and the responsibility to share its experience with less-developed programs. While at the conference, the Chairman held a series of bilateral discussions with key representatives from other nuclear programs. He also met with senior Japanese officials, including the Minister for Science and Technology, to discuss Japan's long-range plans for nuclear energy.

China

In April 1995, Chairman Selin visited China for the third time since becoming Chairman. The highlight of his visit was the opportunity to meet with Vice Premier Wu Bangguo. In an exchange of views on nuclear safety, Chairman Selin stressed the importance of investing adequate resources in the construction and operation of nuclear plants and the nuclear industry's regulatory authority. The Chairman also met with other senior energy officials from the National Nuclear Safety Administration, the State Planning Commission, and the China National Nuclear Corporation. In each discussion, Chairman Selin expressed the hope that China could avoid costly mistakes by accounting for lessons learned from the developed nuclear programs around the world. Accompanying the Chairman, EDO James Taylor visited the Qinshan NPP (a 300-MWE PWR) and gave a series of safety lectures to the regulators.

Taiwan

In October 1994, the NRC participated in the Joint Standing Committee Meeting on Civil Nuclear Cooperation between the American Institute on Taiwan (AIT) and the Taiwan Coordination Council for North American Affairs (CCNAA) that was held in Washington. At the meeting, CCNAA announced that it would be changing its name to Taipei Economic and Cultural Representative Office (TECRO). The meeting provided the opportunity for both sides to offer briefings on key elements of their nuclear programs and identify areas for future cooperation. During the 1994 to 1995 program year, NRC and TECRO were involved in 20 bilateral cooperative programs. In addition, Taiwan is an important partner in many of the NRC's international research programs, including seismic effects, piping integrity, and severe accident programs.

Republic of Korea (ROK)

ROK Minister of Science and Technology Kun Mo Chung visited the NRC in June 1995 to meet with Chairman Selin, Commissioner Jackson, and Commissioner Rogers to discuss current nuclear policies and issues, as well as new directions. In a ceremony scheduled between meetings, he and the Chairman also signed the second renewal of the "NRC-Ministry of Science and Technology Arrangement for the Exchange of Technical Information and Cooperation in Regulatory and Safety Research Matters."

The 16th meeting of the U.S.-ROK Joint Standing Committee on Nuclear and Other Energy Technologies (JSCNOET) was held at the Department of State in May 1995. At the meeting, participants reviewed bilateral cooperation over the past year, proposed cooperation for the coming year, and discussed nuclear energy issues, including nuclear safety and safeguards. The NRC covered its technical information exchange arrangement, training, emergency cooperation, and ongoing safety research projects with Korea.

Korea Institute of Nuclear Safety (KINS) President Yong Kyu Lim visited the NRC on August 15, 1995, to meet with Chairman Jackson and senior managers from the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Regulatory Research (RES), and the Office for Analysis and Evaluation of Operational Data (AEOD). The purpose of these meetings was to discuss NRC/KINS cooperative safety activities and to propose new or expanded activities. The KINS remains highly interested in continuing 1-year on-the-job training assignments at NRC Headquarters for its regulatory personnel, as well as 6-month technical training and reactor inspection assignments at the Technical Training Center and in the regions. Six of KINS' inspectors have now completed these training assignments. The KINS also wishes to establish a formal, annual 2- or 3- day technical exchange meeting with the NRC.

Democratic Peoples' Republic of Korea (DPRK)

On February 1, 1995, an NRC team composed of Carlton Stoiber, Director, OIP; Jack Martin, then Region III Administrator; and Michael Case, NRR; participated in the first detailed safety discussions with a DPRK (North Korea) delegation in Berlin. The safety discussions were an adjunct to a larger, 4-day session scheduled for the U.S. and DPRK Governments to reach concurrence on the terms of a supply agreement under which two 1000-MWe light-water reactors are to be provided to the DPRK in return for freezing its indigenous nuclear program and related activities. Unlike the supply agreement talks, the safety session was marked by a good exchange on both sides. The NRC's presentations covered the role and responsibilities of a regulatory organization; typical NRC licensing, inspection, and international assistance activities; and the international Convention on Nuclear Safety. The staff participated in these discussions to impress upon the DPRK the necessity of developing a true safety consciousness and committing to a solid safety culture in the earliest stages of planning its nuclear power program.

Indonesia

Djali Ahimsa, Director General of the Indonesian National Atomic Energy Agency (BATAN), visited the NRC on May 5, 1995. During that visit, he met with Chairman Selin and Commissioner Jackson to discuss the status of Indonesia's consideration of the nuclear power option and the on-the-job regulatory training program for BATAN personnel, which the NRC has undertaken at Indonesia's request. Director General Ahimsa indicated that he was very pleased with the knowledge and experience gained by the first four BATAN trainees, who completed their 1-year assignments at the NRC in February 1995. He also advised that final decisions were being made on the next four trainees, who are scheduled to begin similar NRC assignments in January 1996.

Indian Subcontinent

In July 1994, the U.S. Government began discussions with India on a broad range of energy issues. As part of those discussions, the NRC initiated a reciprocal nuclear safety dialogue with its Indian counterpart, the Atomic Energy Regulatory Board (AERB).

In October 1994, representatives of the AERB visited the United States for safety discussions and site tours. In February 1995, Chairman Selin, accompanied by an NRC technical team, visited India at the invitation of AERB Chairman A. Gopalakrishnan. NRC–AERB topics of discussion included fire safety, design issues, symptom-based emergency operating procedures, and issues related to the internals of reactor vessels (e.g., core shroud cracking and steam generators). All discussions were based on publicly available information.

Several members of the NRC team visited the Narora Atomic Power Station (NAPS) for discussions and site tours relevant to the nuclear power plant's March 1993 turbine generator fire. The entire NRC team also accompanied three members of Secretary O'Leary's energy delegation, which was in India at the same time, on a visit to the Bhabha Atomic Research Centre (BARC) and the Tarapur Atomic Power Station (TAPS). During this visit, the NRC delegation held meetings with representatives of the AERB, the Atomic Energy Commission (AEC), and the Nuclear Power Corporation.

At the end of the visit, the NRC and AERB agreed to continue discussions on the development of symptom-based emergency procedures, technical exchanges on design issues, fire safety at nuclear power plants, and materials aging and inservice inspection. Other topics suggested for a future reciprocal visit included radiation protection, regulation of medical and industrial uses of radiological sources, licensing of byproduct materials, initiation of a joint NRC–AERB CANDU reactor study, continued discussions on aging boiling water reactors, and fire protection

WESTERN EUROPE AND CANADA

The NRC has traditionally maintained strong ties with countries in this region, many of which have 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

The NRC and the nuclear establishment of France actively continued their cooperative exchange activities during the FY 95 reporting period. In September 1995, Chairman Jackson made an official visit to France to meet with key nuclear officials and visit nuclear facilities. Chairman Jackson met with Ambassador Harriman; A.C. Lacoste, Director of the Directorate for the Safety of Nuclear Installations; Y. d'Escatha, Administrator General of the Atomic Energy Administration; G. Menage, Chairman of Electricite de France; Claude Mandil, Director of Energy and Raw Materials, Ministry of Industry;

P. Vesseron, Director of the Institute for Radiation Protection and Nuclear Safety; Jean Syrota, Chairman, COGEMA; and Y. Kalusney, Director of ANDRA (the French waste management organization). She also visited the Centre de l'Aube low-level waste facility and the Nogent nuclear power plant. The Chairman was favorably impressed with both of the facilities visited, and she expressed her desire to continue the important safety cooperation that the NRC has developed with France.

In October 1994, Commissioner de Planque was a keynote speaker at the European Nuclear Conference (ENC 94) in Lyon, France. She addressed a full conference session on "Radiation Protection: A Lesson in Societal Decision Making." She also made a short visit to the French Cadarache Nuclear Research Center.

In October 1994 and July 1995, French parliamentarian Dr. Claude Birraux, and his assistant, Mr. Michel Bermond, met with the Chairman, Commissioner Rogers, and senior NRC staff. On the first trip, he discussed dismantling and decommissioning nuclear sites; the subject of the second visit was the regulation of low levels of radiation. In the past, Dr. Birraux prepared a number of reports on nuclear safety and control for the Parliament. He is now preparing reports in connection with plans to decommission five of France's older reactors and the possible need to revise occupational dose limits.

Spain

In November 1994, three new Commissioners were appointed to 6-year terms on the Spanish Nuclear Safety Council, the Consejo de Seguridad Nuclear (CSN). Socialist Juan Kindelan, the former President of ENRESA (the Spanish waste management company), was named President of the Spanish Commission, replacing Conservative Donato Fuejo. The other two appointees were Dr. Agustin Alonso, an Independent who is the former head of nuclear safety at the Junta de Energia Nuclear (the forerunner of the CSN), and Dr. Anibal Martin, a Conservative. They replaced Luis Echavarri and Fabio Sarmiento. A fragile Socialist political alliance had kept nominations and renewals for CSN members on hold for about 4 years.

The United Kingdom

During October 1994, Commissioner de Planque traveled to the United Kingdom (UK), where she visited a number of nuclear facilities, including the Sellafield spent-fuel management facility, Drigg low-level waste site, Calder Hall nuclear power plant, the BNFL Capenhurst enrichment site, the Nuclear Radiation Protection Board facilities, and the Nirex facilities. The Commissioner also met with UK utility and government officials. Of particular interest to Commissioner de Planque was the 1994 UK nuclear energy policy review and privatization of the British nuclear program.

Sweden

During December 1994, Mr. Lars Hogberg, Director General of the Swedish Nuclear Power Inspectorate, made an official visit to the NRC. During that visit, he met with the NRC Chairman, Commissioners, and senior staff managers at headquarters to discuss a full range of nuclear safety topics and to sign the renewal of our bilateral cooperative safety arrangement. Following the visit to headquarters, he visited the Limerick NPP in Pottstown, Pennsylvania, and concluded his visit with a trip to the Region I office in King of Prussia, Pennsylvania.

Finland

In October 1994, Commissioner de Planque traveled to Finland to meet with the Finnish Women in Nuclear (WIN) section of the European Nuclear Society, sponsored by the Energy Channel of the Finnish Nuclear Society (FNS). The Commissioner's presentation focused on her responsibilities at the NRC and the role of the NRC in the American nuclear energy program. During her visit, the "Helsingin Sakomat" newspaper conducted an interview to obtain the Commissioner's perspective on nuclear energy. At that time, Commissioner de Planque was one of only two women nuclear safety commissioners in the world. The visit included tours of the Radiation Safety Center (VTT) and the Loviisa Nuclear Power Plant, as well as meetings with utility and government officials.

Canada

In December 1994, the EDO, accompanied by the RES and NRR Directors and additional NRR and OIP staff, met with members of the Atomic Energy Control Board (AECB), Atomic Energy of Canada Limited (AECL), and Atomic Energy of Canada Limited Technologies (AECLT). During that meeting, participants discussed the results of the NRC's acceptance review of the CANDU 3U design certification application and AECLT's intentions regarding continuation of the application. Discussions centered on the schedule and cost of the effort.

In May 1995, Commissioner Rogers visited Toronto, Canada, to give a speech at the International Workshop on Reliability Data Collection. He then went to Ottawa, where he met with nuclear officials at the AECB, the AECL, the National Research Council, and the Department of Natural Resources, Canada, to discuss a number of nuclear issues. Specifically, these issues included waste management, the continued supply of medical isotopes by Nordion, and the use of CANDU reactors for burning plutonium.

LATIN AMERICA

The three largest countries of Latin America—Argentina, Brazil, and Mexico—all have long-standing nuclear programs. In recent years, initiatives by Argentina and Brazil in the nonproliferation area have increased opportunities for U.S. nuclear cooperation with them.

Argentina

In 1994, the Argentine government reorganized the nuclear sector, dividing the Comision Nacional de Energia Atomica (CNEA) into three new entities:

(1) CNEA

(2) Ente Nacional Regulador Nuclear (ENRN)

(3) Nucleoelectrica Argentina S.A. (NASA), which is the utility operating the Embalse and Atucha power reactors

The CNEA is now responsible for operating the country's three research facilities (Ezeiza, Constituyentes, and Bariloche), as well as the waste management program and associated facilities. In addition, the CNEA is responsible for technology management, development of the prototype CAREM reactor, and the commissioning of nuclear power plants. The CNEA is developing options to help pay for their national nuclear program. These options presently include selling goods and services overseas, participating as a subcontractor in international joint nuclear enterprises, developing the 25-MW CAREM prototype reactor for sale to countries just beginning their nuclear programs, and developing their uranium mining base for possible sale of fuel overseas.

ENRN, the new Argentine counterpart to the NRC, has assumed the regulatory activities formerly managed under the CNEA. ENRN will regulate waste management and all nuclear activities, including radioisotopes and accelerators but not x-rays, which are regulated by the Department of Public Health. ENRN has signed the thermohydraulic code management program (CAMP) agreement with the NRC, and is interested in joining with the NRC in its severe accident management research program.

In August, Commissioner Rogers visited Argentina where he conducted useful discussions with nuclear authorities. He also visited the Ezeiza Nuclear Research Center with its RA-3 research reactor, the Conuar fuel fabrication facility, and the waste management facility. In addition, Commissioner Rogers visited the Atucha I and II nuclear power plants and the Bariloche Atomic Center, where he received a tour of the RA-6 research reactor and a briefing on the Pilcaniyeu enrichment program (in lieu of a tour because the enrichment facility was inaccessible as a result of snow).

Follow-up actions by both sides include negotiating an NRC-ENRN arrangement for technical and safety cooperation to replace the arrangement signed in 1990 with the CNEA, as well as defining possible future areas for cooperation.

Brazil

Commissioner Rogers visited Brazil in August to attend the 13th International Conference on Structural Mechanics in Reactor Technology (SMIRT) in Porto Alegre. His visit also included conducting discussions with Brazilian nuclear authorities, and touring nuclear sites.

Commissioner Rogers presented the keynote address at the SMIRT conference, for which NRC was one of many international sponsors. Representatives of most of the countries of the world with nuclear interests attended the conference. This conference provides a forum for members of the international scientific and engineering communities who are involved with the structural mechanical aspects of design, construction, and operation of nuclear reactors to exchange the latest information and ideas, and reestablish personal contacts.

The Commissioner also conducted discussions in Sao Paulo at the Instituto de Pesquisas Energeticas e Nucleares (IPEN), where he was briefed on the organization and distribution of nuclear research responsibilities among Brazil's three research centers (IPEN, CDTN, and IEN). An NRC team also toured the IEA-R1 research reactor and the pilot uranium hexafluoride (UF_6) production line, designed to process uranium yellowcake into UF_6.

The Commissioner met with officials of the Brazil-Argentina Agency for Accounting and Control of Nuclear Materials (ABACC) in Rio de Janeiro and was given a comprehensive overview of the ABACC's work. The speaker noted with pride that Argentina and Brazil are moving toward a good relationship after 150 years of "peaceful but worried coexistence." ABACC has a total staff of 12 technical personnel divided among four sections:

(1) planning and evaluation

(2) nuclear accounting

(3) technical support

(4) operations

The Commissioner also met with the President of the Comision Nacional de Energia Nuclear (CNEN) to discuss CNEN's organization, licensing, reactor activities, and possible areas of cooperation with the NRC. The following day, the Commissioner toured the Angra dos Reis nuclear power plant site south of Rio de Janeiro. When completed, Angra will have three nuclear power plants:

(1) Angra I, a 626-MWe Westinghouse pressurized-water reactor (PWR) operational since 1985

(2) Angra II, for which construction is expected to be completed in 1998, with operation starting in 1999

(3) Angra III, for which construction is planned to start in 1998 or 1999 (both 1229-MWe German Siemens AG PWRs)

During the tour, the group also saw the simulator laboratory and the environmental monitoring facility.

Followup actions by both sides include working out details of possible cooperative projects under the NRC–CNEN arrangement for technical and safety cooperation (e.g., possible technical training of CNEN personnel and reciprocal visits to NRC sites).

SOUTH AFRICA

Following many years of being cut off from the world community because of their now disbanded nuclear weapons program and other policies, South Africa concluded an Agreement for Cooperation Concerning Peaceful Uses of Nuclear Energy with the United States in August 1995. This is a milestone accomplishment in that it renews nuclear exchange and trade between the two countries. The NRC, required by statute to review this action, issued a letter from Chairman Jackson recommending approval of the agreement.

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 International Atomic Energy Agency (IAEA) in Vienna and the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD) in Paris. For example, using data on events at nuclear power plants received from other countries through both agencies, the NRC performs comparative studies of reactor operational experiences that may produce information applicable to the safety of U.S. reactors. The NRC also uses reports of operational events received from the NEA/IAEA Incident Reporting System, from the IAEA, and from bilateral exchange programs with more than 20 countries to supplement domestic data. The NRC also uses these mechanisms to provide U.S. incident reports to the international community. Chapter 3 provides further information on this program.

INTERNATIONAL ATOMIC ENERGY AGENCY

General Conference and Board of Governors Meetings

In September 1995, Chairman Jackson attended the thirty-ninth regular session of the IAEA General Conference in Vienna, Austria. While there, she met with IAEA nuclear safety officials and conducted bilateral discussions with Argentina, Armenia, Canada, China, the Czech Republic, Germany, Ghana, Hungary, India, Indonesia, Japan, the Republic of Korea, the Russian Federation, the Slovak Republic, South Africa, Spain, Ukraine, and the United Kingdom. The NRC's EDO, James Taylor, also attended the General Conference, representing the United States in a meeting of senior regulators, where he led a discussion on the regulatory approach to pressure vessel integrity and annealing. He presented a paper on annealing of U.S. commercial reactor pressure vessels and changes to U.S. requirements for containment leak rate testing. Participants at the meeting, who included regulators from several newly independent countries and Eastern Europe, responded with their own experiences in these areas.

The IAEA General Conference agenda dealt with a range of topics on the IAEA's policies, programs, and budget. These included measures to strengthen international nuclear safety and technical cooperation, measures to strengthen and improve the safeguards system, and measures against illicit trafficking in nuclear materials and other radioactive sources. A resolution adopted in the safety area urged member states to sign and ratify the Convention on Nuclear Safety so it can go into effect in 1996. The United States agreed to a general 3-year increase in contributions to the Technical Cooperation and Assistance Fund in exchange for support of a refinancing approach that would have more member states pay an assessed share of the safeguards budget. The September Board of Governors met before the General Conference to discuss issues arising from proposed resolutions for the General Conference. Among the major issues were the financing of technical assistance and safeguards and, in the safety area, liability for nuclear damage. It has been difficult to reach a consensus concerning an updated liability regime such as the U.S.-proposed global convention covering transboundary effects.

IAEA Meeting Participation

NRC staff attended 20 meetings on a range of nuclear safety topics:

- the Incident Reporting System
- the International Nuclear Event Scale
- radiation safety
- advances in the operational safety of nuclear power plants
- safe management of radioactive waste
- safe transport of radioactive material
- generic safety issues pertaining to light-water reactors

- decommissioning of nuclear power plants and research reactors
- nuclear power plant diagnostics
- cracking in light-water reactor pressure vessel head penetrations
- strengthening structural materials used for transporting radioactive material
- preparation of a program for the revision of the NUSS Design Series documents
- industrial radiography safety practices
- advancements in the implementation of new basic safety standards
- advances in and experiences with accident consequences analysis
- a plant self-assessment program to enhance nuclear safety
- safeguards
- computer codes for severe accident management

Convention on Nuclear Safety

The United States signed the Convention on Nuclear Safety (CNS) at the IAEA General Conference in September 1994. As of June 30, 1995, there were 58 signatories and 11 ratifications (Bangladesh, France, Japan, Norway, Poland, Romania, the Slovak Republic, South Korea, Spain, Sweden, and Turkey). On May 11, 1995, the U.S. Government completed its review of the CNS, and the President submitted the Convention to the Congress for its advice and consent and ratification.

During negotiation of the CNS, certain basic implementation approaches were informally discussed but not embodied in the CNS text. In December 1994 and March 1995, signatories held meetings to clarify some of the implementation issues on which the Convention is silent. Carlton Stoiber, Director, OIP, represented the U.S. Government at both of these meetings, chairing the latter as well as the November 1995 session. In March 1995, the signatories agreed to hold periodic (approximately every six months until the CNS is entered into force) topic-related meetings, to coordinate the approach to formulating options and alternatives to implementing the CNS. Signatories' suggestions may be submitted to the preparatory meetings for formal consideration and approval. These preparatory meetings, called soon after the Convention enters into force, will shape the implementation of the convention.

Implementation of the U.S. obligations under the Convention will be carried out primarily by the NRC as the U.S. civilian nuclear regulatory authority. Other than the requirement to prepare the national report required in Article 5, obligations incurred under the Convention are already embodied in NRC regulations and procedures, and the conforming practices of the U.S. civil nuclear power industry.

Waste Convention

In February 1995, the IAEA convened a preparatory meeting of member states' experts to discuss development of a Convention on the Safety of Radioactive Waste Management. Several issues were raised during the meeting, and the IAEA compiled them into a document, entitled "Inventory of Issues," similar to the Convention on Nuclear Safety. The purpose of the document was to provide member states with a tool to help focus the negotiation process for a waste Convention.

NUCLEAR ENERGY AGENCY (NEA)

NEA Steering Committee Meetings

The NEA Steering Committee met in October 1994 to give final approval to the 1995–1996 Program of Work and Estimate of Expenditures. This was the first proposed 2-year budget approved for the NEA, and discussion focused on the increasing demands of an expanding membership and the Agency's growing program for nonmembers in the face of diminishing resources.

A Special Session in March 1995, focused on clarifying the role of the NEA and its balance of priorities, relations with nonmember economies, the structure and role of the Steering Committee, the possibility of changing NEA statutes to give the NEA more autonomy (particularly with respect to future membership), and the possible restructuring of technical standing committees.

In May 1995, the Steering Committee held its second regularly scheduled meeting, during which Director General Uematsu announced the appointment of Mr. Makoto Takahashi (Japan) as the new NEA Deputy Director for Safety and Regulation. The Director General noted that he was retiring at the end of October 1995. Discussion topics included cooperation with Argentina and Brazil, NEA–IAEA coordination, the Collective Opinion on the Environmental and Ethical Aspects of Geological Disposal, and the need for voluntary contributions to support the NEA Program on Nonmember Economies.

Visit to the NRC by the NEA Deputy Director General

Samuel Thompson, NEA Deputy-Director General, met with Chairman Jackson in July 1995 to discuss bilateral cooperation. Topics of interest included U.S. Government funding for the NEA, a possible 1996 meeting of heads of regulatory organizations, and the upcoming technical standing committee (CSNI) meeting on the safety of Soviet-designed RMBK and VVER reactors.

Energy Charter Treaty Protocol on Nuclear Safety

The Energy Charter Treaty Working Group IV met in May 1995 to finish drafting a Nuclear Safety Protocol. The European Union (EU) suggested that the draft protocol text be modified, and placed a nonbinding hortatory Declaration on Nuclear Energy on the table for discussion. A working group majority favored forwarding such a declaration to the Energy Charter Treaty Conference. However, consensus was not possible because of objections raised by the delegations from Russia, Ukraine, Belarus, and Armenia on the failure of the text to cover trade, economic, and technology issues, and to be legally binding. The subject will be taken up by the Charter Conference in 1996.

G–24 Nuclear Safety Assistance Coordination Activities

In February and June 1995, the NRC participated in the G–24 Nuclear Safety Assistance Center's Steering and Plenary Committee meetings in Brussels, Belgium. The purpose of these meetings was to discuss coordination of safety assistance programs worldwide for the countries of the former Soviet Union and Central and Eastern Europe. In addition, in June 1995, the NRC participated in an ad hoc meeting to coordinate ongoing or planned assistance activities with the Federal Nuclear and Radiation Safety Authority of Russia (GAN). This meeting successfully identified priority areas of assistance for GAN, and highlighted potential overlaps or gaps in assistance efforts. In addition to the NRC and GAN, the regulatory authorities of Canada, France, Germany, Italy, Spain, and the UK were represented. Representatives of the European Union's safety assistance programs also attended.

G–7 Nuclear Safety Activities/EBRD Nuclear Safety Role

The European Bank for Reconstruction and Development (EBRD) plays a dual role in helping to improve nuclear safety in Central and Eastern Europe and the FSU—first, through EBRD's Nuclear Safety Account (NSA), which is focused on financing existing NPPs; and second, through the EBRD loan program, which is available to finance nuclear safety upgrades and completion of newer, safer plants. However, such loans have been difficult to justify because of the EBRD's "least cost" criteria for making energy infrastructure loans and because nuclear energy tends to be very capital intensive.

The NSA is expected to assist in implementing the G–7 action plan for closure of Chornobyl by financing near-term safety upgrades and decommissioning studies at this plant. In the spring of 1995, the NSA made a grant to Russia of about $100 million for safety upgrades to the Kola, Novovoronezh, and Leningrad (Sosnovy Bor) nuclear power plants. As a condition of this loan, Russia agreed to set up a Western-style nuclear reactor licensing regime on the basis of a safety analysis of its nuclear reactors.

Proposed U.S.-EURATOM Agreement for Cooperation

The Agreement between the U.S. Government and the European Atomic Energy Community (EURATOM) Concerning Peaceful Uses of Atomic Energy has been approved by the President and EURATOM. U.S. law requires that the new Agreement sit before the U.S. Congress for 90 days of continuous legislative session, which could extend into April or May 1996. The agreement expired at midnight December 31, 1995. After that date, EURATOM licenses authorizing export of reactors, special nuclear material, or source material for nuclear uses become invalid (i.e., they will expire or be suspended). A separate exchange of notes, expected to take place between the U.S. and EURATOM, will allow the NRC to continue to authorize nuclear-grade graphite, deuterium, and reactor components to EURATOM after December 31, 1995, without interruption.

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

(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 95 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
- reviewing data from researchers in Russia, the Czech Republic, the United Kingdom, and other East and West European countries related to reactor PV embrittlement under intensive neutron bombardment and thermal annealing of the vessel to mitigate embrittlement effects

Chapter 9 (RES) provides additional details on these activities.

EXPORT AND IMPORT LICENSING

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 that these items are used only for peaceful purposes. This authority extends to production and utilization facilities, special nuclear and source material, byproduct materials, certain nuclear-related components, and other materials.

In carrying out these responsibilities, the NRC obtains the views and recommendations of other governmental agencies and departments as needed or required. The NRC is also consulted by the Executive Branch on nuclear-related, dual-use exports licensed by the Department of Commerce

(DOC), as well as nuclear technology transfers and nuclear material retransfers (subsequent arrangements) licensed by the DOE. In addition, the NRC is consulted by the Department of State (DOS) regarding agreements for nuclear cooperation between the United States and other countries.

NRC EXPORT LICENSING SUMMARY

In FY 95, the NRC completed 105 export licensing actions. Of these, approximately 70 involved exports of natural and low-enriched uranium for use in reactors in Western Europe, Indonesia, Japan, South Korea, and Taiwan; 8 covered reactor component exports to Argentina, Eastern Europe, Norway, and Russia; 3 were amendments of previously issued power reactor export licenses to Taiwan and Switzerland; and 1 authorized shipments of depleted uranium components to the Sellafield reprocessing facility in the United Kingdom. Among the other cases in 1995, one authorized the DOE to export low-enriched uranium (and one-half gram of plutonium) in nitric acid solutions to the Sellafield reprocessing facility; another authorized shipment of heavy water to Canada for upgrading and return to the National Institute for Standards and Technology (NIST); three involved tritium exports to Canada, Switzerland, and the United Kingdom for use in light sources or industrial equipment; and several others involved natural uranium, depleted uranium, and thorium exports for nonnuclear industrial, munitions, or resource-recovery uses. The remaining cases included several exports of small (gram quantity) samples of nuclear material for laboratory, calibration, or safeguards use, as follows:

- high-enriched uranium for use in laboratories in Italy, Japan, and South Korea
- 19.9 percent low-enriched uranium for use by the IAEA's Seibersdorf Laboratory
- neptunium-237 for Germany's Karlsruhe Research Center
- assorted by-product materials for DOE use in work on the spent fuel pool at Nyongbyong, North Korea

NUCLEAR SUPPLIERS GROUP

The NRC published new regulations, effective November 4, 1994, that conform its export controls to the international Nuclear Suppliers Group (NSG) Guidelines for exports of dual-use commodities. The NRC participated in the April 1995 NSG Plenary Meeting and dual-use consultations in Helsinki, Finland. Representatives of 30 member states attended, including new members New Zealand and South Africa. Ukraine was an observer. The NSG agreed to place controls on technology associated with all trigger list items and to require government assurances for retransfers of those items. A working group was created to review the graphite entry to resolve the issue of whether large quantities of graphite can be exported to a country without fullscope safeguards for nonnuclear end use. The NSG encouraged efforts to maintain contacts with the New Independent States of the FSU. In addition, the NSG held its first meeting for the purpose of information sharing among members and affirmed the principle of transparency in exporting nuclear items.

SUBGROUP ON NUCLEAR EXPORT COORDINATION (SNEC)

The NRC continued to participate in this interagency body, which meets regularly to reach consensus decisions on nuclear export licensing activities that may raise nuclear proliferation concerns. Export cases licensed by DOC and NRC and nuclear technology transfers authorized by DOE are referred to SNEC because of country destination, concerns about the end user/commodity, the precedent-setting nature of the proposed export, or by agency request. Most of the cases reviewed by the SNEC are dual-use exports. The number of cases continues to decrease as a result of revisions to DOC licensing controls over computer exports.

DEPARTMENT OF ENERGY TECHNOLOGY TRANSFERS

In 1995, the NRC worked with DOE to process two technology transfer cases, the first involving approval of a Combustion Engineering-French CERCA joint venture to produce TRIGA fuel, and the second involving the transfer of PWR technology and fuel to Ukraine. As part of a cooperative project involving the U.S., the IAEA, the Russian Federation, and the European Union, the NRC issued an exemption permitting DOE to distribute four grams of plutonium to Russia for isotopic separation at the International Science and Technology Centre. This material will subsequently be transferred to Belgium's Institute for Reference Materials and Measurements for assembly into certified reference materials for distribution to the IAEA, the United States and other users for safeguards-related applications. The DOE also consulted the NRC on a subsequent arrangement involving Switzerland and the United Kingdom.

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 (POTAS), which provides the largest share of voluntary technical support of any IAEA member state.

ASSISTANCE TO FSU IN NUCLEAR MATERIALS SAFEGUARDS AND PHYSICAL PROTECTION

The Nunn-Lugar legislation was enacted by the United States to support the destruction of nuclear, chemical, and other weapons of mass destruction in the former Soviet Union and to carry out other nonproliferation-related activities. Under this legislation, a Safe and Secure Dismantlement (SSD) interagency group (which is now known as the Cooperative Threat Reduction (CTR) Program) was established a few years ago to assist the FSU in dismantling nuclear weapons. The group's activities include supporting the development of national systems for nuclear materials control and accounting (MC&A) and physical protection.

Under the auspices of the CTR program, the NRC and DOE have established bilateral technical assistance programs with Russia, Ukraine, and Kazakstan to help these countries improve their capabilities to effectively safeguard nuclear facilities and materials. The Presidential Decision Directive on Nuclear Materials Security issued in September 1995 indicated that the NRC, mainly through efforts to strengthen the Russian regulatory body (GAN), would support the high-priority U.S. effort to strengthen controls on nuclear materials in the FSU so they do not contribute to the proliferation of a nuclear explosives capability.

OTHER 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 95, visits were made to Thailand, Taiwan, Philippines, Spain, and Portugal. Similarly, teams from Canada and France visited the NRC and NRC-licensed facilities.

Additional information on items discussed in this section can be found in Chapter 5.

NUCLEAR NONPROLIFERATION ACTIVITIES

U.S. NONPROLIFERATION POLICY

The United States continues to provide strong support for the Treaty on the Nonproliferation of Nuclear Weapons (NPT), for the IAEA and its safeguards role, and for multilateral export controls.

NPT EXTENSION AND REVIEW CONFERENCE

During the FY 95 reporting period, two NPT conferences were held. In January 1995, the Fourth Preparatory Committee (PrepCom) convened, and in April and May 1995, a conference to extend the NPT took place in New York. The Fourth PrepCom focused its discussions on the rules of procedure for the Review and Extension Conference. Specifically, discussions concerned the way in which the decision to extend the Treaty should be made, and whether the vote should be secret or open. Neither of these issues was resolved at the Fourth PrepCom.

The Extension and Review Conference was attended by delegates from 175 of the 178 states then party to the Treaty. Early on, it became obvious that there would be a numerical majority in favor of indefinite extension. South Africa proposed calling for indefinite extension along with strengthening the review process, mainly through the creation of a virtually permanent body that would meet between review conferences for both substantive and procedural discussions, as well as to adopt a set of nuclear nonproliferation and disarmament principles to measure progress in the NPT implementation. This proposal became the basis for a set of measures to strengthen the review process, and a set of nuclear nonproliferation and disarmament principles and objectives for the purpose of determining progress in states' compliance with the Treaty.

The three Main Committees also submitted reports on their respective review activities. The Main Committee I report on arms control issues reflected the minimal agreement among its members, with particular disagreement with regard to nuclear disarmament and security assurances. The Main Committee II report, covering safeguards issues, showed greater member agreement. Main Committee III, charged with reviewing the assistance and cooperation among NPT members, emerged with virtually a consensus report. Carlton Stoiber, Director, OIP, represented the U.S. Government on Main Committee III.

With a majority of the states party to the Treaty in favor of its indefinite extension, the Conference ended with the decision to continue the Treaty in force indefinitely. The Conference also adopted a Final Report reflecting the decision, but without a Final Declaration consensus with respect to the results of the review and decisions to
(a) strengthen the review process for the NPT and
(b) develop principles and objectives for nuclear nonproliferation and disarmament.

CHAPTER 9

NUCLEAR REGULATORY RESEARCH

Activities of the NRC Office of Nuclear Regulatory Research (RES) constitute an essential service to the regulatory process that 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. It is the responsibility of RES to conduct the NRC's rulemaking process, including issuing regulatory guides and rules that govern NRC-licensed activities.

Appendix 5 lists regulations issued by the NRC during fiscal year 1995 (FY 95), while Appendix 6 describes and lists regulatory guides issued, revised, or withdrawn during FY 95.

Pursuant to the Small Business Research and Development Enhancement Act of 1992, Public Law 102–564, the NRC supports the Small Business Innovation Research (SBIR) program. As of FY 95, the NRC was supporting 28 SBIR projects in progress.

In 1995, the NRC staff continued to participate 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 95 under the following major headings: Reactor Regulation (which addresses reactor aging and renewal, as well as reactor safety assessment and regulation development), Standard Reactor Designs, Materials Users, Low-Level Waste and Decommissioning, and High-Level Waste.

REACTOR REGULATION

REACTOR AGING AND LICENSE RENEWAL

Pressure Vessel Safety

This area of NRC research focuses on ensuring the structural integrity of the reactor system pressure boundary; that is, keeping the boundary leaktight and free from damage. The underlying concern in this research is that failure to ensure the integrity of the pressure boundary could compromise the operator's ability to cool the reactor core, and could lead to a loss-of-coolant accident (LOCA) accompanied by the release of hazardous fission products.

Since its initiation in 1967, research in this area has evolved into a broad-based program. Initially, the program focused on the properties and fracture behavior of the reactor pressure vessel (RPV) the large, thick-walled steel cylinder that houses and supports the reactor core. As the

NRC realized the full challenge of ensuring the integrity of this critical component, the staff modified the scope of the research program to include irradiation damage, service-induced cracking mechanisms, and methods for periodically inspecting the RPV. Since then, incidents of cracks and leaks in piping and steam generator tubes have highlighted the need for materials data, analysis methods, and inspection techniques for these components, and the research program was again modified to meet the added challenges.

To put the results of past research into practice, the NRC has implemented regulations, regulatory guides, the Standard Review Plan, and various national codes and standards. Future work will provide the bases for confirming and revising some of the earlier regulatory positions, with the overall objective of providing a stable, well-validated regulatory framework for ensuring the integrity of the primary pressure boundary. The technical aspects of the research program—fracture evaluation and irradiation embrittlement—are central to sound regulatory positions addressing the safe operation of the RPV. For example, results from the pressure vessel safety research program were used to revise the basis for determining the allowable operating pressure and temperature limits to preclude brittle failure of the RPV.

FRACTURE EVALUATION

During FY 95, the development and validation of fracture analysis methods played a large role in the overall pressure vessel safety research program. Fracture analysis involves an ongoing program to develop and implement advanced analysis methods that will improve the ability to predict the allowable pressures and temperatures for RPVs, and to evaluate the integrity of RPVs under design-basis and hypothetical accident conditions.

Researchers at the Oak Ridge National Laboratory (ORNL) and the Pacific Northwest Laboratories (PNL) perform the core studies, augmented by researchers at Brown University, the University of Illinois, and the U.S. Naval Surface Warfare Center, Annapolis Detachment (NSWC). During FY 95, these researchers continued to develop improved analytical methods, and to evaluate those methods against test data developed as part of this program by the ORNL, PNL, NSWC, and the National Institute for Standards and Technology (NIST). This work permits evaluation of test geometries and loadings that are more typical of RPVs in the ductile-to-brittle fracture toughness transition region in the operating temperature range. The researchers have also made significant progress in determining the effects of shallow flaw constraint on fracture toughness of RPV steels under realistic biaxial loading, and on the effect of fracture-mode conversion from ductile to brittle in the transition region. The researchers are also coordinating their work with international research efforts, through a cooperative project on fracture analysis of large-scale experiments, under the auspices of the Committee on Safety of Nuclear Installations. Collaborative efforts with another European Community program are well under way, and are expected to yield results from a large-scale test that will closely simulate an RPV subjected to accident loads. This will provide a more realistic validation of the revised analysis methods.

During FY 95, NRC issued Regulatory Guide 1.161 to provide guidelines for assessing the integrity of RPVs fabricated from materials with low resistance to a "ductile tearing" failure mode. In the early 1970s, the NRC recognized that some RPVs were fabricated using steel plates and weld types that were less resistant to ductile tearing than most other plates, forgings, and welds used in RPVs. In 1973, the NRC issued Appendix G to 10 CFR Part 50 to provide explicit requirements concerning the Charpy upper-shelf energy—a measure of the ductile tearing resistance of these materials—for both new construction and operating plants. The American Society of Mechanical Engineers (ASME) published Appendix K (Section XI, Division 1, February 1993), which addressed this issue, but did not include complete details for all the potential loading conditions for RPVs. In addition, 0zAppendix K did not include guidance on determining appropriate material properties for use in the evaluation method. In September 1993, the RES staff published a draft regulatory guide to supplement the ASME Code guidance that includes evaluation methods pertinent to all service loading conditions, as well as guidance for selecting transients for consideration at various service load levels and estimating material properties. In FY 95, the staff analyzed the public comments on the draft regulatory guide, and used the comments in preparing the final guide, which was subsequently issued.

During FY 95, the RES staff worked with researchers at the ORNL and PNL to develop technical bases, founded in probabilistic fracture mechanics, to revise Regulatory Guide (RG) 1.154, which addresses plant-specific evaluation of pressurized thermal shock in pressurized-water reactor (PWR) RPVs. In accordance with lessons learned from the Yankee Rowe RPV integrity evaluation, SECY–92–283, additional research was coordinated with the efforts of staff specialists in thermal-hydraulics and probabilistic risk assessment (PRA) for use in revising RG 1.154. Development of the technical bases is planned for completion in FY 96, and the draft revisions to the regulatory guide are expected to be published in 1997.

In FY 95, with support from the Nuclear Energy Institute (NEI), the RES staff organized and held a public workshop concerning RPV integrity. The objectives of the workshop were to discuss technical improvements in nuclear RPV operation, maintenance, and inspection, and to achieve a mutual understanding of the progress and plans made by industry and government in the area of RPV integrity. Workshop participants discussed a variety of specific issues:

- the impact of steel chemistry variability on vessel integrity
- RPV annealing to recover fracture toughness
- recent progress in model development to assess recovery
- efforts to improve analyses and approaches being considered by the NRC in revising RG 1.154

RADIATION EMBRITTLEMENT

In ensuring the integrity and continued safe operation of RPVs, a special concern is the increasing embrittlement of the pressure vessel steel caused by neutrons that impinge on the pressure vessel wall during plant operation. Through a complex process, these neutrons reduce the ability of the steel to resist fracture.

Consequently, the research program devotes significant attention and resources to quantify the effects of neutron radiation embrittlement, to understand the mechanisms that control this process, and to find methods to mitigate the embrittlement and restore the original fracture toughness of the RPVs:

- measuring toughness changes with increasing levels of neutron embrittlement
- recovering toughness of embrittled steels through thermal annealing
- modeling embrittlement mechanisms
- developing a better understanding of the original chemistry of RPV welds
- using small surveillance specimens to produce direct measurements of fracture toughness

In FY 95, research continued on development of a physical model of the neutron embrittlement process. This included atom probe field-ion microscopy of neutron embrittled copper bearing steel, which was used to identify and analyze copper-rich precipitates (CRP). These CRPs are believed to be responsible for the increased hardness and loss of toughness in copper-bearing weld metal in many RPVs. The results of this work have been published in the open literature and in NUREG/CR–6231. Concerns about the effects of copper content on the sensitivity of welds to embrittlement resulted in an investigation of the copper distribution along and through welds, using weld metal from the nozzle and beltline of an operating RPV. The study, which was reported in NUREG/CR–6249, also quantified the measured variations in unirradiated weld impact and fracture toughness levels.

As a result of activity concerning the properties of weld metal from steam generators removed from the Palisades (Michigan) nuclear power plant, the research staff performed a study during FY 95 to determine the effects of thermal aging on the toughness of RPV steels. No significant trends were observed regarding thermal embrittlement in U.S. RPV steels.

During FY 95, ORNL and SRI used small surveillance specimens to produce direct measurements of fracture toughness. This research yielded encouraging results using precracked, notched, round bars and precracked Charpy specimens. Coupling these small specimens with the "Master Curve" approach—a Weibull statistical analysis of fracture toughness transition curves—may provide an alternative to inferring changes in fracture toughness from standard Charpy surveillance specimens.

Also during FY 95, ORNL continued to measure the changes in material strength, impact toughness, and fracture toughness that result from neutron embrittlement. The materials included submerged-arc welds with a range of copper concentrations representative of welds in the United States and A302B steel weld heat-affected-zone material. This long-term research requires neutron embrittlement of materials in research reactors and mechanical testing in hot cells. Through this research, ORNL will determine the sensitivity of changes in weld copper content, as well as whether the ductile-to-brittle transition region of the fracture toughness curve changes shape with a shift in transition temperature. This research is necessary to develop better empirical relationship between Charpy impact toughness behavior and fracture toughness for regulatory purposes.

Thermal annealing is the only known way to reverse the effects of neutron embrittlement of RPV steels. Research confirmed the efficacy of annealing, and provided background information for the draft annealing rule, 10 CFR 50.66, and draft supporting regulatory guide that were issued for public comment in FY 95. The NRC has addressed the public comments, and expects to issue the final rule early in FY 96, with the guide to follow shortly thereafter. The guide provides embrittlement recovery equations, developed as part of the research program, that licensees can use to determine the impact toughness recovery expected from thermal annealing. The equations include the effects of copper concentration, irradiation temperature, and flux, along with thermal annealing time and temperature. Research in cooperation with the American Society for Testing and Materials (ASTM) is continuing to confirm the re-embrittlement behavior of thermally annealed steel.

During FY 95, the NRC and the DOE developed and implemented a Memorandum of Understanding (MOU) concerning NRC participation in the DOE Annealing Demonstration Projects (ADPs). The MOU recognizes the mutual interest of the NRC and DOE in the ADPs, and establishes a framework for cooperation and coordination of activities.

To demonstrate the engineering feasibility of thermal annealing, two separate industry consortia will perform the ADPs during 1996 using the reactor vessels at the cancelled Marble Hill and Midland facilities. NRC activities will include independent review of the two test facilities, independent analysis of thermal and stress distributions that would result from annealing, and possible independent instrumentation of both facilities. These activities are intended to facilitate understanding of the ADP results to confirm the adequacy of the proposed NRC thermal annealing rule (10 CFR 50.66) and the supporting draft regulatory guide. The results from the two ADPs are anticipated to provide a basis for annealing, and possible independent instrumentation of both facilities.

In independently assessing the engineering feasibility of the two ADPs, the NRC will develop thermal and stress analysis models for the key reactor system components affected by the demonstration annealing, including the RPV and reactor coolant system piping, as well as the surrounding reactor cavity concrete wall and insulation. By analyzing these models, the NRC will then predict thermal response and resulting deformations, strains, and stresses in key reactor system components at the two ADP plants. In addition, the NRC will take selective measurements at the two ADP sites during the demonstration annealing, and will derive a comprehensive interpretation of the DOE/industry and NRC measured data. On the basis of this interpretation, the NRC will then recommend instrumentation plans for future annealing of U.S. RPVs. The NRC plans to issue its independent assessment and final reports within 6 months of each demonstration anneal.

Environmentally Assisted Cracking

In recent years, the industry has become increasingly concerned with intergranular stress corrosion cracking (IGSCC) in BWR piping systems and, in general, with the integrity of piping as reactors age. This concern has led to increased research on piping integrity, as part of the overall pressure boundary integrity research program.

During FY 95, Argonne National Laboratory (ANL) conducted extensive research on the effects of LWR coolants on fatigue life of reactor coolant system components. The ANL findings supported Japanese research and observations that the present ASME Code design curves may not adequately account for such coolant effects. In addition, the ANL research yielded significant information on dependence of fatigue life on the rate of loading. This information will be used in applying laboratory data to cumulative usage factor calculations, as an essential aspect of NRC evaluations of the service life remaining in aging plants.

Core Internal Components

As reactors age and core components accumulate higher fluence, irradiation-assisted stress corrosion cracking (IASCC) of reactor core internal components is becoming more common in both BWRs and PWRs. Because some affected components are difficult or impractical to replace, it is increasingly important for the NRC to assess the potential for IASCC in particular materials, the residual life of affected components, and the potential consequences of repair measures.

During FY 95, research on test specimens cut from components of operating reactors was supplemented by specimens prepared from carefully characterized material and irradiated in the Halden reactor in Norway. As a result, researchers are making important progress toward identifying the impurities most important in IASCC of materials commonly used in core components.

Inspection Procedures and Techniques

INTERNATIONAL PROGRAMS

The NRC has been a leader and active participant in the Program for the Inspection of Steel Components, Phase III (PISC III), which reached closure in FY 95. The participants in this international program, organized in 1986, have invested an estimated $40 million, including contributions of materials, inspection services, and manpower, to assess the effectiveness of nondestructive testing technologies and procedures for inservice inspection (ISI) of nuclear power plant components. Participants in PISC III research focused on the nondestructive testing of LWR primary circuit components containing realistic flaws. The results of the program will assist regulators and code-making bodies in establishing technical bases for improving ISI requirements.

Since the program reached closure during FY 95, participants have published reports to document the studies. These reports included preliminary results for steam generator tubes, which revealed a significant variation in flaw detection capability among the 17 teams participating in this study. This variation, compounded by the relatively low performance of several teams, indicates the need to upgrade the capability of ISI techniques and teams. Similarly, the PISC III results revealed that flaw sizing was inaccurate, and there was little correlation (that is, significant error) between the estimated and true sizes (depth, length) of the flaws.

During FY 95, teams from the United States, Japan, Europe, and Russia completed round robin studies of service-degraded stainless steel pipes with stress corrosion cracks removed from U.S. plants. These studies will provide an international database for assessing the reliability of the ISI of stainless steel piping.

FABRICATION FLAW DENSITY AND DISTRIBUTION IN REACTOR PRESSURE VESSELS

An important parameter in structural integrity assessments of the reactor pressure vessel is the size, distribution, and density of pre-existing flaws. However, until recently, little data existed on this topic.

During FY 95, a reactor pressure vessel from a cancelled plant was inspected using the Synthetic Aperture Focusing Technique for Ultrasonic Testing (SAFT-UT). This improved method for reliably and accurately detecting and sizing flaws has been developed through extensive laboratory testing and validated through blind trials. The SAFT-UT study at the cancelled plant yielded an extensive database, which was analyzed to evaluate and size the flaws detected. This analysis revealed that very high-sensitivity inspections were performed, and the majority of the flaws were quite small (less than a few millimeters in size). In addition, the extensive database provided sufficient flaw numbers in different size categories to develop statistically valid flaw size and density distributions. The results indicate that the ratio of flaws between the weld metal and the plate metal is lower than normally assumed. Results from this study will be validated through destructive testing of material removed from the reactor pressure vessel.

Steam Generator Integrity

Corrosion problems in PWR steam generator tubes can be traced back as far as 1957 to the Shippingport reactor, the first commercial PWR operated in the United States. In early 1993, the Trojan nuclear plant was shut down long before the end of its design life, in part because of severe steam generator tube degradation problems. By the end of 1995, 38 steam generators in 13 PWRs had been replaced in the United States because of serious tubing degradation, and the replacement of 24 additional steam generators at eight plants was planned.

Steam generator tubing degradation is a potentially significant safety concern, as well as an important economic problem, for the utility industry. Steam generator tube leaks and ruptures can result in containment bypass leading to the release of radionuclides to the environment. Tube ruptures also result in the loss of primary reactor coolant, which can significantly exceed the makeup capacity of the charging pumps.

In response to these safety concerns, the NRC has, since 1977, sponsored a series of research programs on tube integrity and inspection. These programs developed quantitative relationships for predicting the burst pressure of degraded steam generator tubing as well as leak rates through cracked tubes. This work provides an independent verification of similar relationships developed by the industry. NRC research also developed sampling plans for ISI of degraded steam generators as well as performance demonstration criteria to help ensure their effectiveness of ISI systems used to detect and size flaws.

The results of these research programs have helped to ensure the safe operation of nuclear steam generators; however, in recent years, stress corrosion cracking has become the most widespread mode of tubing degradation. This increased incidence of cracking in steam generator tubes has occurred at the top of the tube sheet, at tube support plates, in regions of sludge accumulation, and in the tube free span. At the tube support plate locations, the morphology of the cracking observed is often distinctly different from that observed at other locations, with cracking commonly occurring in the form of numerous short segments separated by uncracked ligaments.

In FY 95, the NRC initiated a new research program at ANL to provide the data and methodologies needed to independently evaluate and assess industry proposals for ensuring steam generator tube integrity. This new research program is divided into four tasks. The objective of the first task is to evaluate and quantify the reliability of the current ISI methods for steam generator tubes. The second task will evaluate advanced nondestructive examination and signal analysis techniques for ISI of original and repaired steam generator tubes, and will develop improved correlations between eddy current results and flaw morphology, leak rate, and failure pressure. The objective of the third task is to evaluate and experimentally validate models for predicting potential degradation modes, progression rates, leak/rupture behavior, failure pressures, and leak rates for original and repaired tubes under normal operating, accident, and severe accident conditions. The final task of this new program will be to synthesize the data, results, correlations, and models from the previous tasks to provide technical assessments and evaluations of current and emerging regulatory issues related to steam generator tube integrity. Work on this new program began late FY 95, and will continue for approximately 5 years. Interim results will be available during the course of the project.

Aging of Reactor Components

AGING RESEARCH

Aging affects all nuclear reactor structures, systems, and components. If aging degradation is not detected and corrected, it can increase risks to public health and safety. Failures of safety-related components have occurred in the past because of age-related degradation processes such as corrosion, embrittlement, wear, and fatigue. The objectives of aging research are to develop the technical bases for continuous safe operation of nuclear power plants; to define the operative aging mechanisms; to confirm the effectiveness of existing detection and mitigation methods; and to develop recommendations for new detection and mitigation methods. Aging research also provides information and technical bases useful in understanding the effects of aging on the safety functions of electrical and mechanical components.

During FY 95, preliminary or comprehensive aging assessments were completed, or final reports were issued, for the following safety-related components, systems, and associated special topics:

- Boiling Water Reactor High-Pressure Injection Systems (NUREG/CR-5462)
- Transformers (NUREG/CR-5753)
- Evaluation of Inspection, Surveillance, and Monitoring Methods for the Class 1E Power and Reactor Protection Systems (NUREG/CR-5719)
- Aging of Turbine Drives for Safety-Related Pumps in Nuclear Power Plants (NUREG/CR-5857)
- Detection of Pump Degradation (NUREG/CR-6089)
- Aging and Service Wear of Spring-Loaded Pressure Relief Valves Used in Safety-Related Systems at Nuclear Power Plants (NUREG/CR-6192)
- Effects of Aging and Service Wear on Main Steam Isolation Valves and Valve Operators (NUREG/CR-6246)
- Review of Monitoring and Diagnostic Methods for Motor-Operated Valves (ORNL/NRC/LTR-94/09)
- An Evaluation of PWR Safety Injection Accumulator Tank Discharge Check Valve Performance (ORNL/NRC/LTR-95/22)
- A Characterization of Pump and Pump Motor Degradation and Failure Experience in the Nuclear Power Industry (ORNL/NRC/LTR-95/24)
- Large Electric Motors (NUREG/CR-6336)
- Containment Isolation Function (NUREG/CR-6339)
- Electrical Surge Protective Devices (NUREG/CR-6340)
- Applications of Reliability Degradation Analysis (NUREG/CR-6415)

AGING EFFECTS ON MOTOR-OPERATED VALVE PERFORMANCE

In FY 95, research efforts continued to determine whether corrosion can affect the torque and thrust requirements of the internal parts of motor-operated valves (MOVs). This information is necessary to assess the performance of MOVs, particularly when they are needed to mitigate accident conditions. Friction experiments were conducted on samples of corroded materials typical of certain valves. The test results indicate that corrosion increases the thrust requirements. However, the results also indicate that, for the material tested, the effects of friction do not change after long periods in typical nuclear plant water environments. This latter finding is very important because motor-operator outputs may not need to be readjusted after long periods of service. Additional experiments were started in FY 95 to determine the effects of corrosion on other materials that are also typical in MOVs.

Information derived from this project is important to the NRC because it can be used to evaluate the capability of MOVs during the periodic verification phase outlined in Generic Letter (GL) 89–10, "Safety-Related Motor-Operated Valve Testing and Surveillance."

PRA-BASED METHODOLOGY FOR AGING ASSESSMENTS AND RANKING ASSIGNMENTS

In FY 95, work continued on evaluating the effects of component aging on plant risk, with specific focus on determining whether changes to inservice test (IST) intervals for check valves can influence risk. When coupled with ranking information, the results of this work will provide the regulatory staff with the technical basis for evaluating licensees' submittals for extending IST intervals on safety-related check valves. These types of engineering applications will also provide guidance to determine which dominant aging stressor(s) should be monitored and maintained during ISTs.

REPLACEMENT OF AGED INSTRUMENTATION AND CONTROL EQUIPMENT

During FY 95, work continued to assess the effect of replacing aged analog instrumentation and control (I&C) equipment with digital I&C equipment. This work was initiated in FY 94 to study the effects of operational and environmental stressors on the long-term performance of digital I&C equipment. Environmental stressors have been ranked according to their impact on the operability of digital I&C and plant risk. Specifically, the environmental stressors being considered in this work include humidity, temperature, vibration, smoke, radiation, and electromagnetic interference/radiofrequency interference (EMI/RFI). Because of limited information on the use of digital I&C equipment in nuclear power plants, the experience of military applications has been used in this work. So far, researchers have completed an example application showing that, for a PWR plant, lightning-related (EMI) events and humidity associated with high temperatures can impose significant risks. Additional evaluations will be made during FY 96.

AGING OF PASSIVE COMPONENTS

Earlier research established an approach for determining the aging effects of active components (pumps and valves) on plant risk. However, the aging effects of passive components, such as pipes and structures, could not be analyzed until a similar approach was completed in FY 95. Consistent with the approach for active components, the new approach uses available engineering information to estimate failure rates associated with the aging of passive components.

AGING EFFECTS ON TURBINE DRIVES

In 1995, the staff oversaw a study to examine the relationship between time-dependent degradation and current industry practices in the areas of maintenance, surveillance, and operation of steam turbine drives for safety-related pumps. These pumps are located in the auxiliary feedwater (AFW) system for PWRs, and in the reactor core isolation cooling (RCIC) and high-pressure coolant injection (HPCI) systems for BWRs. This research entailed examining failure data in the Nuclear Plant Reliability Data System (NPRDS), reviewing Licensee Event Reports, discussing problems with operating plant personnel, and conducting personal observations. The reported failure data were reviewed to determine the cause of the event and the method of discovery.

Based on the research results, attempts have been made to determine the predictability of failures and possible preventive measures that may be implemented. In addition, the study has shown that turbine pump drives have the capability to function in a reliable manner. Although 20 percent of the failures noted in 1991 were discovered under demand circumstances, the data evaluated between 1984 and 1991 generally indicate a decreasing trend in the number of failures detected during demand conditions. Also, the number of failures detected by programmatic methods increased 21 percent between 1984 and 1991 (from 48% to 69% of the total failures per year). (These methods include routine testing, walkdowns, and scheduled preventive maintenance.) This is a positive trend since it is preferable that failures be detected programmatically, rather than in demand situations. Experience and education appear to a major role in the observed trend.

AGING ASSESSMENT OF SURGE PROTECTIVE DEVICES

Devices commonly known as surge arresters and surge suppressors are used extensively in nuclear power plants to protect electrical power and control systems from overvoltages induced by lightning and switching transients. Their applications are important in minimizing initiating event frequencies associated with loss of offsite power and reactor trips. However, aging failures of these devices may result in the same events through a short circuit or overvoltage. Fifteen years of operating data were reviewed as part of this study. Short circuits were found to be the predominant failure mode, and, for some low-voltage suppressors, an open circuit was found to follow short circuits. Although the frequency and type of surveillance testing was found to vary widely among plants, suppressor testing on plant systems on which they are installed was generally not performed. Failure frequencies for lightning-induced loss of offsite power events were found to be low.

AGING ASSESSMENT OF LARGE ELECTRIC MOTORS

Electric motors, rated at more than 500 hp, operating at 4 kV or above, serve as the prime movers for various systems. Their applications include both safety-related and non-safety-related nuclear process and balance-of-plant systems. By virtue of their large size, these motors provide important roles in safe and reliable operation in nuclear plants. The review of large ac motor populations used in nuclear plants found that the squirrel cage induction motor was the most widely used. A review of the failure records contained in the licensee event report and NPRDS databases indicated that a significant portion of the reported failures were attributable to normal aging degradation of the motors, subcomponents, support equipment, and materials. The components most often contributing to large motor failure were bearings, stator windings and insulation, terminations and motor leads, shafts and couplings, and motor mounts. A review of plant maintenance programs indicated that these programs are based on manufacturer recommendations. The additional maintenance, monitoring, and surveillance received by Class 1E pump motors was found to result in improved operating performance.

EQUIPMENT OPERABILITY

For the past 6 years, the NRC has made significant progress in advancing the understanding of MOV technology. During FY 95, efforts continued to evaluate the effects of reduced voltages and elevated temperatures on the efficiency of motor-operators, which are essential to opening and closing MOVs. Current industry guidelines provide licensees with technical information for specifying the capabilities of their specific motor-operators. However, the guidelines may be overstated when these components are subjected to reduced voltage and elevated temperature conditions that are typical of some nuclear plant installations.

Results obtained from this research over the past 6 years are being used by the NRC to evaluate the Electric Power Research Institute (EPRI) report on MOVs. This 25-volume report presents the EPRI MOV research findings that the licensees will rely on in meeting the provisions of GL 89-10. The NRC evaluation will be completed early in FY 96.

Other research efforts under this program focused on updating the computer program, developed in a prior year, that provides the NRC regulatory staff with a user-friendly tool for performing difficult MOV calculations. The program now incorporates the current technical information resulting from the research efforts completed over the past 2 years. In addition, a computer program was developed to evaluate licensee MOV measurement data that are obtained directly from in situ tests. When completed in FY 96, this latter program will provide the regulatory staff with another tool for quickly assessing and resolving specific MOV problems that frequently arise during nuclear plant MOV inspections.

ENVIRONMENTAL QUALIFICATION RESEARCH

NRC staff activities related to license renewal, identified environmental qualification (EQ) of electric equipment as an area that required further review. A major concern related to whether the EQ requirements for older plants were adequate to support license renewal. Consequently, the staff concluded that differences in EQ requirements between older and newer plants constituted a potential generic issue that should be evaluated independent of license renewal.

As a first step in responding to an NRR task action plan on environmental qualification, RES held a public workshop to obtain technical input from industry representatives, as well as from experts in the field. This workshop determined that a great deal of work has already been performed that may be useful in fully or partially resolving some of the questions and concerns related to EQ. Therefore, a literature review was undertaken to obtain and evaluate significant past research, including both domestic and foreign work. The purpose of this review was to optimize this research program and avoid duplication of effort.

The literature review was completed in FY 95, and the results were documented in draft NUREG/CR-6384. This two-volume report includes summaries of the work reviewed, along with an analysis of the work in relation to the issues of interest in this program. A total of seven major issues were identified. These major issues were further broken down into 43 specific topics to be addressed, and each topic was analyzed separately to determine if it could be resolved by past work. As a result of the literature review, 18 of the 43 topics were resolved without the need for additional work. An additional six topics were found to be unresolved, but did not warrant further research in this program. The remaining 19 topics were found to be unresolved, and additional work was recommended in these areas. The results of the literature review will be incorporated into the test plans that govern the future work for this program.

Also in FY 95, the Idaho National Engineering Laboratory (INEL) performed an evaluation of the Class 1E power system, including transformers, and the reactor protection system (RPS). The results of the study indicated that the majority of the RPS components in the 1E power system are outside the scope of 10 CFR 50.49. RPS components that must demonstrate compliance with EQ requirements are electrical penetrations and some connections, cables, cable splices, and sensors/transmitters. With the exception of cables, these RPS components will be covered by the maintenance rule, which requires identification of performance or condition goals that define whether the equipment is capable of fulfilling its intended function.

SAFETY-RELATED PUMP DEGRADATION

In 1995, the NRC issued a Phase II Nuclear Plant Aging Research study report in which the staff evaluated various methods of detecting pump degradation that are currently employed in domestic and overseas nuclear facilities. This report also evaluated the pump testing criteria used in U.S. nuclear power plants, comparing them to features characteristic of advanced diagnostic programs and practices currently implemented by other major industries. In addition, since the working condition of the pump driver is crucial to pump operability, the report briefly reviewed new applications of motor diagnostics, highlighting recent developments in this expanding technology.

The Phase II report also discussed vibration spectral analysis, the most powerful diagnostic tool for the pump analyst. The routine collection and analysis of spectral data are superior to all other technologies in the ability to accurately detect numerous types and causes of pump degradation, such as misalignment, imbalance, looseness, and various bearing anomalies. Existing

ASME Code testing criteria do not require evaluation of pump vibration spectra, focusing instead on overall vibration amplitude. The mechanical information discernible from vibration amplitude analysis is limited, and such analyses failed to detect several cases of pump failure in the nuclear power industry (domestic and overseas) in their early stages.

Pump drivers also are not included in the current battery of required testing. Numerous operational problems thought to be caused by pump degradation were found to actually be the result of motor degradation. Recent advances in non-intrusive monitoring techniques have made motor diagnostics a viable technology for assessing motor operability. In particular, motor current or power analysis techniques can detect rotor bar degradation and ascertain ranges of hydraulically unstable operation for a particular pump and motor set. Damaging low-flow phenomena, such as cavitation and recirculation, may be avoidable if the pump is not operated in these unstable configurations. The concept of using motor current or power fluctuations as an indicator of pump hydraulic load stability is presented in the Phase II report.

Also in 1995, the NRC studied failures of pumps within several BWR and PWR plant systems reported to the NPRDS database. Each failure was assigned to one of three general detection method categories, those detected by regulatory/code required monitoring; those detected by nonmandatory, but routinely implemented monitoring (called plant programmatic); and those that were not detected by either of these types of programs. Failures were also classified by extent of degradation, affected area, and specific failure indicator. Considerable variation in failure rates was found among the examined categories of pumps. The emergency service water (ESW) pumps at PWR plants had a failure rate that was more than twice that of the overall PWR pump population (including ESW pumps), and about 2.7 times that of the other PWR pumps studied. At BWR plants, over 75 percent of all reported pump failures, and over 90 percent of the significant failures, occurred in the ESW system. Excluding ESW pumps, the rate of significant failures for pumps studied at PWR units was almost nine times that of BWR units.

MAIN STEAM ISOLATION VALVE DEGRADATION

In 1995, the NRC completed a study of historical main steam isolation valve (MSIV) failure data for both BWRs and PWRs. Failure records from the NPRDS database were reviewed and characterized. In the research report, the staff evaluated age-related degradation associated with MSIVs by focusing on MSIV failure modes, actuator failure modes, consequences of failure on plant operations, method of failure detection, and major stressors affecting both valve and valve operators.

For BWRs, the major MSIV failure modes affecting plant operations were valve seat leakage in excess of technical specification (TS) limits, valve failure to close within TS limits, and loss of MSIV closure capability. The BWR globe valves have the lowest relative failure rate of all MSIV types. One possible explanation for this is that these valves are subjected to much more maintenance because of failure to meet local leak rate test requirements.

The second lowest relative failure rate was associated with PWR globe valves, followed by check valves, and then gate valves. The relative failure rate for gate valves is the combined failure rate for both Type I and Type II gate valves. Type II gate valves, which use hydraulic pressure to open and pneumatics to close, are considered to be more reliable.

CHECK VALVES

Since operating experience indicates that check valve performance is becoming more predictable, the industry began seeking ways to extend the required test and inspection intervals. One avenue open to licensees is to submit relief requests, supported by data, to the NRC for consideration of whether longer intervals might be acceptable. In anticipation of such requests, the NRC started a research program at ORNL to investigate whether failure data, such as those used in the Nuclear Plant Aging Research program, could be used with confidence to identify valves for which the test and inspection intervals could be extended without compromising plant risk.

In 1995, the NRC undertook an analysis to evaluate check valves in an application that had been reported to have experienced good performance and reliability. The purpose of the analysis was to examine the potential for relaxation of current requirements for inspection and inservice testing for check valves. Accordingly, the staff identified 231 safety injection accumulator tank discharge check valves, and reviewed their performance history from 1984 through 1992. During this period, only 18 failures involving these valves were reported to the NPRDS database. Of these, only seven failures were characterized as being significant in terms of the extent of degradation (to the valve), and none of the reported failures would have affected the ability of any valve to perform its forward flow function in the event of its actuation during an accident.

Studies are continuing to determine whether advanced non-intrusive condition monitoring techniques can be used effectively to predict acceptable check valve performance, thus justifying longer test and inspection intervals.

CHILLERS

Chillers are required in nuclear plants to cool rooms, such as the control room, that contain equipment essential to plant safety. Without proper cooling, control room temperature can rise rapidly, leading to operator stress, and can cause electronic equipment to give erroneous readings or spurious alarms, and even begin to fail. The newer digital controls in the plants are more sensitive to high temperatures than the older analog controls. A Phase II Nuclear Plant Aging Research assessment of essential chillers was completed in FY 94. During FY 95, the NRC completed its review of the draft report, and developed a report entitled, "Aging Assessment of Essential HVAC Chillers Used in Nuclear Power Plants" (NUREG/CR-6043, Vol. 2). The review of operating experience indicated that chillers experience aging and failures associated with vibration, thermal cycling, chemical attack, and poor quality cooling water. Aging is accelerated by moisture, noncondensable gases, contamination, and corrosion of condenser and evaporator tubes. The principal reasons for chiller failures are lack of monitoring, human errors, and omission of scheduled maintenance. Evaluation of licensee event reports indicated that 38 percent of failures were related to aging, 55 percent were partially related to aging, and 7 percent were unassignable. About 25 percent of all failures were caused by human errors. A periodic maintenance program with effective monitoring will reduce and possibly eliminate chiller failures. Such programs and equipment are available, and some plants have successfully implemented such programs.

ISOLATION CONDENSER

The isolation condenser system is an emergency core cooling system designed to provide emergency cooling to selected BWRs when the reactor vessel becomes isolated from the turbine and main condenser by closure of the main steam isolation valves. The system removes residual and decay heat from the reactor, and depressurizes the reactor vessel in the event that the main condenser is not available as a heat sink. A preliminary aging assessment of BWR isolation condenser systems was completed in FY 94. In FY 95, the results were documented in the report, "Pre-Phase I Aging Assessment of the BWR Isolation Condenser" (PNL-10719), published in September 1995.

ACCUMULATORS

Accumulators are vessels attached to reactor coolant systems to provide (1) a limited backup source of stored fluid energy for hydraulic or pneumatic mechanical equipment, (2) a damping effect on pressure pulses in fluid systems, and (3) a volume of fluid to be passively injected into a fluid system. A preliminary aging assessment of BWR and PWR accumulators was completed in FY 94. In FY 95, "Pre-Phase I Aging Assessment of BWR and PWR Accumulators" (PNL-10720), published in September 1995, documented the findings that the accumulator subcomponents are experiencing aging degradation, the most prevalent effect being deterioration of the bladders. Other aging-related concerns include leakage of the gas precharge through the precharge valve, gasket failures on the safety injection tank manway covers, and degradation of the O-rings causing leakage of the fluid into the accumulators or leakage of the gas into the system.

NUCLEAR AIR-TREATMENT AND COOLING SYSTEM FANS

Fans are used to recirculate, supply, and exhaust large quantities of air in several nuclear power plant air-treatment (cleaning) and air-cooling systems. Failure of fans in these systems can impact both plant and public safety. A preliminary aging assessment of fans was conducted, completed, and reported in FY 95, and the "Preliminary Aging Assessment of Nuclear Air-Treatment and Cooling System Fans" (PNL-10617) was published in July 1995. The results suggest that aging degradation is an important factor in fan failure resulting from mechanical, thermal, and environmental stressors, including wear, fatigue, corrosion, erosion, and deterioration of belts and lubricants.

APPLICATIONS OF RELIABILITY DEGRADATION ANALYSIS

To understand aging degradation and the value of mitigating actions to control aging in standby safety system components that are periodically tested and maintained, a reliability degradation model was developed. This model, developed at the active component level (e.g., pumps, valves, compressors), uses maintenance and degradation data to analyze time trends in degradation and the implication of maintenance performed. Previous studies (NUREG/CR-5612 and -5967) defined the methods development associated with this new concept of reliability degradation modeling. This research describes and documents how methods of reliability degradation analysis can be incorporated into an application program to determine the reliability and risk effects of maintenance. It also provides the analysis steps for using reliability degradation modeling approaches to analyze component degradation and the effectiveness of maintenance.

ENGINEERING STANDARDS SUPPORT

The national standards program is coordinated by the American National Standards Institute (ANSI). ANSI provides procedural guidelines to help ensure that participation in the private sector standards development process is sufficiently broad based, and that input from individual interests are fairly considered. NRC participation in this process is consistent with Office of Management and Budget Circular A-119, dated October 26, 1993, which sets forth policies for Federal participation in the development and use of voluntary standards.

The NRC staff is particularly active on ASME code and standards writing committees because portions of the ASME Boiler and Pressure Vessel (B&PV) Code have, since 1971, been incorporated into 10 CFR 50.55a, "Codes and Standards," to establish requirements for the construction, inservice inspection, and inservice testing of nuclear power plant components. Section 50.55a is periodically amended to update the references to include more recent versions of the ASME B&PV Code. In addition, during FY 95, work continued on rulemaking that would, for the first time, incorporate by reference the new ASME Operations and Maintenance Code, which provides rules for inservice testing of pumps, valves, and snubbers. The proposed rulemaking would expedite implementation of certain new ASME B&PV Code requirements for qualification of personnel and equipment used to perform inservice nondestructive ultrasonic examinations on nuclear power plant components.

ASME Code Cases provide alternatives to the criteria specified in the ASME B&PV Code. Regulatory Guides 1.84, 1.85, and 1.147 identify those Code Cases that the NRC has found to be acceptable for design and fabrication, materials, and inservice inspection, respectively. These regulatory guides, which are updated on a regular basis, were revised and issued in the first quarter of FY 95 (see Appendix 6).

License Renewal Regulatory Standards

A final rule (10 CFR Part 51) concerning the environmental review for renewal of a nuclear power plant operating license is nearly completed.

When final, this rule will facilitate relicensing and save resources by providing for generic resolution of a number of environmental impacts of relicensing, including waste disposal. In addition, this rule will eliminate NRC evaluation of the need for generating capacity, and will simplify the approach to considering alternative sources of generating capacity. The final rule and supporting generic environmental impact statement is expected to be published in FY 96.

REACTOR SAFETY ASSESSMENT AND REGULATION DEVELOPMENT

Plant Performance

HIGH-BURNUP FUEL BEHAVIOR

By the early 1990s, it had become clear that burnups in commercial power reactors were exceeding the burnup range for validating the NRC's fuel behavior computer codes and related fuel damage criteria. The following figure shows the burnup distribution of fuel in U.S. power reactors as of mid-1994.

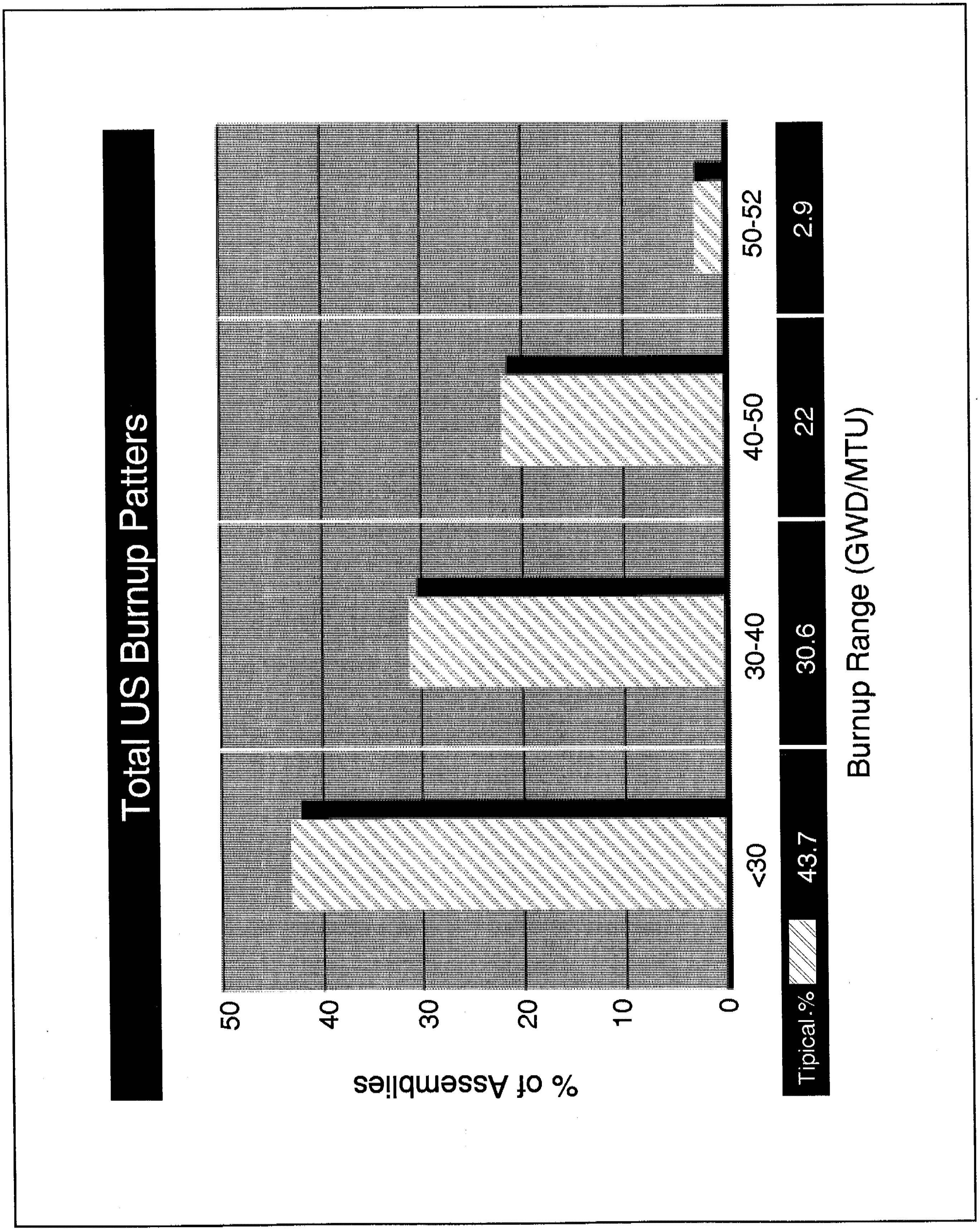
Fuel suppliers were providing high-burnup performance data to support the licensing of higher-burnup fuel designs, but the NRC's independent analytic capability had not been updated. In light of these higher burnups and emerging new data, the NRC decided to update (1) fuel performance models (e.g., UO_2 thermal conductivity, fission gas release) used in NRC computer codes, (2) fuel performance codes (particularly the FRAPCON code used for auditing regulatory analyses), and (3) fuel damage regulatory criteria (including the thresholds and limits used for reactivity transients).

Initially, the NRC placed contracts with three laboratories to respond to this need. One focused on phenomenological models, one on modifying computer codes, and the third on plant transient calculations to estimate the impact on reactor safety. Modeling and computer code modifications were completed in 1995 to provide a fast-running FRAPCON code that is capable of analyzing fuel with burnups in the range of 60–70 GWd/t. Work has been initiated on code validation, which will be followed by a peer review. The plant transient calculations were also completed, showing that moderate energies can be deposited in high-burnup fuel during reactivity transients. This result confirms the need to modify the fuel damage criteria used for regulatory analysis.

During 1994, the NRC, through its international cooperative safety arrangements, became aware of new test results on high-burnup fuel that were being obtained in France, Japan, and Russia. Since no such testing is being performed in the United States, efforts were made to enter into specific cooperative arrangements with foreign laboratories to obtain these data. Agreements providing access to the data from these three countries were signed in 1995. Invitations were extended in 1994 and 1995 to these laboratories to present preliminary information at the NRC's annual Water Reactor Safety Information Meeting, and such presentations were made. More definitive results were obtained in 1995, and these test results are being used to assess and modify fuel damage criteria used by the NRC in licensing for reactivity transients. An additional effort was started to examine the need for modification of fuel damage criteria used in assessing other accidents in licensing safety analyses.

SAFETY CODE DEVELOPMENT AND MAINTENANCE

It is generally not feasible to assess the safety performance of reactor and plant systems with tests in full-scale facilities, and an understanding of the thermal-hydraulic behavior of these plants must be established using computer codes. Most of the NRC's independent analyses for the AP600 and the simplified boiling water reactor (SBWR) will be done with the RELAP code, which is upgraded for application to these designs. Before versions of the NRC codes are used for this purpose, or released for use by others, they undergo developmental assessment and peer review. Revised documentation is also provided for these improved codes. The upgraded version of RELAP for use on the new passive plant designs was released in October 1995.


Total US Burnup Patters
% of Assemblies
50
40
30
20
10
0
<30
30-40
40-50
50-52
Tipical %
43.7
30.6
22
2.9
Burnup Range (GWD/MTU)

As part of the code maintenance activities for RELAP and for the TRAC code (both PWR and BWR versions), the NRC conducts an international Code Applications and Maintenance Program (CAMP). There are now 19 member countries in CAMP, each of which participates in semiannual meetings and makes cash contributions to supplement the NRC code development and assessment studies, recommend code improvements, and make other technical contributions to assist in the development and assessment of the codes.

Control, Instrumentation, and Human Factors Assessment

About half of all safety-related events reported at nuclear power plants continue to involve human performance. Methods and data are needed to identify, systematically set priorities for, and suggest solutions to human performance issues during operation and maintenance activities at nuclear facilities. To best account for human performance issues, the human must be viewed as part of a total system, which also includes the instrumentation and control hardware and software that drive the controls, as well as displays that allow the human to monitor and operate within the larger plant system.

The control, instrumentation, and human performance assessment research program has three objectives:

- Broaden the NRC's understanding of human performance, and identify causes of human error
- Accurately measure the total control, instrumentation, and human system performance for enhancing safer operations and precluding critical errors
- Develop the technical basis for requirements, recommendations, and guidance related to total system performance

Additional human factors research focuses on systems performance of advanced reactors and materials licensee performance. The human factors research for these activities is reported under the related headings of this chapter.

Elements of the control, instrumentation, and human factors regulatory research program are (1) personnel performance, (2) human-system interfaces, and (3) reliability assessment.

The purpose of the personnel performance element is to develop enhanced methods for collecting and managing personnel performance data, and to improve understanding of the effects of personnel performance on the safety of nuclear operations and maintenance. In addition, personnel performance research broadens the understanding of such factors as staffing, qualifications, and training, all of which influence human performance in nuclear systems. Research in this area will develop information necessary to reduce any negative impact these factors might have on nuclear safety.

Research in the human-system interfaces element provides the technical basis for guidelines and criteria to evaluate the interface between the system and the human user from the perspective of safe operations and maintenance.

Reliability assessment includes work on data acquisition and management systems and the human reliability analysis/probabilistic risk assessment (HRA/PRA) methods and application. The reliability assessment element includes multidisciplinary research that integrates human, organizational, and hardware considerations for evaluating reliability and risk in NRC licensing, inspection, and regulatory decisions.

Personnel Performance

During FY 95 work continued on a study to establish a technical basis for minimum shift staffing for both control room crews and operational support staff outside the control room at nuclear power plants, based on workload and task allocation. Technical letter reports were completed for an analysis of literature, incident, and investigation reports related to staffing, and on a survey of a sample of plants regarding their staffing practices and activities for operational staff outside the control room. These reports were used as the basis for NRC Information Notice 95-48, "Results of Shift Staffing Study."

Research continued on communication errors in nuclear power plant events to characterize the root cause(s) of these errors, to identify potential corrective actions for each category of communication error, and to develop proposed review criteria and guidelines. In addition, a study was completed to determine whether links exist between operator effectiveness and the simulator training received by operators at multi-unit stations, compared to simulator training at single-unit stations.

A technical letter report was completed on a study to evaluate the use of a circadian lighting system (bright lighting system) to improve the night shift alertness and performance of NRC headquarters operations officers. The results of the research supported the continued use of the system in the new operations center. NUREG/CR-6046, "Alertness, Performance, and Off-Duty Sleep on 8-hr and 12-hr Night Shifts in a Simulated Continuous Operations Control Room Setting," was published. This research confirmed that a 12-hour shift regimen did not have adverse affects on operator performance when compared with an 8-hour shift.

NUREG/CR-6159, "Using Micro Saint to Predict Performance in a Nuclear Power Plant Control Room," was published. This report describes the use of task-network modeling to develop a computer simulation of operator performance when using computerized and paper-based procedures.

Human-System Interfaces

HUMAN FACTORS

Revision 1 to NUREG-0700, "Human-System Interface Design Review Guideline," was issued for public comment in February 1995, and several comments were received, reviewed, and resolved. This revision incorporates and integrates review guidance previously developed in other RES projects and published as NUREG/CR-5908, "Advanced Human-System Interface Design Review Guideline" (July 1994); NUREG/CR-6146, "Local Control Stations: Human Engineering Issues and Insights" (September 1994); NUREG/CR-6105, "Human Factors Engineering Guidance for the Review of Advanced Alarm Systems" (September 1994); and NUREG-0700, "Guidelines for Control Room Design Reviews" (September 1981).

Work continued on a project entitled "Advanced Alarm System Review Criteria," intended to develop guidance for reviewing advanced digital alarm systems. After refining the research study design, the staff visited candidate study sites, and selected the HAMMLAB at the Halden Reactor Project as the site from which data will be collected. A bilateral agreement will be prepared to allow the conduct of these experiments.

A new effort to evaluate the effects on human performance of mixing analog and digital displays in control stations was initiated during FY 95. If a safety issue is identified, review guidance will be developed.

SOFTWARE

NUREG/CR-6316, "Guidelines for the Verification and Validation of Expert Systems Software and Conventional Software," was published in eight comprehensive volumes. These volumes provide detailed coverage of methods for assessing both conventional and expert system software, certifying knowledge bases, validating scenarios, and establishing procedural guidelines.

NUREG/CR-6293, "Verification and Validation Guidelines for High-Integrity Systems," was also completed, and work is continuing to develop tools to assess software used in safety systems. Such tools would be used to identify undesirable language characteristics that could affect safety. The languages under investigation were selected based on the probability that they might be used in safety system applications. The undesirable characteristics will be ranked for their potential impact on safety. The final report will be used during the software audit to evaluate the submitted product.

The development of a CASE tool to provide NRC auditors with the capability to investigate the amount of diversity in safety system software and to locate common code, or non-diverse software, between two or more safety systems and their functions continues. A CASE tool developed in earlier phases of this effort is being enhanced to improve the user interface.

NUREG/CR-6263, "High-Integrity Software for Nuclear Power Plants: Candidate Guidelines, Technical Basis, and Research Needs," was published in June 1995. This report discusses the results of a study performed to examine the technical basis for guidelines that might be used in reviewing and evaluating nuclear power plant safety system software. In areas where the potential guidelines were judged to have an inadequate technical basis, potential research needs were identified. The report also discusses the lifecycle framework, development of framework subelements, development of candidate guidelines, and evaluation of the technical basis for the candidate guidelines.

HARDWARE

Confirmatory research is under way to develop the technical basis for test methods and acceptance criteria to address electromagnetic and radiofrequency interference (EMI/RFI) and power surge issues for instrumentation and control (I&C) systems. The electromagnetic environment in a nuclear power plant is virtually unknown; thus, electromagnetic measurement data are being collected at various plant sites. These data will be employed to profile the electromagnetic environment at nuclear power plants and establish EMI/RFI-related acceptance criteria. In the meantime, interim acceptance criteria have been developed for use until permanent criteria based on plant measurements can be established. These criteria are described in NUREG/CR-6304, "Interim Electromagnetic Operating Envelopes for Safety-Related I&C Systems in Nuclear Power Plants."

Environmental compatibility studies are being conducted to identify failure modes and system vulnerabilities that are unique to advanced digital systems. The digital components under investigation include fiber optic network interface systems, serial communication links (optical fiber and copper transmission), analog-to-digital converters, multiplexers, and microprocessor-based trip systems. The environmental stressors applied in the investigation are EMI/RFI, temperature, humidity, and smoke exposure.

Research is also being conducted to assess the impact of smoke on digital I&C hardware. This research includes evaluating the means by which smoke may damage this hardware, as well as some possible methods to protect the hardware from smoke damage.

TOTAL SYSTEM

Human-system interface research includes NRC participation in the Halden Reactor Project, a multifaceted program that includes verification and validation of digital systems, man-machine interaction, and surveillance and support systems for advanced control rooms. Information was developed in the following areas:

- methods and tools for developing, and verifying and validating safety-related software
- experience with development and quality assurance of software systems at the Halden Reactor Project
- methods for better assessing human error in Halden research

A National Research Council effort was initiated during FY 95 to define the important safety and reliability issues that arise from the introduction of digital I&C technology in nuclear power plant operations. This research will also identify criteria for reviewing and accepting digital I&C technology. In addition the research will provide a basis for characterizing and evaluating alternative licensing approaches, and for recommending guidelines for the regulation of digital instrumentation and controls. The definition of issues was completed in the first phase of the effort.

Reliability Assessment

During FY 95, the NRC published NUREG/CR-6002, "Risk-Based Maintenance Modeling," which describes risk methods for setting maintenance priorities and quantifying maintenance effectiveness.

In addition, research was completed to analyze information from the simulator portion of the NRC-administered operator requalification examinations. Estimates from this source were compared with human error probabilities derived from the Accident Sequence Evaluation Program.

Reactor Risk Analysis

Probabilistic risk analysis (PRA) is used by the NRC staff to support the resolution of a wide spectrum of reactor regulatory issues. In 1995, work in this area consisted of both specific issue-oriented projects, as well as more general work, including development and demonstration of risk analysis methods and development of risk-related training and guidance for the NRC staff. The following paragraphs describe the progress in these projects during FY 95.

ANALYSIS OF LOW-POWER AND SHUTDOWN ACCIDENT RISKS

As a result of the Chernobyl accident and other precursor events, an extensive, two-phased project was begun in 1989 to examine the potential risks of accidents initiated during low-power and shutdown modes of operation. Phase 1, completed at the end of 1991, was a coarse screening analysis of all operational modes (other than full power) for one BWR and one PWR. Based on the Phase 1 results, the Phase 2 effort concentrated on a specific operating state for each of the two plants, selecting the potentially highest risk operating state for further detailed analysis. In addition to a Level 1 PRA, a simplified analysis (Levels 2 and 3) of potential in-plant and offsite accident progression and health consequences of such accidents was performed. The complete results of Phase 2 were published as NUREG/CR-6143 for the BWR, and NUREG/CR-6144 for the PWR. The six-volume set for each plant was completed during 1995 with the publishing of a comprehensive summary (Volume 1) and the Level 2 and 3 analyses (Volume 6).

SAPHIRE COMPUTER TOOLS

The set of System Analysis Programs for Hands-On Integrated Reliability Evaluation (SAPHIRE) underwent numerous improvements leading to version 5.0 released during FY 94. This set of programs used in performing PRAs permits an analyst to achieve many of the functions necessary to create, quantify, and evaluate the accident risks of nuclear power plants. The programs were used extensively to perform the low-power and shutdown risk analyses previously described, and are currently being used to analyze operating plants and evaluate the safety aspects of nuclear plant designs.

GEM, a new SAPHIRE program has been developed specifically for the Accident Sequence Precursor (ASP) program, and is being used in event assessment applications by the Office for Analysis and Evaluation of Operational Data (AEOD) and the Office of Nuclear Reactor Regulation (NRR). The primary use of GEM is to quantitatively determine if either the occurrence of an existing event or the operating plant condition adversely impacts safety.

During 1995, many of the 75 plant models used in the ASP program were improved. These train-level models, representing the 110 operating plants, were modified to include more plant-specific features needed for ASP analyses. In addition, many of the full PRA data loads in the SAPHIRE database were modified to use the new features added to the code.

Also during 1995, the final two reports documenting SAPHIRE version 5.0 were completed, resulting in a 10-volume set published as NUREG/CR-6116. Training courses on using SAPHIRE continued to be provided to the NRC staff, their contractors, and a number of foreign regulatory agencies who have established specific cooperative agreements with the NRC.

OFFSITE CONSEQUENCE UNCERTAINTY ANALYSIS

The NRC has completed a pilot probabilistic consequence uncertainty analysis in atmospheric dispersion and deposition in cooperation with the Commission of the European Communities (CEC). A formal expert judgment elicitation and evaluation process was used to obtain the probability distributions needed. The methods used in, and results and findings of, this pilot study were published in January 1995 in a three-volume joint report, NUREG/CR-6244. The CEC has taken the lead, with the NRC providing the necessary technical support, in using the methods formulated during the joint pilot study to obtain quantitative information in a consequence analysis regarding the dose received from deposited material, and the ingestion pathway. The NRC and CEC are currently planning for the next and final set of joint formal expert judgement elicitation exercises in the areas of radiation health effects and dosimetry. This final set of exercises is scheduled for completion in 1996. The NRC and CEC will also use the same jointly established process to obtain other needed information in performing independent probabilistic consequence uncertainty analyses.

HUMAN RELIABILITY ANALYSIS

As part of an NRC-sponsored program evolving from an assessment of human reliability issues in low-power and shutdown operations in nuclear power plants, an improved approach to human reliability analysis (HRA) is currently being developed. This approach is intended to be fully integrated with PRA methodology to improve assessment of the human contribution to plant risk, both during low-power, shutdown and at-power operations.

In FY 92 and 93, a Human Action Classification Scheme for categorizing human actions and associated influences in actual low-power and shutdown events was developed and implemented. These accomplishments were documented in NUREG/CR-6093, "An Analysis of Operational Experience During Low Power and Shutdown and a Plan for Addressing Human Reliability Assessment Issues."

During FY 93 and 94, work continued on developing a multidisciplinary framework for integrating HRA with PRA, and characterizing errors of commission (EOCs) and human dependencies, including general guidance for their identification and representation in PRAs. Work also continued on recognizing database improvement needs, including better characterization of human actions and their associated performance context (e.g., plant conditions, performance shaping factors, and dependencies), as well as better description of an event timeline. These accomplishments are currently being documented.

This framework provided the capability to identify factors that influence humans to perform unsafe actions, and thereby created a systematic basis for evaluating the significance and characteristics of EOCs and dependency from operational events. Thus, the framework enabled important aspects of EOCs and dependency to be considered in the development of an improved HRA methodology, and clarified the requirements for their more realistic inclusion in PRA models. By providing a single language and common structure for relating the different dimensions of human-system interactions, the framework demonstrated that the evaluations of EOCs and dependencies is both tractable and tenable. Considering the importance of these issues in nuclear power plant safety, this change is an important advance. These EOC and dependency capabilities will be refined and expanded upon in subsequent tasks pertaining to the development phase.

The primary product of the work during FY 95 and 96 will be a working HRA quantification process involving the following methods:

- how to identify and incorporate human failure events in the logic models used in PRAs
- what information is required for assigning probabilities to these failure events
- how this information is used to estimate the probabilities
- how the probabilities are incorporated into the PRA quantification process

The final phase of the project during FY 96 will demonstrate the usefulness and acceptability of the developed methodology's implementation guidelines, using selected parts of a full-power PRA.

Severe Accident Analysis

In order 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. The overall goals of the research are three-fold. First, the research will develop technical bases for assessing containment performance over the range of risk-significant core-melt events. Second, the research will improve understanding of the range of phenomena expected during severe reactor accidents. Finally, the research will yield improved methods for assessing fission product behavior. With these data, the NRC will be better able to confirm the adequacy of its requirements for the design and reliability of the systems that may be used to mitigate the consequences of severe accidents.

HIGH-PRESSURE MELT EJECTION—DIRECT CONTAINMENT HEATING

In certain reactor accidents, the reactor core can degrade while the reactor coolant system remains pressurized. In such instances a molten core left uncooled will slump and relocate to the bottom of the reactor vessel. If the reactor vessel fails, the core melt will be ejected into the containment cavity under pressure. If the material should subsequently be ejected from the reactor cavity into the surrounding containment volumes in the form of fine particles, thermal energy can quickly be transferred to the containment atmosphere, pressurizing it. The metallic components of the ejected core debris could further oxidize in air or in steam, and could generate a large quantity of hydrogen and chemical energy that would further pressurize the containment. This process is called direct containment heating (DCH).

As part of the DCH issue resolution plan for U.S. PWRs, completed studies encompass 41 Westinghouse nuclear power plants with large dry or subatmospheric containments. The DCH issue resolution for the Zion (Illinois) nuclear power plant was specifically documented in NUREG/CR-6075 and its Supplement 1, "The Probability of Containment Failure by Direct Containment Heating in Zion," December 1994; and for the Surry (Virginia) plant in NUREG/CR-6109, "The Probability of Containment Failure by Direct Containment Heating in Surry," May 1995. The more generic report, "Resolution of the Direct Containment Heating Issue for All Westinghouse Plants with Large Dry Containments or Subatmospheric Containments," has undergone peer review and will be published in FY 96.

The culmination of extensive experimental and analytical research has produced the finding that, for those nuclear power plants studied, DCH loads are lower than once estimated, and consequently they pose no significant threat to the containment during a severe accident. This conclusion is based mainly on the inherent design characteristics of many U.S. reactors. Future efforts will seek to extrapolate these findings to the Westinghouse nuclear power plants with ice condenser containments, as well as the Combustion Engineering and Babcock & Wilcox nuclear power plants.

HYDROGEN COMBUSTION

Significant information exists on hydrogen combustion to assess the possible threat to containment and safety-related equipment. However, some ancillary issues remain 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.

The largest current NRC program in this area comes out of a joint agreement between the NRC and the Ministry of International Trade and Industry of Japan, managed by the Nuclear Power Engineering Corporation (NUPEC). Under the agreement, a high-temperature hydrogen combustion program related to high-speed combustion modes (i.e., detonation and deflagration to detonation transition) is under way at the Brookhaven National Laboratory. A small-scale developmental apparatus was constructed, and has provided preliminary experimental data and solutions to a number of design and operational problems for a larger-scale high-temperature combustion facility (HTCF). The construction of the HTCF was completed in FY 94, and intrinsic detonability and deflagration-to-detonation transition experiments at high temperature were completed in FY 95. As a result of the cooperative agreement, the NRC has access to the ongoing hydrogen research in Japan managed by NUPEC. This research provides a greatly expanded and improved database for validating analytical tools.

A hydrogen research program is also under way to investigate diffusion flame behavior in low-speed hydrogen combustion. Experiments were performed in a small-scale facility to examine the influence of ignition source strength on the lean flammability limits of hydrogen-air mixtures at temperatures of 300 K and pressure of one bar. The facility has been redesigned to eliminate diffusion flame interference with the walls. Construction has been completed, and shakedown tests are under way. The results will be used to help resolve several outstanding issues in severe accident behavior, such as high-temperature combustion phenomena and detonation initiation by high-temperature steam-hydrogen-particle jets.

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 thermally and chemically interact with structural concrete. The major areas of concern associated with melt-concrete interactions during a severe accident are the penetration of the basemat and failure of the liner, the generation of radioactive aerosols and gases, including combustible gases, and the overpressurization of the containment.

Early experiments on melt-concrete interactions were conducted without an overlying water pool. More recent experiments on melt-concrete interactions, otherwise known as debris coolability experiments, were conducted in the presence of an overlying water pool. It has been postulated that adding water to cover the core debris will effectively quench the molten core debris and terminate melt-concrete interactions. The currently active experimental research on debris coolability, called the Melt Attack and Coolability Experiments (MACE) program, was developed as an extension of the Advanced Containment Experiments (ACE) program under the sponsorship of the NRC, the Electric Power Research Institute (EPRI), and other, mostly governmental, agencies in several countries. The MACE program is intended to determine the ability of water to cool prototypic ex-vessel core debris of urania-zirconia composition. Five tests, including a scoping test, were conducted under the MACE program during 1992 through 1995. A sixth test is currently planned for spring 1996. 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, taking into account the timing of the postulated releases and other information needed to calculate offsite consequences of a hypothetical severe accident. NRC research in this area is reflected in the updated version of TID-14844, which has been used for three decades in connection with plant siting assessments. An extensive review of the updated TID-14844 has been completed, and the final NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," was published in February 1995. The revised source terms are currently being used in the AP600 design. In addition, the NRC and the utilities are evaluating their use for current reactor licensing applications.

The NRC has also entered into an agreement with the Commissariat a l'Énergie Atomique of France (CEA) to participate in the PHEBUS-FP (fission product) program sponsored by the CEA and the Commission of the European Communities. This program is aimed at studying—under sufficiently prototypical conditions in an inpile facility—those phenomena governing the transport, retention, and chemistry of fission products under severe accident conditions in light-water reactors (LWRs). Phenomena to be studied are those occurring in the core, the primary reactor coolant circuit, and the containment.

This agreement is of significant benefit to the NRC because, at a relatively modest cost, the NRC can participate in the PHEBUS-FP project over its lifetime. The NRC will be able to obtain integral experimental data to further validate its analytical models for fission product transport in the reactor coolant system and containment and for iodine chemistry in the containment. The experimental data from PHEBUS-FP will be used to confirm the conclusions reached from the NRC's completed fission product research program.

The first PHEBUS-FP test, FPT-0, was successfully conducted in December 1993. The analysis and interpretation of FPT-0 is continuing; lessons learned from FPT-0 are being taken into account in planning for the next test, FPT-1, scheduled for early 1996.

CORE-MELT PROGRESSION

"In-vessel core-melt progression" describes the state of an LWR core from a core being uncovered up to reactor vessel melt-through in unrecovered accidents, or through stabilization of the temperatures and core geometry in accidents recovered by core reflooding. Melt progression provides the initial conditions for assessing the loads that may threaten the integrity of the reactor vessel and the containment. Significant results of melt progression are the melt mass, composition, temperature (superheat), and rate of release of the melt from the core (and later from the reactor vessel if vessel failure occurs). Melt progression research also provides information about the in-vessel hydrogen generation, the conditions that govern the in-vessel release of fission products and aerosols and their transport and retention in the primary system, and the core conditions for assessing accident management strategies.

In FY 95, major accomplishments were achieved in preparing the XR2-1 test:

- design, development, and testing of a radiant cavity melt delivery system and wire-feeding machinery that delivers wires at controlled rates into the radiant cavity melter system
- development and refinement of a real-time x-ray imaging system
- fabrication and assembly of the XR2-1 test section
- development of a process to control the needed thickness of oxide layers on the XR2-1 Zircaloy surfaces
- successful demonstration of a near full-scale melt delivery system

Following this demonstration, the XR2-1 test is scheduled to be run in early FY 96.

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. A molten pool then forms and can impose a significant heat load on the reactor vessel lower head. When this molten pool forms on the lower head, a solid crust of material forms around the periphery of the pool, but internal heat generation resulting from radioactive decay of fission products ensures that most of the debris remains molten and, in fact, undergoes significant internal natural convection in the pool.

Knowledge of in-vessel and ex-vessel heat transfer phenomena to the lower head is needed to assess the ability of the reactor pressure vessel to maintain its integrity during a severe accident. Detailed understanding of the natural convection process provides information on the local heat flux distribution around the inside surface of the crust. This distribution, in conjunction with the thermal boundary conditions imposed on the outer crust surface, determines the fraction of the total heat dissipation that is transferred through the upper crust to the inside of the reactor vessel by radiative heat exchange, and the fraction that must be conducted through the wall of the reactor vessel lower head.

In August 1994, the NRC, in cooperation with 13 countries and under the auspices of the Organization for Economic Cooperation and Development's (OECD) Nuclear Energy Agency (NEA), 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 OECD RASPLAV, is being performed at the Russian Research Center. During FY 95, tests were carried out to demonstrate the proposed heating methods (i.e., side wall heating and direct electrical heating) of the corium for conducting the integral experiments. Code development has been under way for pre- and post-test calculations, and measurements of thermophysical properties of various corium compositions have been performed.

In order to remove the fraction of heat conducted through the vessel lower head, the concept of flooding the reactor cavity to externally cool the reactor pressure vessel lower head and prevent its failure is being investigated. One major uncertainty involved in the external cooling of the lower head is the critical heat flux distribution on the bottom curved surface of the reactor vessel. An experimental program is 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. The results of this study include data on the critical heat flux (CHF) and the development of an analytical model for the CHF on downward facing surfaces. A series of transient and steady-state experiments have been carried out to measure CHF on a downward-facing hemispherical surface. In addition, model development is under way to predict CHF for the hemispherical surface. Further experiments and extension of the CHF model to toroidal-shaped surfaces will be performed in FY 96.

An experimental program is under development at the 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 loads as a result of a core meltdown accident. During FY 95, the scaling, design, and construction of the experimental test set-up were carried out. In FY 96, experiments will be performed on the scaled lower head test sections, both with and without lower head tube penetrations.

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 non-explosive breakup and quenching of melt, with possible formation of a coolable debris bed or energetic steam explosions. These explosions could challenge reactor vessel and containment integrity, as well as create a leakage path for radiological releases. It is in this context that the FCI is considered a severe accident issue of potential risk significance, and its resolution is sought in the framework of severe accident closure.

The Reactor Safety Study (WASH-1400) quantified the failure mode induced by in-vessel steam explosion-generated missiles (identified in the WASH-1400 study as the alpha-mode failure). Since that time, significant progress has been made in understanding the processes and parameters that effectively limit the potential of missile-induced failure by an in-vessel steam explosion. Most recently, in June 1995, the NRC convened a second Steam Explosion Review Group (SERG-2) workshop during which a panel of international experts reviewed the current understanding of the complete spectrum of FCI issues. (The first Steam Explosion Review Group (SERG-1) workshop took place in 1985.) The NRC is currently preparing a report (NUREG-1529) summarizing the deliberations of the experts on the alpha mode and other FCI issues; this report will be published in FY 96.

The SERG-2 experts generally concluded that the alpha-mode failure issue was resolved or "essentially" resolved, meaning that this mode of failure is of very low probability and of little or no significance to the overall risk in a nuclear power plant. The SERG-2 experts also noted that, with the essential resolution of the alpha-mode failure issue, the emphasis of FCI research shifted to other issues. These issues include the mild quenching of core melt during non-explosive FCI, and the shock loading of lower head and ex-vessel structures arising from explosive localized FCI. These issues are relevant with regard to determining certain accident management strategies for operating reactors, and the adequacy of certain passive system design features of advanced light-water reactors (ALWRs).

In 1995, the NRC renewed its technical exchange arrangement for 4 years with the Safety Technology Institute of the Joint Research Center (JRC) of the Commission of the European Communities at Ispra, Italy. The renewed arrangement will continue the melt quenching experiments at the FARO facility, and the steam explosion experiments at the KROTOS facility, both at Ispra. In the FARO facility, large masses (typically, up to 250 kg) of reactor prototypic melt are generated and poured into a water pool of varying depths at a range of system pressures. So far, five successful FARO tests have been carried out, and the results showed generally consistent melt quenching with no steam explosion. The next FARO test is planned in FY 96. In the KROTOS facility, small masses (typically, up to 4 kg) of both prototypic and simulant melts are generated and poured into a water pool of varying depths at a low system pressure (0.1 MPa) to study steam explosion potential and energetics. KROTOS experiments with prototypic melt (UO_2-ZrO_2) produced no steam explosion, even under conditions of high water subcooling, high melt superheat, or presence of a trigger. On the other hand, more recent KROTOS experiments, all performed in 1995 with a simulant melt, produced a steam explosion in every case, with or without a trigger. These experiments indicate that the explosion potential of a melt may be influenced by material behavior or properties.

The ongoing FCI experimental program at the University of Wisconsin is examining the effects of various fuel and coolant parameters on explosion energetics. Experiments performed in 1994 and 1995 with tin simulant considered the effects of melt superheat, water subcooling, water viscosity, system pressure, fuel/coolant mass ratio (alternatively, volume ratio), and the presence of a trigger on energetics. Experiments in 1995 concentrated on the effect of the fuel-to-coolant mass ratio (volume ratio) on energetics. Among those selected, this parameter was found to be the one that had the most influence on the energetics.

An experimental program was initiated in 1994 at the Argonne National Laboratory to determine whether chemical augmentation of the energetics can occur in Zircaloy-water and Zr-ZrO_2-water steam explosions. Such chemical augmentation important in assessing the shock loading of the lower head and ex-vessel support structures, and was observed in an aluminum-water system in connection with the new production reactor (NPR) safety research. Several scoping tests with 200 grams of molten Zircaloy interacting with a 1-meter-deep water pool were performed in 1995 with the preliminary results showing no measurable augmentation. Additional experiments are planned in FY 96 with a larger quantity (1 kg) of both Zircaloy-water and Zr-ZrO_2-water systems to investigate their augmentation potential.

SEVERE ACCIDENT CODES

Because of the difficulty in performing prototypic experiments for a variety of severe accident scenarios, substantial reliance must be placed on the development, verification, and validation of system-level computer codes for analyzing severe accident phenomena. Several system-level codes (MELCOR, SCDAP/RELAP5, CONTAIN) have been developed for various stages in severe accidents, for both in-vessel and ex-vessel structures, and both BWRs and PWRs. Additional codes (such as VICTORIA) are being developed and maintained to perform specific functions that require more detailed modeling than the system-level codes.

MELCOR is an integrated computer code that models the progression of severe accidents in LWR power plants. The code can be used to evaluate the progression of severe accidents from initiation through containment failure. It can also be used to estimate severe accident source terms, as well as their sensitivities and uncertainties, in a variety of applications. The NRC has been supporting the MELCOR development and assessment program for a number of years. The focus of the development efforts in FY 95 was to model downward and radial flows in the reactor core, the interactions of boron carbide with steam, and incorporation of the Larson-Miller vessel failure criterion. In addition, the code was improved to model the scrubbing of fission product vapors through a suppression pool by incorporating into MELCOR the latest version of the SPARC code. New models are under development for fission product chemical reactions with surfaces and in aqueous solutions. A significant effort was made to develop new or revised models to perform calculations for a potential severe accident involving the AP600 plant design, which includes several features not found in current operating nuclear power plants. Another byproduct of this effort was the incorporation of code enhancements that resulted in substantial improvements in code running time.

During FY 95, NRC contractors continued to assess MELCOR by applying the code to the analyses of various plant accident transients. A large number of code assessments were completed in FY 95 by several U.S. and international user organizations. Significant assessment efforts include exploration of improved treatment of Zircaloy oxidation during core damage, and careful comparison of in-vessel accident progression results as predicted by MELCOR to results predicted by the SCDAP/RELAP5 code.

Also during FY 95, the MELCOR Cooperative Assessment Program, an international forum with membership from 19 countries, continued the ongoing successful exchange of information on the applicability, limitations, and operational experiences of MELCOR. Results of 18 highly useful assessment and application calculations with MELCOR were presented and discussed at the annual meeting in spring 1995.

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. Major accomplishments in FY 95 include completing SCDAP/RELAP5/MOD3.1 full-plant calculations for resolving the direct containment heating issue, as well as SCDAP/RELAP5/MOD3.1E updates and systematic assessments. (The key elements of these updates are debris oxidation model improvements, the Ag-In-Cd control rod material interaction model, and BWR control blade/ channel box model improvements). Other major accomplishments in FY 95 include peer review of proposed late-phase model improvements, completion of the Browns Ferry reference calculations to support the ex-reactor (XR2-1) test at the Sandia National Laboratories, and completion of general PWR/BWR upper plenum component model development. Ongoing work continuing in FY 96 includes incorporating proposed late-phase model improvements into SCDAP/RELAP5, performing additional code assessment studies against experimental data, and continuing to improve high-priority modeling deficiency items, as recommended by the SCDAP/RELAP5 independent peer review committee.

CONTAIN is a detailed code for integrated analysis of containment phenomena. This code provides the capability to predict the physical, chemical, and radiological conditions inside a reactor containment in the event of a severe accident. The primary objective of the contain enhancements during FY 95 was to modify the code to develop and validate models related to the unique ALWR safety features that affect containment performance for both design-basis and severe accident type calculations. The CONTAIN code was also assessed against selected tests from the AP600 Passive Cooling System Large-Test Facility.

VICTORIA is a computer code designed to analyze fission product behavior within the reactor coolant system (RCS) during a severe accident. The code provides detailed predictions of the fission product release from the fuel and the transport in the RCS of radionuclides and non-radioactive materials during core degradation. During FY 95, pre-test analyses were conducted for the Phebus FPT3 and FPT4 fission product release and transport experiments. VICTORIA was also used to assess the boundary conditions and consequences associated with steam generator tube rupture events. A peer review of VICTORIA also began in 1995.

Reactor Containment Structural Integrity

During 1995, important progress was made on research projects involving model tests and studies of the effects of corrosion, as well as on the rulemaking endorsing sections of the ASME Code. Under the research topics, a model of a steel containment was fabricated in Japan and shipped to the United States as part of a cooperative research program of containment model tests. A series of tests was also completed to assess the failure of containment bellows, bringing to a conclusion an investigation of the potential containment failure modes involving penetrations.

CONTAINMENT MODEL TESTING

The major effort in this program for the past few years has been cooperation with the Ministry of International Trade and Industry (MITI) of Japan. Two areas of cooperative research are being pursued—one dealing with steel containments using BWR designs in both the United States and

Japan—and the other relating to pre-stressed concrete containments. The current generation of Japanese PWR containments are of a pre-stressed concrete design. In the United States, there are 41 pre-stressed containments, compared to 20 reinforced concrete containments.

A reinforced concrete model was chosen for the NRC-sponsored testing that was performed at the Sandia National Laboratories (SNL) in 1987. Subsequent analyses of the results of that model test have shed light on how potential failure modes develop in concrete containments. Some of the results also apply to pre-stressed concrete containments; however, there are two main reasons for performing an additional pre-stressed containment model test:

- No test data exist with regard to the ultimate capacity available for a pre-stressed containment, that closely represents the designs used in the United States.
- The margin between the ultimate capacity and the design pressure for pre-stressed containments is now thought to be somewhat lower than that for reinforced concrete or steel containments. It is important to have accurate predictions of the ultimate behavior of pre-stressed containments for activities such as accident management, risk analysis, and confirmation of assumptions about the robustness of containments for the Severe Accident Policy Statement.

The steel containment vessel test specimen is a scale model representing some features of an improved BWR Mark II containment vessel in Japan. A scale of 1:10 is used for the overall geometry of the model, with 1:4-scaling of the wall thickness. This selection of scales allowed the model to be small enough for transportation from Japan to SNL, while being thick enough to ensure quality construction.

The model, fabricated at the Hitachi Works in Japan, was completed in November 1994, and arrived at SNL in March 1995. It has since been installed in the protective structure within which the test will take place, and instrumentation of the model is in progress. The test is scheduled for fall 1996.

The pre-stressed concrete containment vessel (PCCV) model is representative of U.S. containment designs, and will be a scaled representation of an actual PCCV in Japan. The actual PCCV, which was designed in accordance with the Japanese Concrete Containment Vessel Design Code, consists of a hemispherical dome, a cylindrical wall, and a basemat. Two buttresses are used to anchor the horizontal or "hoop" tendons, and a "hairpin" tendon layout is employed in the vertical direction. 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, which is 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.

The basic design of the PCCV model was completed in December 1994. Fabrication of the liner by Mitsubishi Heavy Industries in Kobe, Japan, began in April 1995, and will be completed in 1996. The liner segments will be shipped to SNL, where construction of the model will take place during 1996–1998. Instrumentation of the model will be performed in 1998–1999, partly in parallel with the onsite model construction. Testing of the PCCV model will then take place late in 1999.

CORROSION STUDIES

Based on recent experience, corrosion effects can significantly degrade containments. Numerous examples of degradation caused by corrosion have been found in Mark I BWR containments, ice condenser PWR containments, and the liners of concrete containments. The robustness of undegraded containments was verified in tests performed at SNL showing their capacity to sustain loads well beyond design level, and this robustness is a significant consideration in the Commission's Severe Accident Policy Statement. However, based on the degradations of containment found at operating plants, a better understanding of factors related to the occurrence of corrosion, efficacy of inspection, and containment capacity reduction is necessary to support regulatory activities.

In order to assess the reduction in containment capacity caused by corrosion, the extent of the corrosion must be determined, and an analysis must be performed to determine the reduction of capacity for localized and general corrosion. A comparison of remaining thickness of containment and containment liners with the minimum ASME Boiler and Pressure Vessel Code requirements is the first step of an assessment. The elastic analysis methods used for design cannot be extrapolated to provide estimates of actual failure. Methods are being sought that can relate containment capacity to the amount and location of degradation, using the results of research on actual failure modes of containments. If this effort is successful, a basis can be found for judging the seriousness of a given degree of degradation at a particular location.

During FY 94, the Oak Ridge National Laboratory initiated a program to assess state-of-the-art nondestructive testing techniques for examining steel containments and the liners of concrete containments. As part of this program, statistically based sampling plans will be developed to provide confidence limits on the detection of corrosion. One subtask scheduled to be completed in 1996 is a program assessing nondestructive examination techniques that can be used to determine if degradation has occurred in inaccessible areas of the containment. SNL initiated a related program during FY 94 to investigate and develop analytical methods to account for the effects of corrosion on the capability of steel containments to withstand static internal overpressurization loads associated with severe accident conditions. Benchmarking of the containment models has been completed, and SNL is presently adding the individual elements to model the effects of corrosion.

The containment bellows test program began in 1990, and was completed in 1995. This program was initiated as a result of concerns that bellows could be a possible source of containment leakage during a severe accident. As testing progressed, the program was separated into two segments:

(1) Bellows were tested in a "like-new" condition, while subjected to extreme conditions of internal pressure and elevated temperature. Tests indicated that bellows in like-new condition would remain leaktight up to, or near, the point of full axial compression, under those extreme conditions.

(2) When the bellows were tested in a corroded or degraded condition, tests indicated that significant reductions in performance were caused by relatively small amounts of bellows corrosion. This work has raised the awareness of the industry for increased surveillance needs for bellows. The results of this program have been transmitted to the ASME Section XI code group for possible inclusion in future inspection activities.

The structural aging (SAG) program addressed the aging management of safety-related concrete structures in nuclear power plants to strengthen the technical bases for their continued service. The SAG program included activities in four major technical task areas, including (1) program management, (2) the materials property database, (3) structural component assessment/repair technologies, and (4) a quantitative methodology for continued service determinations. The final program report is expected to be completed by early 1996.

Regulatory applications of this research include improved predictions of long-term material and structural performance, as well as available safety margins. This research will also permit establishment of limits on exposure to environmental stressors, and will increase the capability to evaluate the integrity of structures. In addition, this research will yield an improved damage inspection methodology that could be incorporated into national standards.

RULEMAKING

In order to ensure that containment inspection practices and procedures are effective, work continued in 1995 on the rulemaking to incorporate by reference Subsections IWE and IWL into 10 CFR 50.55a. Subsection IWE provides rules for the inservice inspection of metal containments and the liners of concrete containments. Subsection IWL provides rules for the inservice inspection of the reinforced concrete and the post-tensioning systems of concrete containments. However, Subsections IWE and IWL address only the accessible areas of containments. Consequently, a provision was included in the proposed rule to address inspection of inaccessible areas in containments. Some instances of containment degradation suggest the possibility that degradation may have occurred in inaccessible areas. As noted in an industry report on PWR containments, the state of practice for inspection of inaccessible areas will have to be improved before resolution of this issue is achieved. The final rulemaking is scheduled to be published in 1996.

Severe Accident Implementation

In August 1985, the Commission issued a Severe Accident Policy Statement (50 FR 32138), which concluded that existing plants posed no undue risk to public health and safety. However, the Commission recognized that systematic examinations of existing plants could identify plant-specific vulnerabilities to severe accidents for which further safety improvements could be justified. On November 23, 1988, the Commission issued Generic Letter 88–20, requesting that licensees perform a systematic examination "to identify any plant-specific vulnerabilities to severe accidents and report the results to the Commission."

INDIVIDUAL PLANT EXAMINATIONS

The individual plant examination (IPE) process involves two distinct efforts. The first is an examination of existing plants for vulnerabilities to severe accidents resulting from initiating events occurring within the plant (e.g., valve hardware failure), including internal flooding, while the plant is at full power. The second effort, referred to as the IPE for external events (IPEEE), considers vulnerabilities to severe accidents caused by external events (e.g., earthquakes, fires, winds), also while the plant is at full power.

All 77 IPE submittals have been received from licensees, and the staff review is expected to be concluded in calendar year 1996. The reviews of the IPEEE submittals will closely follow the approach used for the IPEs. To date, the staff has received approximately half of the 75 expected IPEEE submittals, and 24 are currently under review. The staff expects to receive and review IPEEE submittals for all licensed nuclear power plants by the end of calendar year 1998.

In parallel with the staff review, the NRC initiated an IPE/IPEEE Insights program. This program summarizes insights gained from the IPE and IPEEE reviews, particularly looking at safety insights for the different reactor and containment types and plant designs. As part of this program, a technology transfer effort was implemented to inform necessary personnel (e.g., plant resident inspectors) of the results of the staff review.

Earth Sciences

Seismic hazard is an important consideration in nuclear power plant siting and design as it affects the entire plant, simultaneously challenging the redundancy of safety systems. Because of the large uncertainties in estimating seismic hazards, there is also a large uncertainty in estimating the nuclear power plant risk associated with seismicity. In order to reduce these uncertainties and provide background for regulations that will ensure the safe operation of nuclear power plants and other nuclear facilities, the NRC is continuing research into the causes and distribution of seismicity. Research is also progressing in improved methods of converting the earth science information into estimates of ground motion levels for use in plant design.

SEISMOGRAPHIC NETWORKS

The new National Seismographic Network (NSN) was established through a cooperative agreement between the NRC and the U.S. Geological Survey (USGS). Including cooperative stations, the NSN now operates 39 broadband three-component stations with satellite telemetry, providing high-quality data on significant earthquakes within minutes. These data are expected to provide new insights into the causes and distribution of seismicity, particularly in the central and eastern United States.

A computer program completed during FY 95 allows the NRC to read, archive, and analyze NSN data received via satellite. The program selects data that exceed certain magnitude criteria, and sends an e-mail notice if high ground motion levels are expected at nearby nuclear power plants.

Several research contracts to analyze NSN data, together with other seismological, geological, and geophysical data, were started at the end of FY 94 and continued into FY 95. The new research includes analyzing detection capabilities of the NSN, modeling seismic source functions and ground motion attenuation, defining regional seismicity and velocity models, and comparing seismicity with tectonic data. The preliminary results obtained from this research during FY 95 include indications that seismic source characteristics in the eastern United States may be different from what was previously believed.

SOUTHEASTERN TECTONICS

Investigations continued in South Carolina to determine whether there is a second source for a large earthquake in this region of the coastal plain, in addition to the source of the 1886 Charleston earthquake. This issue was identified as a result of an earlier, NRC-supported paleoliquefaction study that identified anomalously large, seismically induced paleoliquefaction features that were formed in the vicinity of Georgetown, South Carolina, about 1800 years ago. However, no such paleoliquefaction features were found in the Charleston area. The present study, which has been ongoing for 2 years, consists of locating and analyzing other 1800-year-old features in the Georgetown area, and re-investigating the Charleston earthquake meiszoseismal area to identify paleoliquefaction features of that age, if they exist. To date, other features of that age have been found near Georgetown but not at Charleston.

PALEOSEISMICITY OF SOUTHERN ILLINOIS, OHIO, AND INDIANA

Paleoliquefaction investigations carried out in the Wabash Valley of southern Indiana and southern Illinois during the past 2 fiscal years were extended further into central and southern Illinois. Paleoliquefaction evidence for the large Holocene earthquakes centered near Vincennes, Indiana, and evidence for smaller events from about 4200 to 4500 years ago was also found. In addition, paleoseismic evidence for smaller earthquakes, separate from smaller events identified in Indiana, were found in west-central Illinois. The estimated times of occurrence of these earthquakes, based on radiocarbon dating, are 20,000 to 25,000, 7,000 to 8,000, less than 6,000, and 3,700 years ago. In south-central Illinois, strata with ages ranging from recent to 10,000 years were surveyed, and no geological evidence of prehistoric earthquakes was found. Likewise, in northern Ohio, in the epicentral region of the 1986 Ashtabula earthquake (magnitude 5.2), many miles of exposure of Quaternary soil that had the potential to liquefy were examined, but no paleoliquefaction features were identified.

NEW MADRID SEISMIC ZONE

Paleoliquefaction investigations continued in the New Madrid seismic zone, particularly at the Wilkerson Ditch north of New Madrid, and at Eaker Air Force Base in northern Arkansas. Radiocarbon and archaeological data offer evidence of two large prehistoric events at these two sites within the last 2000 years. All paleoliquefaction data taken from the New Madrid region indicate four events during the past 2000 years, including one event less than 600 years ago, and one each approximately 900, 1300, and 1600 years ago.

Based on the preliminary analysis of high-resolution data acquired during FY 95 across the southeast projection of the Reelfoot fault, it is interpreted that the fault continues beyond the south side of Reelfoot Lake, and that the cretaceous surface is uplifted 40 to 50 meters across the fault beyond the south side of the lake. Preliminary analysis of vibrioses data that were obtained from industry supports a previous interpretation that there has been very little slip on the fault (about 100 m) since the late Cretaceous period.

These investigations, along with several new studies that will continue during the next fiscal year, are part of an ongoing effort to estimate the recurrence of large-to-great earthquakes (magnitude 6-to-8) in this region, and to define the causative faults.

GEOTECHNICAL INDICATIONS OF PALEOLIQUEFACTION

During the past 2 fiscal years, the NRC has conducted a project to identify alterations in geotechnical properties that can be used to locate paleoliquefaction features. The first year's study confirmed that during liquefaction, a stratum of water forms at the top of a liquefiable layer, just below a relatively impermeable stratum, and this phenomenon plays a role in lateral spreading. The second year's study addressed the question of whether liquefaction causes changes in relative density. Much time was spent studying the effects of the 1995 earthquake in Kobe, Japan, where it was determined that very large vertical strains caused densification.

WEST-CENTRAL UNITED STATES

During FY 95, the NRC investigated three faults showing quaternary displacements, including the Cheraw and Fowler faults on the Colorado Piedmont, and the Harlan County fault in Nebraska. Of these, only the Cheraw fault is considered to be a tectonic feature at this time. The Fowler fault is probably of fluvial origin, and the Harlan County fault is currently thought to be a landslide. The Cheraw fault is 44 kilometers long, and apparently dips to the northeast at about 50°, with the hanging wall to the southeast and footwall to the northwest of the fault. It is characterized at ground surface by a scarp that affects drainage. There is evidence of multiple offsets beginning about 100,000 years ago after a long period of quiescence, with successive displacements about 25,000 years ago, between 10,000 and 11,000 years ago, and most recently approximately 8,000 years ago, based on thermoluminescence and radiocarbon dating methods. The calculated slip rate is 0.01 mm/yr. Study of this fault illustrates temporal clustering and the low recurrence intervals that characterize faults in the central United States. These characteristics are very problematic in estimating the seismic hazard of this region.

FAULT SEGMENTATION STUDIES

FY 95 was the final year of investigating the fault segmentation that accompanied the 1992 earthquake in Landers, California. This study indicates that, if all the fault segments within this fault system had been investigated before the earthquake, with respect to geometry and past behavior and using modern paleoseismic techniques, the segments that ruptured in 1992 could have been predicted fairly closely.

As part of this project, a reconnaissance was made to an area in Mongolia that is believed to be analogous, in its intraplate setting, to the New Madrid area but with fault rupture at ground surface rather than obscured by many hundreds of meters of sedimentary strata. Within the past several decades, this region of Mongolia has experienced several earthquakes of magnitude 7 to nearly 8, all of which were accompanied by substantial ground rupture. The fault segments showed long periods of inactivity between rupture events, and instances where several segments were ruptured during the same event. Based on observations of the effects of the 1957 Gobi Altai earthquake, it is believed that rupturing through several segments would not have been predicted based on investigations before the earthquake.

These projects are part of an ongoing effort to estimate the magnitudes of future earthquakes through detailed studies of the characteristics of fault segments and their past behavior.

STRONG GROUND MOTION STUDIES

The NRC continued to participate in several cost-sharing ground motion research programs in cooperation with the U.S. Geological Survey. As part of a project to estimate high-frequency ground motion, an effort is being made to develop an improved technique to evaluate site subsurface characteristics by analyzing shear waves generated at the surface instead of analyzing in-hole data. Another research project concentrated on analyzing ground motion attenuation data in the southeastern Atlantic coastal plain, using ground motion data recorded by down-hole seismographs. A third project used data recorded by the National Seismographic Network to determine attenuation characteristics in the Basin and

Range, southern California, and northern California. A fourth project experimented with techniques to determine a relationship between ground motions recorded teleseismically, those recorded regionally, and those recorded locally. A fifth project studied the small-scale predictability of ground motion, based on data from the 1994 Northridge earthquake. The sixth and final research project investigated the relationship among dynamic strains, site damage response, and ground failure using data from the Northridge and plate interface earthquakes in Mexico.

GEOCHRONOLOGICAL STUDIES

FY 95 was the second year of a project to assemble state-of-the-science data on methods to determine the age of geological materials. Geochronological analyses of faults, paleoliquefaction features, and other paleoseismic features are important factors in determining the seismic and geological hazards of sites for critical facilities. This year, field and laboratory experiments were conducted to validate certain geochronological techniques and their application to a variety of field conditions, and a final report was prepared. Sites tested included Hebgen Lake, Montana; Virginia Beach, Virginia; Georgetown, South Carolina; and the Meers fault in south-central Oklahoma.

CRUSTAL STRAIN MEASUREMENTS

A 45-station crustal strain network for the central and eastern United States was established in 1987 and measured for the third time during FY 93. Calculations performed using these measurements have shown that strain rates in the central and eastern United States are low (approximately 1.5 x 10^{-8}). This is close to the noise level of the measurements, and no differential strains have been detected. A study of the Charleston, South Carolina, area also determined a regional strain rate of about 10^{-8} and a rate of about 10^{-7} in the area of high seismicity around Charleston. This study concluded that triangulation data, even over a span of decades, are not sufficiently accurate to produce valid crustal strain data, and Global Positioning System (GPS) measurements produce better results. Additional data can be expected in the future from high-precision GPS networks established by states and other entities. In addition, continuously operated GPS stations now being established by the Coast Guard and the Federal Aviation Administration are expected to provide very detailed and accurate data in the future. Information on strain distribution and strain rates will provide a basis for refinements in seismic hazard determinations.

PROBABILISTIC SEISMIC HAZARD ANALYSIS

The Senior Seismic Hazard Assessment Committee (SSHAC) is a panel of scientists assembled under the sponsorship of the NRC and the DOE. During FY 95 with input by the Electric Power Research Institute, the SSHAC completed its final report documenting the results of a study of probabilistic seismic hazard analysis (PSHA) methodologies. The 3-year study began with an analysis of previous methodologies, and its goal was to derive guidelines for an improved methodology that is scientifically balanced and usable for regulatory decisions over the next decade. The new guidelines place particular weight on appropriate methods of eliciting expert opinions and on rigorous treatment of uncertainty, both of which are of fundamental importance in PSHA. The study is in the final stage of a peer review by a panel convened by the National Academy of Sciences to ensure scientific objectivity. In addition, a limited test and implementation of the SSHAC guidelines was started in FY 95 in order to exercise the guidelines and ensure that they are sufficiently complete to obtain the consistency sought in their development.

Plant Response to Seismic and Other External Events

REPLACEMENT OF APPENDIX A TO 10 CFR PART 100

Proposed geologic and seismic siting factors and earthquake engineering criteria were published for public comment as Section 100.23 to 10 CFR Part 100 and Appendix S to 10 CFR Part 50 on

October 17, 1994 (59 FR 52255). When these regulations become final, they will replace criteria in Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," to 10 CFR Part 100, for new nuclear power plant applications. The notice of the availability of draft regulatory guides and standard review plan sections providing methods acceptable to the NRC staff for implementing the proposed regulations was published on February 28, 1995 (60 FR 10880). The public comment period on both the proposed regulations and draft guidance documents closed on May 12, 1995. (See the 1994 NRC Annual Report, pp. 192–193). In general, most of the comments support the staff positions, and many of the commenters provided editorial and technical suggestions that would clarify the rulemaking. A few commenters provided more substantive comments requiring a careful assessment of their implementation.

EXPERIENCE-BASED SEISMIC QUALIFICATION

In its Utilities Requirements Document for ALWRs, the EPRI proposed the use of experience as a seismic qualification method as an applicable substitute, on a case-by-case basis, for more traditional tests and evaluations (see the 1993 NRC Annual Report, p. 171). The Advanced Reactor Corporation developed positions on the use of experience data for seismic qualification of equipment in ALWRs, as well as design-by-rule for cable tray and conduit systems and design concepts for HVAC ducting and supports. A panel of nationally recognized experts was organized by the Brookhaven National Laboratory to review and comment on this initiative. Three public meetings were held during FY 95 and a report documenting the panel's findings will be completed during FY 96.

INDIVIDUAL PLANT EXAMINATION FOR SEISMIC EVENTS

On September 8, 1995, the NRC issued Supplement 5 to Generic Letter 88–20, "Individual Plant Examination of External Events for Severe Accident Vulnerabilities," to notify licensees of modifications in the recommended scope of seismic reviews. The methods and guidance described in Supplement 4 to Generic Letter 88–20 and NUREG–1407 are still acceptable (see the 1991 NRC Annual Report, p. 174, and the 1990 NRC Annual Report, pp. 153 and 166). However, the results of the revised Lawrence Livermore National Laboratory seismic estimates (NUREG–1488) indicated that the perceived seismic hazard has been reduced for most plant sites in the central and eastern United States. Accordingly, reductions in the scope of the seismic individual plant examinations of external events were identified. (For further information, see Severe Accident Implementation in this chapter.)

COOPERATIVE INTERNATIONAL SEISMIC PROGRAMS

The NRC's participation in international seismic test programs is beneficial both for sharing research resources and for gaining different perspectives on seismic design issues. Resource pooling allows the development of large-scale tests, which are an important element in validating methods for predicting the seismic response behavior of nuclear plant systems.

The Large-Scale Seismic Test (LSST) facility is one of the largest in the world for soil/structure interaction (SSI) research. The construction of a 1:4-scale model of a reinforced concrete containment, 10.5 meters in diameter and 16.5 meters high (11.1 meters above the ground) was completed in March 1993, and a formal dedication ceremony was held in Hualien, Taiwan, in April 1993. The LSST program at Hualien, Taiwan, is a follow-on to the SSI experiments at Lotung, Taiwan.

The LSST program was initiated in January 1990, and is expected to continue until 1998. The goal of this program is to collect real earthquake-induced SSI data, in order to evaluate computer codes used in SSI analyses of nuclear power plant structures. In the program, observations are made on the motions of the reactor building model and the surrounding ground during large-scale earthquakes. The expectation is that the test model will be shaken by numerous earthquakes in this seismically active area of Taiwan. To date, five moderate earthquakes have been recorded at the facility. Instrumentation located on the scale model and in the field along a three-dimensional strong ground motion array recorded the recent earthquake data.

EPRI has organized the Hualien LSST experiment and coordinated participation with the Taiwan Power Company, the NRC, the Central Research Institute of Electric Power Industry, the Tokyo Electric Power Company, the Commissariat a l'Énergie Atomique, Electricite de France, Framatome, the Korea Power Engineering Co., and Korea Electric Power Corp. In addition, in a collaborative effort involving exchange of technical information with the Ministry of International Trade and Industry (MITI) and the Nuclear Power Engineering Corporation (NUPEC) of Japan, the NUPEC completed seismic proving tests for a main steamline typical of PWR plants, and a feedwater system typical of BWR plants. Tests were conducted at several levels of seismic excitation, using both conventional and energy absorber supports for the piping systems. In this collaborative effort, the NRC is conducting post-test analyses to assess the applicability of currently available analytical models. Data are also being obtained from NUPEC for seismic proving tests of a computer system and a reactor shutdown cooling system.

HYOGO-KEN NANBU (KOBE) EARTHQUAKE OF JANUARY 17, 1995

An eight-member team composed of staff and consultants representing the NRC and the DOE visited Japan from February 11–19, 1995, to gather data on the Hyogo-ken Nanbu earthquake of January 17, 1995. The team focused on evaluating the performance of industrial facilities, with emphasis on power generating and distribution facilities. Both NRC and DOE have made extensive use of experience-based data to evaluate components and equipment in power plants and other facilities. During the visit, the team met with Kansai Electric to discuss the overall performance of the power generating and distribution facilities, effects on the nuclear plants because of the grid disturbances, design criteria used, steps necessary for recovery, and lessons learned. The team also visited a thermal power station and a substation to observe the damage and to discuss operational aspects.

Both the Northridge and Hyogo-ken Nanbu earthquakes demonstrate the need to consider displacement limits as well as stress limits in structural members responding to earthquake ground motions. This is particularly true for facilities within the near-field of fault rupture zones. The Nuclear Safety Commission of Japan organized a special committee to review seismic requirements for nuclear power plants after the earthquake. In a recently published report, this committee concluded that there is no need to revise current seismic design criteria, but research will be needed in several related areas.

SEISMIC DESIGN RULES FOR PIPING

In the 1994 Winter Addenda of Section III, ASME published revised rules for the seismic design of piping systems. One of the major changes in the addenda is to increase allowable stresses by 50 percent, which is significantly beyond material yield strength. Under a research program, the NRC has been reviewing the underlying technical basis for these changes. Based on findings from this program and participation of NRC staff members on code committees and working groups, the NRC informed ASME that it was unable to accept the revised rules pending further evaluation. On the basis of comments from the NRC and other organizations, the ASME Section III Design Sub-Group has convened a Special Working Group on Seismic Rules (SWG–SR) to examine the revised rules. The SWG–SR expects to complete its assignment in a 2- or 3-year time period.

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 implementing a possible resolution for each. Information and guidance on GSIs are reflected in the NRC's Five-Year Plan.

PRIORITIES OF GENERIC SAFETY ISSUES

In prioritizing GSIs, the NRC continued to use risk and cost data in implementing the methodology originally described in the 1982 NRC Annual Report. 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 generally been updated semiannually with supplements 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 95, the NRC identified and prioritized two new GSIs (Table 1), and resolved one GSI (Table 2). Table 3 contains the schedules for resolving the 15 GSIs that remained unresolved at the end of FY 95.

Table 1. Issues Prioritized in FY 1995

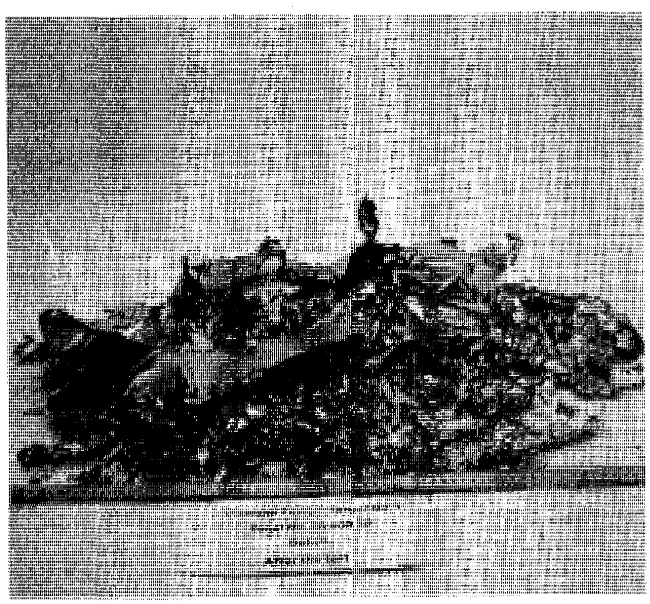
Number	Title	Priority/Status
170	Reactivity Transients and Fuel Damage Criteria for High Burnup Fuel	Nearly Resolved
171	Engineered Safety Feature Failure from Loss of Offsite Power Subsequent to a LOCA	High

Table 2. Generic Safety Issue Resolved in FY 1995

Number	Title
155.1	More Realistic Source Term Assumptions

PROGRESS ON GSI RESOLUTION

As described in the 1994 Annual Report, studies and experiments continued during FY 95 related to the potential for BWR emergency core cooling system strainer blockage as a result of debris produced during a loss-of-coolant accident. A BWR6/MK1 reference plant was analyzed to estimate the probability of a loss of net positive suction head margin, and the results were reported in NUREG/CR–6224. The severe effects of fibrous debris, coupled with filtration of other materials present in the suppression pool, such as "sludge," have become more apparent from these studies and related experiments. As an example of possible material present in the pool, this photograph illustrates the resulting condition of a reflective metallic insulation assembly when subjected to a simulated steam line break at BWR operating conditions and, correspondingly, the severity of insulation destruction that can occur.



The variability of U.S. BWR plant layouts and insulations employed precludes arriving at a singular generic solution to this safety issue. The staff and the U.S. BWR Owners' Group (BWROG) are continuing to exchange experimental findings to identify resolution options that are both appropriate and cost effective.

Finally, the NRC participated in an international working group sponsored by the Organization for Economic Cooperation and Development/Nuclear Energy Agency, Committee for the Safety of Nuclear Installations (OECD/NEA–CSNI), Principal Working Group 1. This international working group comprised participants from German, Swedish, Finnish, Japanese, and U.S. regulatory authorities, the U.S. BWROG, and other U.S. companies, thereby enhancing the exchange of information and facilitating peer review. The charter of this working group was to establish an internationally agreed-upon knowledge base for assessing the reliability of emergency core cooling water recirculation systems. NRC-sponsored studies and experiments were a major resource for developing of a draft report submitted to the OECD/NEA–CSNI in September 1995.

Reactor Regulatory Standards

RULEMAKING IMPROVEMENT PROGRAM

In response to Executive Order 12866 (58 FR 51735) and the report of the National Performance Review, the NRC completed new procedures that will make the rulemaking process more efficient. These procedures include the 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 January 1995, Management Directive 6.3, "The Rulemaking Process," containing the revised procedures was approved and published for staff use. In addition, NUREG/BR–0053, "Regulations Handbook," was revised to implement Management Directive 6.3 in FY 95. This handbook provides detailed guidance on the process used for developing regulations.

REACTOR RULEMAKINGS

On September 26, 1995 (60 FR 49495), the Commission issued a final rule on performance-based primary reactor containment leakage testing for water-cooled power reactors (10 CFR Part 50). The final rule amends the Commission's

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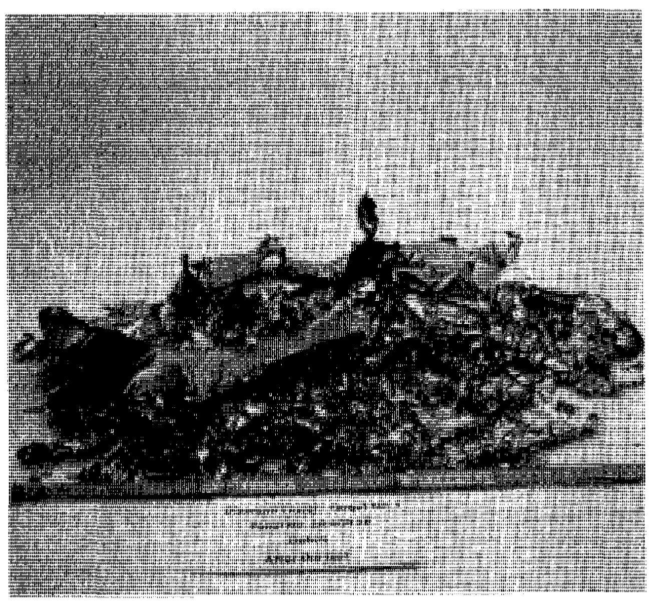

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On September 19, 1995 (60 FR 48369), the Commission issued a final rule on procurement of commercial-grade items by nuclear power plant licensees (10 CFR Part 21). The final amendments clarify and add flexibility to the process used by nuclear power plant licensees to procure commercial-grade items for safety-related service. This final rule responds to a petition for rulemaking (PRM–21–02) submitted by the Nuclear Management and Resources Council (NUMARC), which is now incorporated into the Nuclear Energy Institute (NEI).

On March 14, 1995 (60 FR 13615), the Commission issued a final rule to reduce reporting requirements imposed on NRC licensees for water-cooled nuclear power reactors, research and test reactors, and nuclear materials (10 CFR Parts 50, 55, and 73). This action implements an NRC initiative to review its current regulations with the intent of revising or eliminating duplicative or unnecessary reporting requirements.

On March 6, 1995 (60 FR 17902), the Commission issued for comment a proposed rulemaking on standard design certification for evolutionary light-water reactors (10 CFR Part 52). The Commission anticipates that applications for design certification may be ready for such rulemakings in the future. An applicant for a combined license under 10 CFR Part 52 may use these certified designs without further indepth review by the NRC.

On September 7, 1995 (60 FR 46497), the Commission issued a final rule on changes to nuclear power plant security requirements associated with containment access control (10 CFR Part 73). Based on staff review experience gained in security program implementation and comments from the public and industry, the final rule changes requirements associated with controlling the access of personnel and materials into reactor containment during periods of high traffic (such as refueling and major maintenance). These changes relieve nuclear power plant licensees of the requirement to separately control access to reactor containments during these periods. Deletion of this requirement decreases the regulatory burden for the licensees without degrading physical security.

On March 14, 1995 (60 FR 19002), the Commission issued for comment a proposed rulemaking on emergency planning and preparedness exercise requirements (10 CFR Part 50) for production and utilization facilities. The proposed rule would amend the regulations governing domestic licensing of production and utilization facilities, as necessary, to facilitate greater flexibility in licensees' activities associated with the annual "off-year" exercise. The rulemaking also preserves the existing requirement that each licensee, at each site, exercise biennially with participation by States and local governments within the plume exposure pathway emergency planning zone (EPZ). In addition, the proposed rule would require licensees to continue enabling State and local governments in plume exposure pathway EPZs to participate in exercises and in drills during the interval between exercises. This proposed rule responds to a petition for rulemaking submitted by the Virginia Electric and Power Company (PRM–50–58).

During FY 95, the Commission withdrew six NRC policy statements that have been superseded by subsequent NRC rulemaking actions:

- Nuclear Power Plant Access Authorization Program, March 9, 1988 (53 FR 7534)
- Training and Qualification of Nuclear Power Plant Personnel, March 20, 1985 (50 FR 11147)
- Fitness-for-Duty of Nuclear Power Plant Personnel, August 4, 1986 (51 FR 27921)
- Maintenance of Nuclear Power Plants, December 8, 1989 (54 FR 50611)
- Information Flow, July 20, 1982 (47 FR 31482)

- Planning Basis for Emergency Responses to Nuclear Power Reactor Accidents, October 23, 1979 (44 FR 61123).

A notice of withdrawal of these policy statements was published in the *Federal Register* on January 20, 1995. The decision for withdrawal of these policy statements does not change reporting requirements for licensees, and does not in any way reduce the protection of the public health and safety.

REGULATORY ANALYSIS GUIDELINES

The NRC performs regulatory analyses to support numerous regulatory actions that affect nuclear power reactor and nonpower reactor licensees. As such, the related guidelines set forth a number of policy decisions that have broad implications for the NRC and its licensees with regard to the preparation and contents of regulatory analyses. The revised guidelines reflect the NRC's accumulated experience with implementing Revision 1 of the guidelines, as well as changes in NRC regulations and procedures since 1984, especially the backfit rule (10 CFR 50.109) and the Policy Statement on Safety Goals for the Operation of Nuclear Power Plants (51 FR 30028; August 21, 1986). The revised guidelines also reflect advances and refinements in regulatory analysis techniques, and regulatory guidance for Federal agencies issued by President Clinton, the Administrative Conference of the United States, and the Office of Management and Budget. In addition, the revised guidelines incorporate procedural changes designed to enhance the NRC's regulatory effectiveness.

The staff is also in the process of revising NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook," which was issued as a draft report in August 1993. This handbook is to provide guidance and standardized methods for regulatory analysts to use in preparing and presenting high quality regulatory analyses, including backfit and CRGR regulatory analyses. The handbook also implements the policies of the "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," NUREG/BR-0058, Rev. 2. In addition, the handbook expands upon the policy concepts included in the NRC guidelines, and translates the six steps in preparing regulatory analyses into implementable methodologies for the analysts.

During this report period, the NRC also completed or initiated the development or review of about 18 safety-related regulatory impact analyses to evaluate new regulatory requirements or actions for NRC licensees.

Reactor Radiation Protection and Health Effects

The NRC maintains a program of research and standards development in radiation protection and health effects intended to ensure continued protection of workers and the public from radiation and radioactive materials in connection with licensed reactor activities. The program includes 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.

REACTOR RADIATION PROTECTION RULEMAKINGS

On July 13, 1995 (60 FR 36038), the Commission issued a final rule on radiation protection requirements to amend definitions and criteria (10 CFR Parts 19 and 20). The final rule amends the Commission's regulations in the following ways:

- Deleted the definition "controlled area" to make it clear that any area to which access is restricted for the purpose of radiological protection is a restricted area as defined in the regulation

- Revised the definition of "occupational dose" to delete reference to the "restricted area"

- Revised the definition of "unrestricted area" to be consistent with the deletion of controlled area

- Revised the provision in 10 CFR Part 19 entitled "Instruction to Workers," so that radiation protection training will be provided to all persons with the potential to be occupationally exposed

- Restored a provision in 10 CFR Part 20 to provide that whenever licensees are required to report exposures of individual members of the public to the NRC, those individuals are to receive copies of the report

On February 10, 1995 (60 FR 7900), the Commission issued a final rule on the frequency of medical examinations for use of respiratory protection equipment (10 CFR Part 20). The final rule amends the Commission's regulations concerning the required frequency of medical examinations to ensure the safe use of respiratory protection equipment. It also requires a determination by a physician before the first field use of respirators (and periodically thereafter) that the individual user is medically fit to use the respiratory protection equipment.

On March 25, 1995 (60 FR 20183), the Commission issued a final rule clarifying the superseded 10 CFR Part 20 recordkeeping requirements. This final rule reinstates certain record retention requirements not intended to be removed that were inadvertently deleted. In so doing, this rulemaking ensures that licensees continue to retain records generated under the previously existing provisions of Part 20.

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 ALARA research. This work includes abstracting national and international articles and books that discuss dose reduction in areas such as plant chemistry, stress corrosion cracking, steam generator repair and replacement, robotics, and decontamination. In May 1995, the NRC published NUREG/CR-3469 (Vol. 8), "Occupational Dose Reduction at NPPs: Annotated Bibliography of Selected Readings in Radiation Dose Reduction and ALARA." This information is particularly important to power reactor facilities in the planning stage. BNL also continued publishing the newsletter, "ALARA Notes," on about a quarterly schedule.

BNL also published NUREG/CP-0143, "Proceedings of the Third International Workshop on the Implementation of ALARA at Nuclear Power Plants," in March 1995. The report includes papers presented by national and international representatives of the nuclear industry on a wide range of topics related to dose control.

CONTROL ROOM HABITABILITY

During FY 95, the NRC published two reports related to air quality and control room habitability. PNL 10286, "Atmospheric Dispersion Estimates in the Vicinity of Buildings," published in January 1995, provides validation of a model to be used for predicting air quality at control room air intakes in the event of an accident. NUREG/CR-6331, "Atmospheric Relative Concentration in Building Wakes—ARCON 95 Code," prepared also by PNL, was published in May 1995. This report provides a validated code for calculating accident-caused concentrations at control room air intakes when adjacent buildings affect flow characteristics.

OCCUPATIONAL EXPOSURE DATA SYSTEMS

The NRC continued to collect and process data in the computerized Radiation Exposure Information Reporting System (REIRS), which provides a permanent record of worker exposures for reactors and several other categories of licensees. A report on 1993 exposures, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities—1993" (NUREG-0713, Vol. 15), was issued in January 1995. Compilation of the statistical reports indicated that approximately 190,000 individuals were monitored during 1993, and one-half received a measurable dose. The average measurable dose remained steady at 0.31 rem (cSv) for 1993. The collective dose obtained from summing all of the individual doses was 29,045 person-rem (person-cSv). The database also includes exposure data on approximately 687,000 individuals who have terminated employment with certain licensees, most of whom worked at nuclear power plants. 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.

In addition, a homepage for the Internet's Worldwide Web was developed for NUREG-0713. This homepage includes how to submit an annual report of occupational radiation exposure, and the address to which the report is to be mailed. It also tells of upcoming meetings related to occupational exposure reporting, contains the May 1991 issue of Part 20, and provides links to other related sites.

In September 1994, the staff published Generic Letter 94-04, "Voluntary Reporting of Additional Occupational Radiation Exposure Data," as a mechanism to complete the available REIRS data on occupational exposure. With the revision of 10 CFR Part 20, licensees are required to submit only data on the present year's activities. Previously, data were collected at the time an individual terminated employment. Thus, in order to complete the database, data were requested for persons that were employed as of January 1, 1994, who were not already covered by termination reports.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Work is continuing at the National Institute of Standards and Technology (NIST), under Interagency Agreement RES-93-017, on an ongoing study aimed at developing protocols and quality assurance and quality control procedures needed for NIST to establish traceability of neutron sources. The sources are used by Pacific Northwest Laboratories (PNL) in their role as testing laboratory for the NIST/NVLAP accreditation program for dosimeter processors mandated by the NRC. Calculations of the fluence and current of PNL and NIST sources has been completed, and the present work involves establishing protocols for intercomparison of measurements at the two sites, using transfer survey instruments. The current work also involves comparing californium neutron sources at the two sites, with the possibility of including americium-beryllium neutron sources at a later date, since the revised standard used for the NVLAP testing program, ANSI N13.11-1993, now includes the americium-beryllium neutron category.

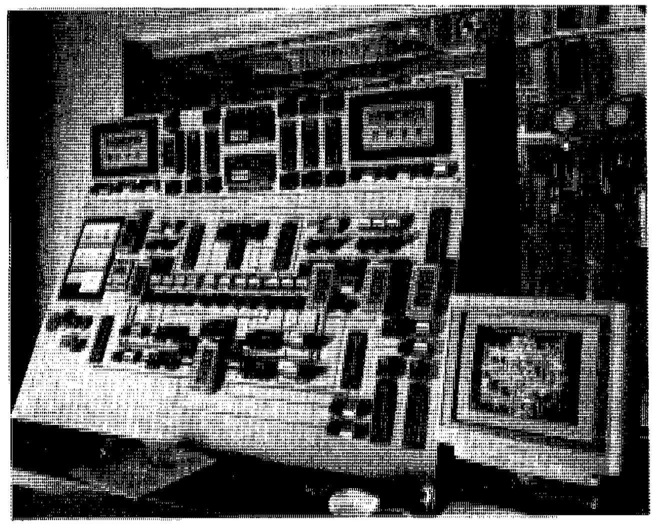
GAMMA-RAY DOSIMETER/ SPECTROMETER

Work under an ongoing Small Business Innovative Research (SBIR) Phase II contract involves the development of a pre-production prototype Yttrium Aluminum Perovskite (YAP) plastic combination gamma-ray dosimeter spectrometer, coupled to a miniaturized multichannel analyzer, and evaluation of its performance in extensive field trials. YAP, a rugged inorganic scintillator used principally in the former Soviet Union, is a much faster detector than the commonly used NaI scintillator. As a result, YAP is expected to replace NaI in high-intensity radiation fields, and in areas of high humidity and temperature, where the NaI is more environmentally sensitive. Phase I research established the feasibility of using YAP phoswich-type detectors, and the present work is expected to lead to commercially feasible YAP dosimeters for use over a wide environmental range.

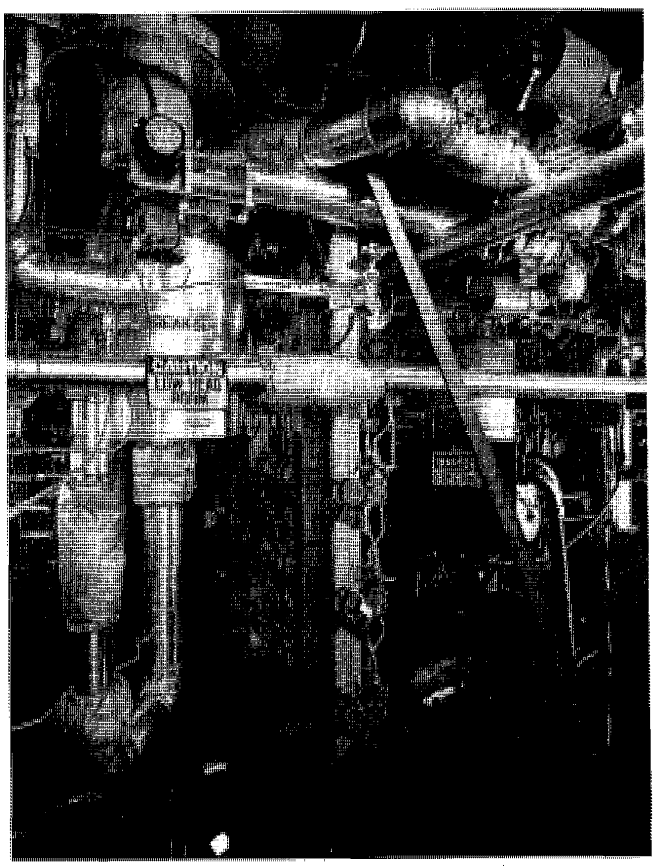
ELECTRONIC PERSONNEL DOSIMETERS

On August 16, 1995, PNL published a notice of availability for review and comment (60 FR 42629) of NUREG/CR-6354, "Performance Testing of Electronic Personnel Dosimeters." This report discusses the possible uses of electronic personnel dosimeters (EPDs) as potential alternatives to conventional dosimeters (such as film badges or thermoluminescent dosimeters), examines their reliability, and suggests a set of performance tests and implementing procedures to ensure their proper performance if used in lieu of conventional dosimetry. Following an analysis of comments on the subject report, it is expected that a series of side-by-side tests with conventional dosimeters will be undertaken to establish the reliability of EPDs in various environments (such as electrical, magnetic, and electromagnetic fields).

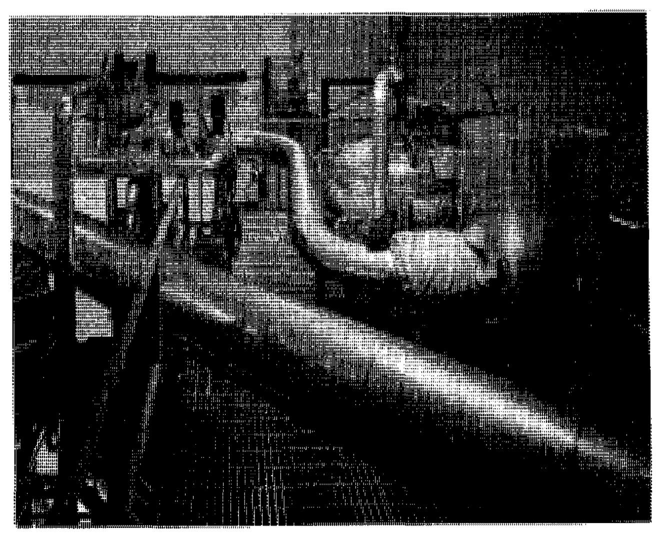
the liquid plug. The characteristic slow oscillations of considerably large amplitude appear in practically all system variables, particularly in the pressurizer liquid level, upper plenum pressure, core temperature, ADS4 flow, and vessel injection flow. If such oscillations may occur in the AP600 plant, the operator should be made aware of when and why such oscillations might occur. The following three photographs show, respectively, differential pressure instruments and the break-flow measurement system, valves, and piping leading to the flow measurement system, and the APEX control panel.



APEX control panel with facility visible through window in background.



Lower region of facility showing the bottom of the vessel (right), differential pressure instruments (center), and break flow measurement system (left).



Automatic depressurization system valves and piping leading to flow measurement system.

A new test program was initiated in FY 95 to verify the performance of passive autocatalytic recombiners (PARs). PARs have been proposed recently by Westinghouse as part of the AP600 design certification to control combustible gases in the containment following a design-basis loss-of-coolant accident. Experiments will be performed in FY 96 to examine the startup characteristics, the hydrogen depletion rate, and the performance of PARs in the presence of steam. The results will be used to develop an independent audit capability to evaluate the performance of PARs.

SUPPORT FOR SBWR DESIGN REVIEW

To provide confirmatory testing and computer code assessment for the General Electric Simplified Boiling Water Reactor (SBWR), the NRC established a research program composed of three elements. The first element is the Purdue University Multi-Dimensional Integral Test Assembly (PUMA), a well-scaled integral test facility for investigating a broad spectrum of loss-of-coolant accidents in the SBWR. For the second element, tests will be performed in the PUMA facility to produce data for a broad spectrum of loss-of-coolant accidents and transients postulated for the SBWR. For the third element, the PUMA data will be used to assess the capabilities of the thermal-hydraulic RELAP5 code for SBWR analysis, as well as the capabilities of the CONTAIN code for SBWR containment analysis. The PUMA data will also be used to assess the integral performance of the SBWR-unique safety systems that maintain core and containment cooling, and to identify and understand the important phenomena observed in the tests.

PUMA has a low-pressure (150-psi), 1/4-height facility with a volume 1/400 of the SBWR volume. Scaling analysis and facility design were completed in 1994, and facility construction was completed at Purdue University in September 1995. Shakedown tests were scheduled for completion in November 1995, and a total of approximately 30 integral tests will be performed by December 1996.

HUMAN RELIABILITY

Efforts are continuing to develop methods for assessing the impact on risk of changes in human performance due to the introduction of advanced digital displays and controls. These methods were tested on control stations representative of a retrofit, a hybrid, and an advanced control room configuration. The results were peer reviewed and the final report is in preparation.

Research to establish a technical basis for minimum operations shift staffing for advanced control room designs was initiated in Fiscal Year 1994 at the Halden Reactor Project. The research is based on workload and task allocation studies. Data were collected at the Loviisa plant simulator in Finland to represent the conventional configuration and will be collected at the Halden Man-Machine Laboratory simulator to represent the advanced configuration. Loviisa plant operators are serving as subjects in the experiments. Task network modeling will also be used to estimate performance.

Regulatory Application of New Source Terms

The Commission's reactor site criteria (10 CFR Part 100) require that an accidental fission product release from the core into containment be assumed to occur, and that its radiological consequences be evaluated. The criteria for the release into containment are derived from the 1962 report, TID-14844.

Since 1962, the NRC has gained a better understanding of the timing and nature of fission product release. As a result, the staff has identified a number of regulatory activities that may benefit from changes introduced as a result of source term and severe accident research. NRC research in this area is reflected in the updated version of TID-14844, which has been in use for three decades in connection with plant siting assessments. An extensive review of the updated TID-14844 has been completed; and the final NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," was published in February 1995. The revised source terms are currently being used in the AP600 certification, and the NRC and the utilities are evaluating their use for current reactor licensing applications.

UPDATE OF SITING REGULATIONS

In FY 95, staff efforts continued to update 10 CFR Part 100, "Reactor Site Criteria." A proposed rule to revise Part 100 was first issued for comment in October 1992. That proposed rule eliminated source term and dose calculations for reactor siting by specifying a minimum exclusion area distance, and by stating population density criteria. An update of the seismic criteria would incorporate probabilistic, as well as deterministic, methods. Extensive comments, both domestic and foreign, favoring the continued use of source term and dose calculations for reactor siting were received. As a result, in October 1995, the proposed rule was withdrawn, and a revised proposed rule was published in the *Federal Register* for public comment (59 FR 52255). This proposed rule incorporates basic reactor site criteria, and continues the use of source term and dose calculations for siting plants. The public comment period ended on May 12, 1995. The comments are currently being evaluated, and a final rule is expected to be issued in 1996.

MATERIALS USERS

NUCLEAR MATERIALS RESEARCH AND REGULATION DEVELOPMENT

Materials Licensee Performance

Through its human factors regulatory research program, the NRC seeks to improve its understanding and to maintain its requirements concerning the effect of human performance on the safety procedures involving the medical and industrial use of nuclear materials. During FY 95, comprehensive reports were completed on the results of extensive human factors evaluations of medical systems that use nuclear byproduct materials. NUREG/CR-6277 is a five-volume report on the human factors evaluation of teletherapy, and NUREG/CR-6125 is a three-volume report on the human factors evaluation of remote afterloading brachytherapy. The first volume of each set identifies human factors problems within each system, presents alternative approaches to solving these problems, and assesses these approaches with respect to their relative ability to solve the system's human factors problems. The remaining volumes of each set support the findings described in the first volume, providing results of job and task analyses, as well as indepth studies of human-system interface, procedures, training, and organizational practices and policies for each of the systems.

Materials Regulatory Standards

On December 2, 1994, the Commission issued a final rule (59 FR 61767) on the use and preparation of radiopharmaceuticals for diagnosis, therapy, or medical research (10 CFR Parts 30, 32, and 35). This action was taken in response to a petition for rulemaking (PRM-35-9). The final rule provides greater flexibility by allowing properly qualified nuclear pharmacists and authorized physician users greater discretion in preparing radioactive drugs containing byproduct material for medical use. This rule will also allow research involving human subjects using byproduct material, as well as medical use of radiolabeled biologics.

On December 14, 1994, the Commission issued a final rule (59 FR 64283) on notification of incidents (10 CFR Part 72). This rule amends the regulations to revise licensee reporting requirements regarding the notification of events related to radiation safety at independent spent fuel storage installations (ISFSIs) and monitored retrievable storage (MRS) installations.

On August 15, 1995, the Commission issued for comment a proposed rulemaking for comment (60 FR 42079) on physical protection requirements for storage of spent fuel (10 CFR Parts 72 and 73). The proposed rule amends the regulations for the physical protection of spent fuel stored under a specific license. This action is necessary to clarify the physical protection requirements for ISFSIs and MRS installations owned by the Department of Energy. This proposed rule would not affect spent fuel stored at power reactor sites under a general license, and would reduce the regulatory uncertainty regarding the physical protection requirements for ISFSIs.

On December 22, 1994, the Commission issued a final rule (59 FR 65898) on adding a standardized

HUHOMS cask to the list of approved spent fuel storage casks (10 CFR 72.214). This rule will increase the number of NRC-certified spent fuel storage casks from which the holders of power reactor operating licenses can choose to store spent fuel under a general license.

Two petitions for rulemaking were granted during FY 95: PRM-21-02 from NUMARC was granted by publishing a final rulemaking amendment to 10 CFR Part 21 on September 19, 1995 (60 FR 48369). PRM-35-09 from the American College of Nuclear Physicians was granted by publishing a final rulemaking amendment to 10 CFR Part 35 on the use of radiopharmaceuticals on December 2, 1995 (59 FR 61767).

Materials Radiation Protection and Health Effects

MATERIALS RADIATION PROTECTION RULEMAKING

On September 20, 1995, the Commission issued a final rule (60 FR 48612) on administering radiation and radioactive materials to patients (10 CFR Parts 20 and 35). The final rule will amend the regulations to clarify that the administration of radiation or radioactive materials to any patient, even a patient not supposed to receive an administration, is regulated by the NRC's provisions governing the medical use of byproduct material and is not within the scope of regulations concerning NRC's standards for protection against radiation. This rule was necessary to indicate clearly that this has been the NRC's policy; it does not represent a change in policy.

On December 28, 1994, the Commission issued for comment a proposed rulemaking (59 FR 66814) on recordkeeping requirements regarding the termination or transfer of licensed activities (10 CFR Parts 30, 40, 70, and 72). The proposed rule would amend the regulations pertaining to the disposition of certain records when a licensee terminates licensed activities, or when licensed activities are transferred to another licensee. If licensed activities will continue at the same location, the proposed rule would require a licensee to transfer records necessary to evaluate offsite consequences, and to decommission the facility effectively to the new licensee. Similarly, the proposed rule would require a licensee to send records, such as waste disposal and dose records, to the NRC after the license is terminated.

On January 4, 1995, the Commission issued a final rule (60 FR 322) on preparation, transfer for commercial distribution, and use of byproduct material for medical use (10 CFR Part 32). The final rule will amend the regulations to provide greater flexibility in these areas.

The NRC is currently developing a final rule that would amend the Commission's regulations to revise the radiography and radiation safety requirements for radiographic operations (10 CFR Part 34). The final rule would amend the regulations to clarify the requirements in Section 34.27 and to bring Part 34 into conformance with the approach developed by the Conference of Radiation Control Program Directors, Inc., and the State of Texas in Part 31 of the Texas Regulations for Control of Radiation. Comments and suggestions from regulatory groups, users, and manufacturers are considered in the final revision. In December 1994, the NRC staff held a 3-day public workshop with Agreement States and the American Society for Nondestructive Testing to discuss the issues and possible resolutions. This rulemaking will also respond to a petition for rulemaking (PRM-34-4) from the International Union of Operating Engineers, Local No. 2. The final rule will be published in FY 96.

The NRC is also developing a final rule that would amend the Commission's regulations to revise the patient release criteria contained in 10 CFR 35.75, and the applicability of the dose limits for members of the public in 10 CFR 20.1301. This rulemaking will respond to the requests of three petitions for rulemaking. PRM-20-20 from Dr. Carol S. Marcus and PRM-35-10/10a and PRM-35-11 from the American College of Nuclear Medicine. These requests expressed concern that the five-fold reduction in the public dose limit (5 to 1 mSv y^{-1}) might lead to a five-fold reduction in the exposure rate and activity criteria for patient release. Consequently, patients might have to remain in hospitals for a longer period of time, and patients now treated on an outpatient basis would have to be hospitalized. However, the new criteria for patient release are dose based, rather than activity based, and are consistent with the recommendations of the International Commission on Radiation Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP). Licensees may authorize a patient's release if the total effective dose equivalent to any other individual from exposure to the released individual is not likely to exceed 5 millisieverts (0.5 rem). The final rule will be published in FY 96.

In support of this final rule and under a grant funded by the NRC, the NCRP published NCRP Commentary No. 11, "Dose Limits for Individuals Who Receive Exposure from Radionuclide Therapy Patients." This commentary addresses the risks to members of the public exposed to radiation from radionuclide therapy patients, discusses the societal costs and benefits of controlling these risks, and recommends methods by which the radiation risks to the public can be controlled in a manner that is as low as reasonably achievable (ALARA) and acceptable from the viewpoint of patient access to efficacious medical care.

During FY 95, the Commission approved a proposed rule that would amend the regulations to constrain air emissions of radionuclides to 10 mrem/yr, similar to the program developed pursuant to Appendix I to 10 CFR Part 50 for power reactors. The proposed rulemaking will codify the regulatory basis for the Environmental Protection Agency (EPA) to make a legal finding that the NRC program provides an ample margin of safety to protect the public and the environment from air emissions of radionuclides. Such a finding would permit the EPA to rescind 40 CFR Part 61 for NRC-licensed facilities other than power reactors. This proposed rule will demonstrate that the NRC program is sufficient to protect the public and the environment from airborne radionuclide emissions from NRC-licensed facilities, and to eliminate the need for dual regulation, thereby reducing the burden of compliance on licensees.

The Commission also denied two petitions for rulemaking during FY 95. In PRM-20-23 from Steve Gannis, dated March 13, 1995 (60 FR 13385), the petitioner requested that the Commission amend its regulations because he believed the requirements in 10 CFR Part 20 should limit annual dose of radiation to the public to 1 mr. PRM-72-01 from the Maryland Safe Energy Coalition dated July 26, 1995 (60 FR 38286), identified generic issues related to dry cask storage (10 CFR Part 72).

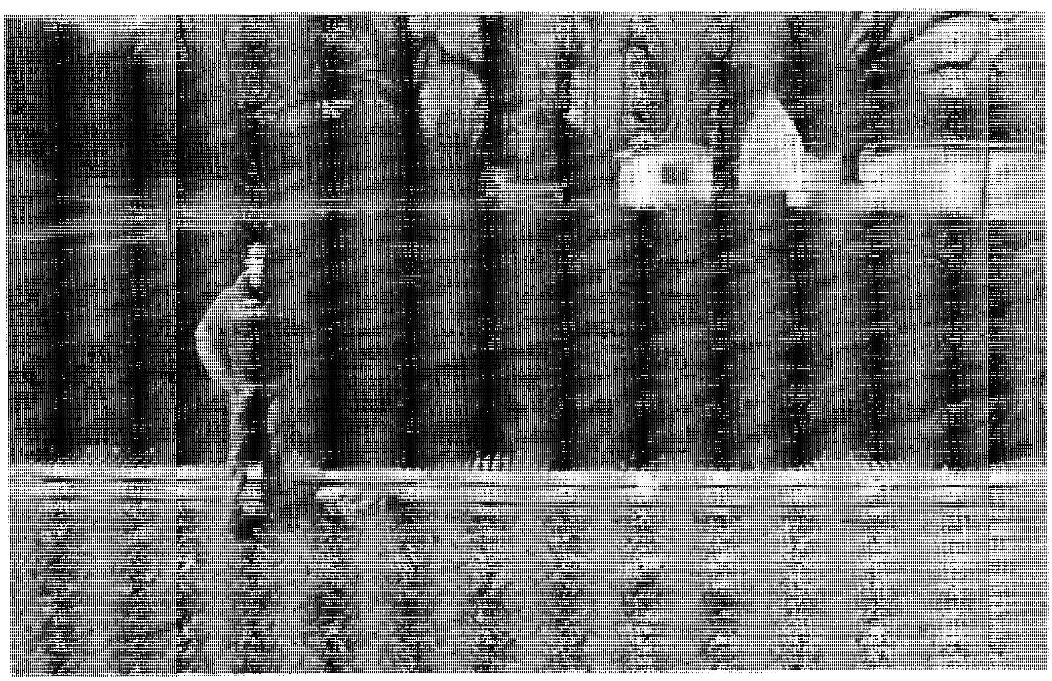
EMBRYO/FETAL DOSE FROM MATERNAL INTAKE

In FY 95, the NRC completed a study to improve understanding of the contribution of maternal radionuclide burdens to prenatal radiation exposure; the final report is scheduled to be published in FY 96. The methods and data developed under this project have been used by the NRC in preparing Regulatory Guide 8.36, "Radiation Dose to Embryo/Fetus," which describes acceptable methods of compliance with Section 20.1208 of 10 CFR Part 20. This guide might have to be revised to incorporate the information that will be presented in the final report. The methods developed under this project are also useful in calculations of doses in cases of accidental releases of radioactive materials.

CRITICALITY AND FUEL CYCLE SAFETY

During FY 95, the Oak Ridge National Laboratory continued to develop a slide rule for estimating nuclear criticality information. One goal of this project is to provide information useful in estimating potential fission yields for homogeneous fissile material solutions. The second goal is to provide a readily available nuclear criticality accident emergency evaluation and response tool that will address the preponderance of potential accidents at NRC-licensed nonreactor nuclear facilities that process fissionable materials.

Two views of bioengineering water management testing sites at the Maryland Agricultural Experiment Station in Beltsville, Maryland.



nuclear reactor decontamination waste was extended to examine samples from a full reactor decontamination at Indian Point. These studies were aimed at determining radionuclide and chelating agent releases, as well as the compressive strength of the cement solidified waste. Test results are being summarized in papers that will be published in scientific literature and in NUREG-series reports prepared by contractors.

Plutonium 239 (Pu–239) activity levels in decontamination wastes presented in NUREG/CR–6201 were used by the National Academy of Sciences in assessing potential Pu–239 inventory levels for the proposed Ward Valley LLW disposal facility.

Field lysimeter studies containing radioactive ion-exchange resins solidified in cement and vinyl ester-styrene continued at the Oak Ridge and Argonne National Laboratories to determine radionuclide release rates and transport in soils under environmental conditions. Recent observations (NUREG/CR–5291) have indicated upward migration at the ORNL site, and a preliminary investigation was completed on the presence of radio-colloids in leachate from the lysimeters.

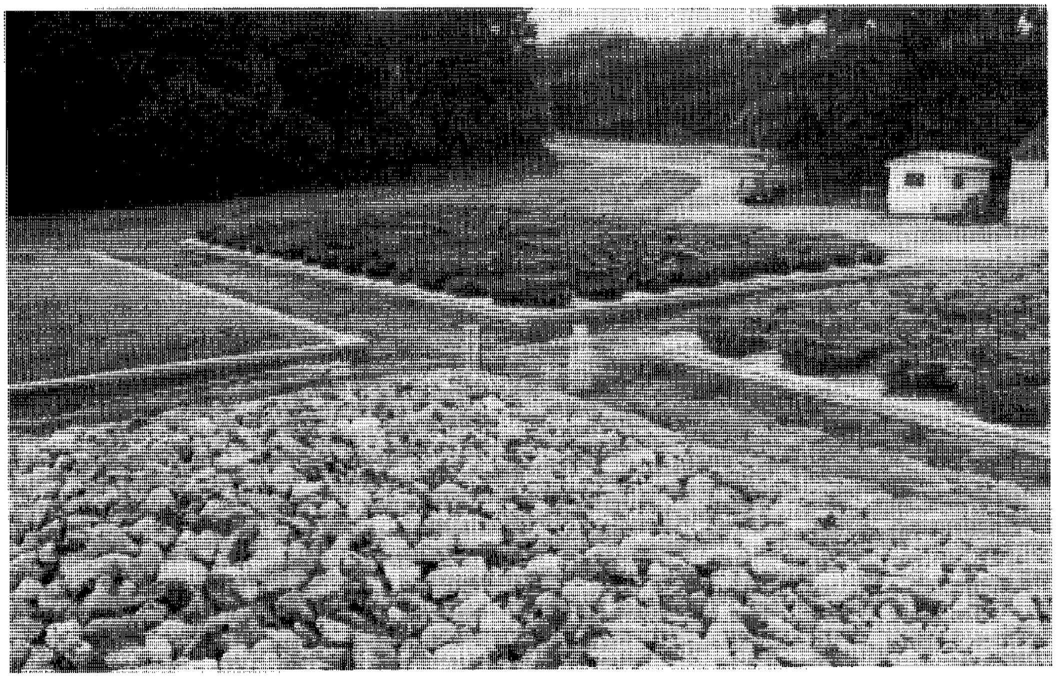
Studies were also completed at INEL during FY 95 (NUREG/CR–6188) to investigate biodegradation of LLW by microorganisms to ensure that the stability requirements of 10 CFR Part 61 are met, and to evaluate microbially enhanced release of radionuclides from LLW. Studies continued at the Pacific National Laboratories (PNL) to assess levels of long-lived radionuclides in LLW and to determine scaling factors for assessing hard-to-measure radionuclides in LLW. Work at PNL examined the effects of chelating agents used in reactor decontamination on leaching and transport in soils of radionuclides from LLW. Also a new research project was initiated to determine the solubility of radionuclides found in LLW and at contaminated sites for use in source terms used in performance assessments for license reviews.

Infiltration of Water

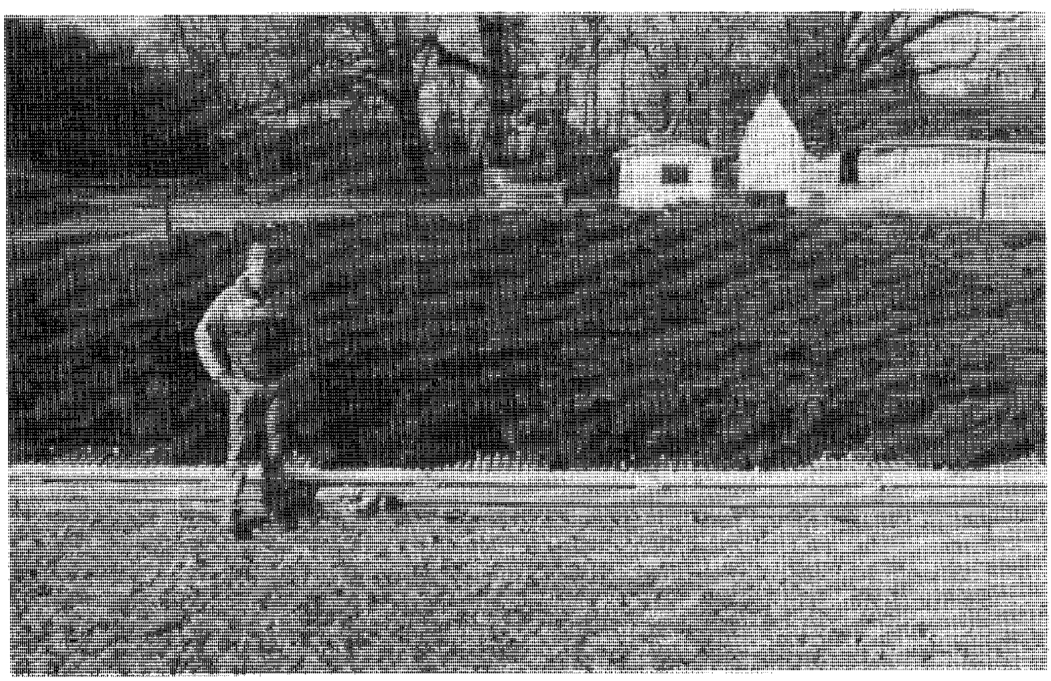
The University of California at Berkeley, in cooperation with the University of Maryland, continued to field test—at the Maryland Agricultural Experiment Station in Beltsville, Maryland—a variety of covers for use in LLW disposal. In addition to any LLW disposal method that includes an earthen cover, these covers can also apply to LLW, the Site Decommissioning Management Plan (SDMP), Uranium Mill Tailings Remedial Action (UMTRA), and hazardous waste sites. Two designs are proving to be particularly effective. One, called bioengineering water management, shown in the following two photographs, reduced water infiltration to a negligible amount, and dewatered the cells to which it was applied.

Hence, this cover lends itself to remedial action for sites susceptible to subsidence. In 1993, the New York State Energy Research and Development Administration finished constructing a bioengineering water management cover over such a trench at the West Valley LLW disposal facility in New York. A second promising cover consists of a conductive layer barrier placed below a resistive layer barrier. This cover has functioned perfectly since its installation in January 1990. Research results for 1995 were published in NUREG/CR–4918, Volume 8.

In 1995, PNL completed a hydrologic evaluation methodology for estimating water movement through the unsaturated zone at commercial LLW sites; this methodology is documented in NUREG/CR–6346, which presents results from two application studies for a hypothetical arid site and humid site. The report demonstrates the methodology, using actual site-specific data and realistic facility designs. It also demonstrates strategies for addressing the analytical difficulties arising in any complex hydrogeologic evaluation of the unsaturated zone. PNL and its subcontractor, New Mexico State University, have also developed the PolyRES code for solving transient, two-dimensional water flow in unsaturated-saturated soils; this code is documented in NUREG/CR–6366, which provides example problems demonstrating the versatility and robustness of the PolyRES code.



Two views of bioengineering water management testing sites at the Maryland Agricultural Experiment Station in Beltsville, Maryland.



HYDROLOGY AND GEOCHEMISTRY

Radionuclide Migration in Soil

Current models of radionuclide retardation in soils introduce significant conservatism into current assessments of performance of an LLW disposal facility. This conservatism results from the quantitative uncertainty as to the degree of retardation in different soil types under various conditions.

To reduce this uncertainty, and permit more realistic assessment of actual expected performance of an LLW disposal facility, the NRC is developing more realistic retardation models based on field observations and laboratory experiments. At the Chalk River in Canada, PNL collected air, water, soil, and vegetation samples at a site contaminated by a ground-water plume containing C-14. Radiochemical analyses are under way to determine C-14 transfer and uptake coefficients in vegetation for the soil-to-plant and air-to-leaves pathways. Work also continued on the role of naturally produced organic complexes and microparticulates in enhancing migration.

During FY 95, Sandia National Laboratories (SNL) and the U.S. Geological Survey (USGS) continued to examine the application of surface modeling to describe complex soil retardation processes. The SNL work focused on theoretical development of appropriate models and supporting laboratory experiments. The USGS work involved application to uranium transport at a uranium ore body in northern Australia. During 1995, a new NEA-sponsored international study (Analogue Studies in the Alligator Rivers Region) of this uranium deposit was initiated in which the NRC will participate and share the data and results from the USGS project.

Hydrology and Contaminant Transport

PNL has completed work in cooperation with the USGS demonstrating its infiltration methodology using the USGS research data from the LLW disposal facility in Beatty, Nevada. The USGS and PNL investigators presented their work at a National Academy of Science/DOE workshop on surface and subsurface barriers for long-term containment of radioactive waste. The USGS-NRC cooperative research program related to LLW continued in FY 95 and included a workshop held in conjunction with the PNL technical briefing on the completed research studies.

COMPLIANCE, ASSESSMENT, AND MODELING

Performance Assessment

During FY 95, the NRC continued research to develop a realistic, flexible, and computationally tractable performance assessment methodology to support decontamination and decommissioning activities for contaminated sites. These activities include risk assessment, site characterization, remediation, and site monitoring.

LLW Source Term Modeling

During FY 95, extensions were completed to the existing breach, leach, and transport (BLT) LLW source term code developed by the Brookhaven National Laboratory to incorporate additional geochemistry and gaseous release. The background, theory, and description for the extended model were recently published in NUREG/CR-6305, and the code documentation and user's guide are currently being finalized.

DECOMMISSIONING AND ENVIRONMENTAL PROTECTION REGULATION

On July 26, 1995, the Commission issued a final rule (60 FR 38235) to clarify decommissioning funding requirements (10 CFR Parts 30, 40, 70, and 72). The final rule amends the regulations for non-reactor licensees on the expiration and termination of licensees. This rule stipulates that financial assurance must be in place and updated when the licensee decides to cease operation and begin decommissioning. These amendments explicitly describe the implementation and timing requirements for licensees who have been in timely renewal since the issuance of the 1988 decommissioning funding rules, as well as licensees who cease operations without adequate funding arrangements in place.

On July 20, 1995, the Commission issued for comment a proposed rulemaking (60 FR 37374) on decommissioning nuclear power reactors (10 CFR Part 50). The proposed rule would amend the Commission's regulations on the decommissioning procedures that lead to the termination of an operating license for a nuclear power plant and release of the property for unrestricted use. It would also clarify ambiguities that have arisen in the past, and would codify practices that have been used for other licensees on a case-by-case basis.

The NRC is also developing a final rule that would amend the Commission's regulations on radiological criteria for license termination of nuclear facilities (10 CFR Parts 20, 30, 40, 50, 51, 70, and 72). The final rule would amend the regulations to codify the basic principles and radiological criteria that would allow decommissioned lands and structures to be released for public use. Regulatory guidance is also being developed to assist licensees in implementing the final rule. Together, these activities should benefit the public, the industry, and the NRC by providing a risk-based framework within which decommissioning activities and license terminations can be accomplished. The framework will ensure adequate protection of public health and safety, and will identify residual radioactivity criteria upon which licensees can confidently develop reasonable and responsible decommissioning plans. The final rule will be published in FY 96.

In support of the rulemaking, the NRC completed two NUREG-series reports providing a record of comments received from the public on aspects of the decommissioning rule. NUREG/CR-6307, "Summary of Comments Received at the Workshop on Use of a Site-Specific Advisory Board (SSAB) to Facilitate Public Participation in Decommissioning Cases," was published in June 1995. Draft NUREG/CR-6353, "Comments on Proposed Rule on Radiological Criteria for Decommissioning and Related Documents," is currently being prepared for publication.

As previously noted, regulatory guidance is being prepared to assist licensees in implementing the final rule. This supporting guidance will provide measurables in the form of surface and volume radioactivity concentrations and site radioactivity inventory values. The staff held a special workshop in September 1995, inviting public participation on the development of methods for surveys and dose methodology to be included in the regulatory guidance. Also, the NRC published three documents in August 1995 as draft reports for comment to support the regulatory guide preparation. These are NUREG-1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys"; NUREG-1506, "Measurement Methods for Radiological Surveys in Support of New Decommissioning Criteria"; and NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions."

Cadmium-Telluride Detector

Work is being carried out under a Small Business Innovative Research (SBIR) contract to develop a high-resolution cadmium-telluride detector to be used as a field tool for measuring contamination in soils. Use of this detector will decrease decommissioning costs by allowing the conduct of real-time surveys in the field, rather than the sampling process currently used.

Decommissioning Cost Reassessment

During FY 95, PNL completed NUREG/CR-5884, "Revised Analyses of Decommissioning for the Reference Pressurized Water Reactor Power Station" (Vols. 1 and 2), and NUREG/CR-6054, "Estimating Pressurized Water Reactor Decommissioning Costs." The companion BWR reports, NUREG/ CR-6174, "Revised Analyses of Decommissioning for the Reference Boiling Water Reactor Power Station" (Vols. 1 and 2), and NUREG/CR-6270, "Estimating Boiling Water Reactor Decommissioning Costs," are in the final stages of review. These final reports are scheduled to be published in FY 96. Based on information already gathered, a proposed rule is being developed to modify the financial assurance requirements for decommissioning nuclear reactors and is scheduled to be issued in FY 96.

Safety Issues Related to Permanently Shutdown Reactors

Brookhaven National Laboratory is evaluating the technical and safety criteria that should remain as part of the decommissioning regulations under 10 CFR Part 50 for permanently shutdown nuclear reactors. Code development is under way to determine radiological consequences for various spent fuel pool configurations during permanent shutdown. Financial assurance requirements for offsite liability will be re-examined based on the technical assessments. Technical criteria needed to support rulemaking for permanently shutdown reactors are also being developed, and the proposed rulemaking is scheduled to begin in FY 96.

HIGH-LEVEL WASTE

HIGH-LEVEL WASTE RULEMAKING

On June 22, 1995, the Commission issued a final rule (60 FR 32430) on emergency planning for independent spent fuel storage facilities (ISFSIs) and monitored retrievable storage (MRS) facilities (10 CFR Part 72). As directed by the Nuclear Waste Policy Act of 1982, the final rule amends regulations regarding emergency planning licensing requirements for ISFSIs and MRS facilities.

HIGH-LEVEL WASTE RESEARCH

The Nuclear Waste Policy Act of 1982 requires the DOE to dispose of high-level radioactive waste (HLW), which can be spent reactor fuel or the byproduct of reprocessing spent fuel, in a deep geologic repository. The act further requires DOE to apply for a license from the NRC to dispose of HLW.

As directed by the Congress in December 1987, the NRC maintains an active HLW research program involving theoretical study and laboratory and field experiments. The objective of this program is to develop an understanding of the physical processes that control and determine repository performance in the unsaturated volcanic tuff at the Yucca Mountain (Nevada) site currently under consideration by the DOE. A related goal of the NRC's HLW research is to provide models, methods, data, and technical information to support the staff's independent judgments as to the appropriateness and adequacy of DOE's demonstration of compliance of the HLW repository with NRC requirements specified in 10 CFR Part 60 and with the EPA's HLW standard, incorporated by reference into 10 CFR Part 60. The program is divided into three parts. First, engineered systems research, examines issues related to controlled release of radionuclides, containment of waste, and the engineering-geology interface in the repository. Second, geologic systems research examines issues related to the hydrology, geochemistry, and geology of the repository site. Third, performance assessment research integrates mathematical models from the other research areas into the NRC's HLW performance assessment methodology. Key technical issues being addressed include methods to assess the long-term performance of the packages containing the HLW, the potential for volcanic and seismic events, and flow and transport mechanisms in unsaturated fractured rocks.

Most NRC HLW research is conducted by the Center for Nuclear Waste Regulatory Analyses (CNWRA), a division of the Southwest Research Institute in San Antonio, Texas. However, a significant portion of the NRC's HLW research on hydrology is being conducted at the University of Arizona.

ENGINEERED SYSTEMS RESEARCH

Controlled Release

The regulation, 10 CFR Part 60, specifies a criterion for the maximum rate of release of radioactive material from the repository's engineered barrier system. Research on controlled release is being conducted by CNWRA at the natural analogue site at Peña Blanca, Mexico.

This site is located in an unsaturated tuff environment similar to that at Yucca Mountain. A uranium ore body is serving as a surrogate for disposed spent fuel, and limits on the expected range of spent fuel behavior in oxidizing chemical environments like those of Yucca Mountain are being developed.

Containment

Part 60 also specifies a criterion for the minimum lifetime of HLW containment within waste packages placed in the repository. CNWRA is conducting confirmatory research on the behavior of waste package materials in the expected repository environment. During FY 95, CNWRA conducted research on stress-corrosion cracking, repassivation potentials for long-term corrosion of stainless steel, thermal stability of stainless steel, and microbial corrosion.

Engineering-Geology Interface

Part 60 requires that the repository's engineered and geologic systems function together, so as not to compromise repository safety. During FY 95, CNWRA conducted two projects related to coupled processes deriving from the engineered system's interaction with its surrounding geologic system. One project, on the redistribution of liquid water by emplaced HLW, is using laboratory-based similitude experiments and theoretical simulations to assess models of this redistribution. Work on this project was completed in FY 95 with a final report and papers on the prediction of thermally driven fluid flows at different scales in unsaturated fractured rock. In the other project, on rock-mechanical aspects of repository performance, CNWRA researchers issued reports on the effect of mine seismicity on ground-water hydrology and research on rock-joint characteristics. CNWRA also continued to support NRC participation in DECOVALEX—an international cooperative effort to test the validity of mathematical models of thermal-hydrological-mechanical interactions, by preparing several chapters in a book entitled "DECOVALEX—Mathematical and Experimental Studies of Coupled Thermo-Hydro-Mechanical Processes in Fractured Media."

GEOLOGIC SYSTEMS RESEARCH

Hydrology

Because ground water transport is considered to be the most likely path for radionuclide transport from an HLW facility to the accessible environment, the NRC is actively studying ground-water infiltration, recharge, flow, and transport processes. At the experimental Apache Leap Tuff site operated by the University of Arizona in partially saturated fractured rock similar to that at the Yucca Mountain site, research continued in FY 95 on testing hydrologic site characterization methods and scale effects in fluid flow and radionuclide transport in unsaturated media. Reports from this research were issued on fingering instabilities, air-permeability tests, and observations of water infiltration.

In FY 95, the CNWRA examined conceptual and mathematical models of the Death Valley regional ground-water system, which includes the Yucca Mountain ground-water system, and began a new project on subregional hydrology. The new project began by examining data in infiltration at Yucca Mountain. Also, during FY 95, the University of Arizona and the CNWRA cooperated in conducting a workshop on flow and transport in unsaturated rocks. The NRC, DOE, and Nevada personnel and their contractors participated in the workshop.

Geochemistry

Knowledge and application of the geochemical conditions at Yucca Mountain are important to understanding many aspects of repository performance, including waste package corrosion, radionuclide release and transport, and alteration of ground-water flow paths. During FY 95, the CNWRA began a new project on non-isothermal geochemistry near emplaced HLW. The project's early efforts concerned thermodynamic data for uranyl silicate minerals.

A significant problem with addressing the geochemistry of radionuclide transport is that the complexity of the chemistry makes calculations difficult and time consuming. Simplified geochemical models have been developed to make transport calculations tractable, but these models oversimplify the chemistry to the point that even so-called bounding calculations may not be truly bounding. For this reason, the NRC initiated a project at CNWRA to determine whether a model could be developed that would be sufficiently realistic to yield credible results and yet be calculationally tractable. During FY 95, the CNWRA tested models of radionuclide sorption on certain kinds of clays, and issued reports and papers on uniform approaches to modeling radionuclide sorption.

Because there are no operating HLW repositories, the NRC studied several ancient man-made structures and natural ore bodies around the world as archaeological and natural analogues to HLW disposal. The objective of these studies has been to use the analogues as physical models to test conceptual and mathematical models of radionuclide release and transport around HLW repositories. During FY 95, CNWRA finished research on an archaeological analogue of HLW disposal near Akrotiri, Greece, and continued work on a geochemical transport analogue at Peña Blanca, Mexico. CNWRA also prepared a paper on a test of long-term predictive geochemical transport modeling at the Akrotiri site. Work at the Peña Blanca site involved hydrogeologic studies and observations of the migration of naturally occurring radionuclides.

Geology

Two CNWRA projects involve investigating (1) techniques to estimate the likelihood of the occurrence of volcanoes in the Yucca Mountain area as an alternative to the method currently used by the DOE, and (2) possible consequences to HLW disposal of a volcano at Yucca Mountain. During FY 95, CNWRA issued two archival papers showing that other methods may suggest a higher likelihood of a volcano at Yucca Mountain than the method currently used by DOE. To gain insight into the consequences of volcanism, the CNWRA has been examining active volcanoes in the United States, Mexico, Nicaragua, and Russia that may be analogous to possible volcanoes at Yucca Mountain. During FY 95, the CNWRA observed active volcanoes in Nicaragua and Russia, and both volcanism research projects were subject to a rigorous peer review.

The CNWRA is also conducting research on tectonic processes in the Basin and Range Province where Yucca Mountain is located. During FY 95, the CNWRA issued reports and papers on faulting and stresses on faulted rock masses in the Basin and Range.

PERFORMANCE ASSESSMENT

The NRC will assess the DOE demonstration of compliance with both the NRC's requirements for HLW disposal given in 10 CFR Part 60 and EPA's HLW standard. The use of a performance assessment methodology, independent of the DOE performance assessment methodology, is a key element in NRC's strategy to review that demonstration of compliance. To support implementation of that strategy, the NRC is conducting research at the CNWRA on the development of performance assessment tools. The tools are being used in their current state of development in the joint NRC–CNWRA HLW Iterative Performance Assessment (IPA) effort, which is providing insights as to the processes and phenomena that may be critical to repository performance. It is anticipated that as the performance assessment tools become more robust, the IPA effort will also assist in setting priorities for future HLW research.

In FY 95, the CNWRA issued reports and papers on multiphase transport theory, an improved method for solving the unsaturated zone's flow equation, an improved method for modeling radionuclide sorption during liquid-phase transport, a new method for analyzing the output of performance assessments, and a stochastic method for analyzing the effects of volcanism on repository performance. The improved method for modeling radionuclide sorption predicts channeling of radionuclide transport caused by the occupation of sorption sites by radionuclides that arrived at the sites earlier.

CHAPTER 10

PROCEEDINGS AND LITIGATION

This chapter covers significant activities, proceedings and decisions of the NRC's Atomic Safety and Licensing Boards (ASLBPs), as well as noteworthy decisions of the Commission in its appellate review of ASLBP decisions. The chapter includes a judicial survey of important litigation involving the NRC during the fiscal year.

OFFICE OF THE SECRETARY

The Secretary of the Commission manages the official adjudicatory dockets for the Commission. These 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 Atomic Safety and Licensing Boards (ASLBs). The Secretary also serves Orders of the Commission and ASLBs on parties to proceedings, and certifies docket indexes to the courts in agency litigations.

ATOMIC SAFETY AND LICENSING BOARDS

The Atomic Energy Act and the Commission's rules provide hearing opportunities for matters such as reactor operating licenses and combined construction/operating licenses, amendments to reactor licenses, antitrust issues, enforcement actions, civil penalties, the licensing of nuclear materials, Program Fraud Civil Remedy Act violations, and special matters the Commission directs to be heard. The Act also requires that a hearing precede every issuance of a construction permit for a nuclear power plant or related facility. Hearings provide individuals and organizations an opportunity to voice their concerns before an independent tribunal and provide a means for NRC license holders and affected parties to contest Commission actions they dispute.

Adjudicatory hearings at the Nuclear Regulatory Commission are conducted by administrative judges sitting alone or in three-member licensing boards. The judges are drawn from the Atomic Safety and Licensing Board Panel ("the Panel") created by the Commission in 1962 under the authority of Section 191 of the Atomic Energy Act. The Panel's judges are lawyers or scientists 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. The Chief Administrative Judge assigns individual judges to particular hearings where their legal or technical knowledge will enable them to resolve the particular technical and legal matters at issue in the proceeding. During fiscal year 1995, the Panel was comprised of 34 administrative judges (13 full-time and 21 part-time). By profession, they included 11 lawyers, 10 public health and environmental scientists, 13 engineers or physicists, and 3 medical doctors. (See Appendix 2 for the names and disciplines of fiscal year 1995 Panel members.)

RESPONSIBILITIES OF LICENSING BOARDS

Licensing boards consist of three administrative judges, comprised of one legal member who chairs the proceeding and two technical members. Three-judge boards are used primarily for proceedings involving commercial nuclear reactors and enforcement actions against licensees. Materials and reactor operators licensing proceedings are heard by a single administrative judge from the Panel. Where one judge presides, the Panel assigns a legal or technical administrative judge as an assistant to the presiding administrative judge. That policy assures the availability of the necessary technical expertise.

Panel judges conduct both formal and informal proceedings. Formal proceedings contain the traditional procedures utilized in litigation including pretrial discovery between the parties and formal trial-type procedures at the hearing. In informal proceedings (for example, proceedings under 10 C.F.R. Part 2, Subpart L), a hearing is only conducted as to those issues that the administrative judge cannot resolve based on the parties' written submissions and any additional information the administrative judge has deemed relevant. Informal proceedings rely heavily on the active involvement of the administrative judge in creating and shaping the record of the proceeding.

The Panel employs a number of case management techniques to make the adjudicatory process as efficient as possible. Licensing boards and presiding officers frequently structure their hearing schedules into distinct phases, each dealing with discrete groupings of related issues. In complex proceedings involving several topics and multiple issues, the Panel may create separate, parallel licensing boards and assign one or more discrete topics to each board. These parallel adjudications save time and enable Panel members' expertise to be more precisely matched to the issues to be resolved. Proceedings are also made more efficient by the efforts of Panel judges to eliminate or at least reduce issues for litigation. They do so by consolidating admissible contentions whenever possible and fostering a free exchange of views among the parties conducive to possible settlement of disputed issues.

To avoid licensing delays and litigation expenses for the parties and the government, the Panel's judges also actively encourage case settlement. The salutary effect of judge involvement in settlement was demonstrated during 1995 in the settlement of several cases involving the Safety Light Corporation of Bloomsburg, Ohio. Settlement was particularly important because litigation expenses could have dissipated financial resources for decontaminating the Bloomsburg site. Due in part to the efforts of the Safety Light licensing boards, settlement was reached prior to litigation for each proceeding, allowing $396,000 to be set aside for site characterization, decontamination, and decommissioning. *Safety Light Corporation,* LBP-94-41, 40 NRC 340 (1994).

TECHNOLOGY AND FACILITIES

During the fiscal year, the Panel continued its leadership role in automating the hearing process. A particularly important innovation was the inclusion, in large complex cases, of significant documents (such as prefiled testimony and hearing transcripts) into an electronic database for use by the judges. The system includes indexing and companion search and retrieval capabilities that considerably enhance and expedite document handling and information accessibility. In 1995, Personal Librarian software (PLS) was utilized for the electronic database which is PC LAN based and can be accessed on stand-alone personal computers. PLS is more efficient and less expensive than previous systems, affording potential savings of $30,000 to $40,000 annually.

Also during the year, some Panel members participated in a project to draft electronic data interchange (EDI) standards for the electronic filing of adjudicatory documents in NRC hearings. These standards, to be developed under the guidance of the American National Standards Institute's X-12 group, are designed to expedite delivery of adjudicatory documents and save resources by eliminating paper mail systems and human handling. They have the potential to be used as filing standards throughout the agency and by other administrative agencies. The project is expected to be completed in Fiscal Year 1996.

In Fiscal Year 1995, the Panel began using its new hearing room in the Two White Flint North building in Rockville, Maryland. The new room, which was designed specifically for conducting agency licensing and enforcement adjudications, accommodates approximately 100 members of the public with an essentially unobstructed view of events within the "well of the court." The room includes a speaker-phone system that allows outside parties to participate or "appear" in the proceedings. Plans for the new hearing room include installation of a local area network that, using notebook computers, will allow the presiding officer, counsel, and witnesses to locate and view electronic text or imaged versions of exhibits, perform word-processing or spreadsheet functions, and perform legal research using outside computer databases.

PERSONNEL CHANGES

Deputy Chief Administrative Judge Robert M. Lazo died in office in May 1994. Judge Lazo had served the Panel for 22 years as a member, Acting Chairman, Executive Secretary, and Deputy Chief Judge. He held a Ph.D. in Chemistry and a J.D. in Law.

During the year, the Commission appointed James M. Gleason Deputy Chief Administrative Judge. Judge Gleason first became a part-time Panel member in 1967 and took a full-time appointment in 1992.

PANEL CASELOAD

There were a total of 33 proceedings on the Panel's docket during Fiscal Year 1995. Eight involved nuclear power plants or related facilities, and 25 involved other Commission licensees. Fourteen cases were closed and 10 new cases were docketed.

The Panel's 1995 caseload primarily involved enforcement actions against licensees, contested license amendment proceedings, and nuclear materials proceedings. Over the next several years, the Panel expects an infusion of new types of proceedings involving decommissioning, license extension of existing reactors, design certification of new reactors, and interim storage for high-level waste.

Six of the Panel's 1995 proceedings were particularly large and complex. These included a construction permit application by Louisiana Energy Services (LES) to build a gas centrifuge uranium enrichment facility in Claiborne, Louisiana; a license recapture proceeding for Pacific Gas and Electric Company's Diablo Canyon Nuclear Reactor; an operating license amendment application by Georgia Power Company to transfer operating control of its Vogtle reactor to another corporate entity; a license amendment application by Gulf States Utilities to transfer ownership and operating control of its River Bend reactor to a new operator and owner; and an enforcement and license amendment proceeding involving the Sequoyah Fuels nuclear fuels facility in Gore, Oklahoma.

The *Diablo Canyon* proceeding was completed in FY 1995, but the other five cases were still ongoing at year's end. In *Diablo Canyon*, the licensee had requested that the operating licenses for the reactors be increased by 13 years for Unit 1 and 15 years for Unit 2 in order to "recapture" the period spent in constructing the plants. Included in the proceeding was a maintenance/surveillance program contention with 43 distinct subparts and a contention dealing with the licensee's use of Thermo Lag as a fire barrier. After conducting full evidentiary hearings, the board held that the licensee's programs were adequate to allow the operating licenses for the Diablo Canyon units to be extended as requested. It did, however, order corrected some problems in the licensee's maintenance and surveillance programs. *Pacific Gas and Electric Company* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-94-35, 40 NRC 180 (1994).

In the *Louisiana Energy Service* case, both the safety and environmental phases of the hearings were concluded during the year, and a licensing board decision is now pending. The litigated contentions pertained to emergency preparedness, decommissioning, financial qualifications, the disposal of nuclear waste, and a novel National Environmental Policy Act (NEPA) related issue regarding "environmental justice" (i.e., the placement of potentially hazardous facilities in areas inhabited by minorities and economically disadvantaged persons).

In *Vogtle*, a whistleblower intervenor alleged that individuals who would manage the plant after license transfer to a new corporate entity lacked requisite character and integrity to operate the facility. The whistleblower claimed that in the past these managers had engaged in a *de facto* transfer of facility operators prior to NRC approval and intentionally misrepresented information to the NRC about the plant's diesel generators. This highly-contested proceeding has included approximately 22 weeks of hearing during 1995, and additional hearing dates are expected in FY 1996.

In the *River Bend* proceeding, the facility's co-owner claimed that a proposed change in operators at the reactor could jeopardize safety. According to the co-owner, the new operators might be underfunded because of legal actions pending against the reactor's present principal owner and operator, Gulf States Utilities, that could result in the utility's bankruptcy. *Gulf States Utilities Company* (River Bend Station, Unit 1), LBP-94-3, 39 NRC 31 (1994). The prehearing phase of the proceeding has been highly contested, and an evidentiary hearing is expected to begin in Fiscal Year 1996.

The *Sequoyah Fuels* litigation involved a materials license amendment proceeding and a related enforcement proceeding regarding a Gore, Oklahoma facility used for processing uranium hexafluoride and uranium tetrafluoride. In the license amendment proceeding, intervening Indian tribes and environmental groups oppose the licensee's curtailment of management and supervision at the site following cessation of commercial operations. In the enforcement proceeding, these same intervenors contest an NRC staff order holding Sequoyah Fuels Corporation's parent company, General Atomics, jointly and severally responsible for providing financial assurance for the facility's decommissioning. An important issue in both proceedings, as well as for future NRC decommissioning policy, is the jurisdictional question whether a parent corporation is liable for decommissioning a contaminated site that is operated by a wholly-owned subsidiary. Evidentiary hearings are scheduled in Fiscal Year 1996 for both proceedings. *Sequoyah Fuels Corporation* (Source Materials License No. SUB-1010), October 14, 1994 Slip Opinion; LBP-94-5, 39 NRC 54 (1994); LBP-94-8, 39 NRC 116 (1994); LBP-94-19, 40 NRC 9 (1994).

During Fiscal Year 1995, licensing boards and presiding officers also ruled on a number of important procedural issues involving docketed Panel cases. These issues included:

Native American Tribe Participation in NRC Proceedings

Native American Tribes and individuals representing the interests of these tribes intervened in three different NRC cases during FY 1995. In each case, presiding officers recognized that while the tribes had to comply with the Commission's rules, they nonetheless enjoyed some special participant status and that recognition should be given to their tribal rights, culture, and religious heritages. This occurred in *Hydro Resources, Inc.*, LBP-95-2, 41 NRC 38 (1995), where the presiding officer granted a Native American a second chance to cure procedural defects in his original petition and in *Sequoyah Fuels Corporation*, Slip Opinion at 2-3 (October 14, 1994), when the presiding officer granted standing to Native Americans based on alleged injury to tribal river beds on the Arkansas River held in trust by the U.S. Government. Similarly, in *Energy Fuels Nuclear, Inc.*, LBP-94-33, 40 NRC 151 (1994), the presiding officer recognized the importance of tribal grave sites, historical monuments, and Indian artifacts as subjects of environmental concern.

Subpart L Hearing Requirements

On several occasions during the year, presiding officers were asked to add new areas of concern in Subpart L informal proceedings after the time for filing these concerns had expired. The presiding officer in *Parks Township* rejected these requests, explaining that late-filed concerns should not be accepted unless the delay is excusable and granting the untimely request will not injure or prejudice other parties. He noted that in that case no attempt had been made to explain the delay and none of the late-filed areas of concern were founded upon information contained in the Hearing File. *Babcock and Wilcox Company* (Parks Township, PA), LBP-95-1, 41 NRC 1 (1995). Employing similar standards, a presiding officer in *Sequoyah Fuels* allowed a petitioner to add late-filed areas of concern because the additional concerns had involved matters that arose after the filing of the original petition and the licensee was not prejudiced because written presentations were still to be filed. *Sequoyah Fuels Corporation,* June 9, 1995 Slip Opinion.

Another Subpart L issue concerned the requirement for parties in their written submissions to presiding officers to submit organized presentations. In *Parks Township,* the intervenors had submitted large volumes of documents without analyzing them or identifying how they related to the case. The presiding officer ruled that parties are responsible for comprehensively organizing and presenting their cases and that presiding officers are not duty-bound to consider disorganized and unstructured presentations. He explained that, as an impartial judge, he could not construct a controversy on behalf of the intervenors from these papers "in bulk", nor for that matter, could he construct their cases for them. *Babcock and Wilcox Company* (Parks Township, PA), LBP-95-1, 41 NRC 1 (1995).

Organizational Standing

In a license renewal proceeding involving the Georgia Tech University research reactor in Atlanta, Georgia, a group titled Georgians against Nuclear Energy (GANE) sought intervention on the basis that one of its members worked near the reactor site. The member had not officially joined GANE until after GANE had filed its initial petition to intervene. As one of the bases for accepting standing, the licensing board held that a person can establish standing on behalf of an organization if that person becomes a member during the time when an amended petition to intervene can still be filed in the proceeding. This was proper, the board reasoned, because the Rules of Practice permit amendment of a petition to intervene "without prior approval" of the board. *Georgia Institute of Technology* (Georgia Tech Research Reactor), LBP-95-6, 41 NRC 281 (1995).

Intervenor Witness Requirements

In a proceeding involving the *Diablo Canyon* reactor, the licensee sought to prevent an intervenor from presenting technical arguments in its post hearing findings of fact because the materials relied on by the intervenor had not been sponsored by the intervenor's own expert witnesses. In overruling the licensee, the board held that NRC intervenors may utilize, as part of their case, documents and testimony introduced through other party witnesses. The board reasoned that to do otherwise would abrogate the right of intervenors to present their cases through cross-examination and might limit technical analysis and conclusions in NRC cases to statements made by licensee and staff expert witnesses. The board, in this regard, pointed out the value of opposing points of view and stressed that the board had the technical expertise to evaluate (and not be prejudiced by) unsponsored materials presented by the parties. *Pacific Gas and Electric Company* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-94-35, 40 NRC 180 (1994).

Access by OI and OIG to Confidential Hearing Materials

In the *Sequoyah Fuels* case, NRC staff had claimed that the NRC's Office of Investigations and Office of the Inspector General should be allowed unfettered access to confidential documents obtained during discovery. A majority of the board ruled that access to these materials could not be obtained without the board's permission and that the board would not grant permission absent a threat to health and safety. The majority reasoned that courts traditionally have not allowed discovery materials to be utilized by prosecutors and that protected information is generally only released when an agency's statute or rules specifically allow it to be. No such authorization existed in this case. *Sequoyah Fuels Corp.* (Gore, Oklahoma Site), LBP-95-5, 41 NRC 253 (1995).

Cross-Examination

In the *Diablo Canyon* proceeding, staff had contended that the intervenor was required to give staff notice prior to the hearing of all documents it intended to introduce into evidence at the hearing. Advance notice would have forced the intervenor to reveal to opposing parties the documents that it intended to utilize for cross-examination purposes at the hearing. The board held that requiring such notice would undercut the utility of the cross-examination. As explained by the board, the parties had not been prejudiced by the lack of notice because they later had been offered additional time to examine these documents. *Pacific Gas and Electric Company* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-94-35, 40 NRC 180 (1994).

SIGNIFICANT COMMISSION DECISIONS

The Commission exercises its appellate authority over adjudications when a party to a Nuclear Regulatory Commission adjudicatory proceeding is dissatisfied with an Atomic Safety and Licensing Board decision and seeks Commission review of that decision, or when the Commission on its own decides that review of a licensing board decision is necessary. The Commission also resolves adjudicatory matters raised for the first time before the Commission. The Office of Commission Appellate Adjudication and the Office of the General Counsel assist the Commission in its adjudicatory role. Discussed briefly below are the more significant Commission decisions in fiscal year 1994. These Commission decisions are published in their entirety in the "Nuclear Regulatory Commission Issuances," NUREG-0750.

The Commission considered appeals from the presiding officer's Initial Decision and Reconsideration Order in *Curators of the University of Missouri*, an informal hearing proceeding that addressed two materials license amendment applications filed by the University. Those amendments 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) are using these materials in research known as the "TRUMP-S Project," the purpose of which is to develop an inexpensive means to reduce the volume of high-level radioactive waste.

The presiding officer had concluded that the University's possession and use of the materials at issue were consistent with the public health and safety, did not harm the common defense and security, and therefore satisfied the requirements of the Atomic Energy Act (AEA). However, in order to decrease further the risks associated with such possession and use, the presiding officer imposed on the University certain additional conditions—mostly related to fire safety. LBP-91-31, 34 NRC 29, *clarified*, LBP-91-34, 34 NRC 159 (1991).

The University appealed to the Commission the presiding officer's imposition of these additional conditions. The intervenors appealed the presiding officer's rulings that the license amendments satisfied the requirements of the AEA; questioned his authority to issue his clarifying order (LBP-91-34); challenged many of his procedural rulings; and appealed his decision to exclude their areas of concern regarding waste disposal, nuclear proliferation and decommissioning funding.

In addressing these two appeals, the Commission for the most part reached the same conclusions as the presiding officer, although in some instances it followed a different line of reasoning. CLI-95-1, 41 NRC 71 (1995). The Commission affirmed the presiding officer's two orders with certain modifications, and thereby approved the University's license amendment applications (but subject to nine new conditions). More specifically, the Commission concluded that the presiding officer had jurisdiction to issue his clarifying order; affirmed his conclusions regarding all procedural issues raised on appeal as well as his decision to exclude three areas of concern; conducted an independent analysis and concluded that the risk of dispersion of radioactive material from the TRUMP-S experiments is acceptably small; and both modified and supplemented the fire safety conditions which the presiding officer had imposed upon the University.

Following the issuance of CLI-95-1, the parties submitted an unprecedented three rounds of petitions for reconsideration. In the first round, the University challenged one of the nine conditions imposed by the Commission, and the intervenors challenge numerous technical and legal underpinnings of CLI-95-1.

The Commission responded in CLI-95-8 by clarifying the wording of one fire-safety condition but otherwise declining to modify CLI-95-1. CLI-95-08, 41 NRC 386 (1995). The University then sought further reconsideration—this time regarding the newly-revised condition. The University complained that the Commission's revised condition did not specify that the triggering conditions for a Site Area Emergency —a potential 1-rem exposure or a "significant release possibly approaching EPA PAG levels"— should be measured (or estimated) at the site boundary.

In August 1995, the Commission issued CLI-95-11, 42 NRC 47, denying the University's second petition on the ground that a reference to the site boundary was already implicit in the revised "Site Area Emergency" condition. In addition, the Commission in CLI-95-11 *sua sponte* required the University either (i) to require evacuation of all persons (except emergency personnel) to a point at least 150 meters from the Alpha Lab if an alert is declared as a result of a fire involving TRUMP-S materials or (ii) to provide the NRC staff sufficient information to determine that the existing Emergency Plan and procedures (or any proposed modifications of the Plan and procedures) adequately protect the public within the site boundary in the case of a fire involving TRUMP-S materials.

In late August, the intervenors sought reconsideration of CLI-95-11 on three grounds: the order was issued when the Commission lacked a quorum and was therefore *ultra vires*; the Commission's acknowledgement in CLI-95-11 that the MURR site is open to the public undermined the Commission's prior determination that the TRUMP-S Project is safe; and the *sua sponte* conditions were inadequate to protect the public. That petition for reconsideration remains under Commission review.

In *Sequoyah Fuels Corp.*, CLI-95-2, 41 NRC 179 (1995), the Commission considered whether a licensee that prematurely ceases operations, without sufficient time to prepare in advance final decommissioning reports and surveys, must renew its license before continuing limited decommissioning-oriented activities. Intervenors (the Native Americans for a Clean Environment and the Cherokee Nation) challenged a presiding officer's decision that permitted the Sequoyah Fuels Corporation (SFC) to withdraw a license renewal application, and that terminated the administrative proceeding then in progress on the application. SFC had notified the Commission in July 1993 that all production activities had ceased at its Gore, Oklahoma facility, and that any continuing activities would be limited to controlling entry into restricted areas and decommissioning the site. Arguing that it no longer needed a license renewal, SFC moved to withdraw its renewal application and to terminate the proceeding then pending on that application. In LBP-93-25, 38 NRC 304 (1993), the presiding officer granted both requests.

In challenging the presiding officer's decision, the intervenors claimed that SFC's withdrawal of its license renewal application would deprive the company of its regulatory authorization to continue any activities, including non-production activities, at its facility. The Commission concluded that 10 C.F.R. § 40.42(e), an agency license extension regulation existing at the time (but since superseded), maintained SFC's license in effect past its expiration date, as long as the licensee limited its actions involving source material to previously-approved actions related to decommissioning and to the control of entry into restricted areas. The Commission rejected as unsupported the intervenors' claim that the former section 40.42(e) was inapplicable to licensees whose sites still contained unused raw source material—in SFC's case, bulk yellowcake.

The Commission concluded moreover that even if section 40.42(e) could be read to exclude licensees that had not yet disposed of unused source material, a new provision—which became effective in August 1994, which superseded the former section 40.42(e), and which will be codified at 10 C.F.R. § 40.42(c)—would unambiguously act to extend SFC's license for limited decommissioning purposes, without need for a license renewal, regardless of the nature of the source material onsite. The Commission emphasized, however, that the agency's license extension regulation applicable to materials licensees accords SFC only limited license authority. Because SFC has withdrawn its license renewal application, SFC is no longer authorized to conduct the principal activities authorized by its license, and SFC would still need to obtain a license amendment before implementing any activity—decommissioning-oriented or not—previously unauthorized under its license.

In *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, GA), the Georgians Against Nuclear Energy (GANE) challenged the application of Georgia Institute of Technology (Georgia Tech) to renew its license to operate the Georgia Tech Research Reactor (GTRR). The Atomic Safety and Licensing Board issued an interlocutory order, LBP-95-6, 41 NRC 281 (1995), that both granted GANE's request to intervene and admitted two of GANE's contentions: one challenging the physical security of the GTRR, particularly during the 1996 Olympic Games in Atlanta, and the other alleging problems in the GTRR's management. GANE's physical security contention centered on an alleged "tempting target" for terrorism posed by the GTRR's fuel. Georgia Tech and the NRC staff appealed this order and requested that the Commission stay discovery pending resolution of their appeal. In requesting the stay, Georgia Tech objected to divulging to GANE the details of security arrangements for the Olympic Games.

In an unpublished order issued on June 9, 1995, the Commission temporarily stayed discovery in order to permit the parties to brief the Commission on the merits of a stay. Georgia Tech then introduced new information to the Commission, indicating Georgia Tech's intention to remove the fuel from the research reactor, and to replace it only after the conclusion of the Olympics. In CLI-95-10, 42 NRC 1 (1995), the Commission lifted its June 9th temporary stay of discovery, vacated the Licensing Board's original ruling on the security contention, and remanded that contention to the Board for reconsideration in light of Georgia Tech's new intentions. In October 1995, the Commission upheld the Licensing Board's rulings on GANE's standing and on its management contention. CLI-95-12, 42 NRC 111 (1995).

In *Georgia Power Co.* (Vogtle Electric Generating Plant, Units 1 and 2), CLI-95-9, 41 NRC 404 (1995), the Commission denied a request by the Georgia Power Company (GPC) to stay indefinitely inquiries being conducted by the NRC's Office of Investigations (OI) into matters that concerned GPC. According to GPC, the investigation was interfering with the Atomic Safety and Licensing Board proceeding involving similar issues. GPC further argued that the proceeding should be stayed because the OI investigation could provide an avenue for the intervenor in the licensing board proceeding to obtain affidavits that he had already been denied in the adjudication and that the parallel proceeding interfered with GPC's ability to present its case before the licensing board.

The Commission declined to stay the proceeding because, as a general matter, it is not unusual for an adjudicatory proceeding and an OI investigation on the same general subject matter to proceed simultaneously. Although the Commission has been willing to stay parallel proceedings in the past, the Commission declined to do so here, reasoning that GPC's objections were mostly speculative and did not rise to the level of substantial prejudice required to enjoin an ongoing, customary agency activity.

The Commission issued two decisions denying petitions for review of Initial Decisions. In the first, *Babcock and Wilcox Co.* (Pennsylvania Nuclear Service Operations, Parks Township, PA), intervenors questioned whether there has been, and under a license renewal whether there will be, offsite radiation from Babcock and Wilcox's (B&W) Parks Township facility which threatens the health and safety of the nearby population and threatens radiological contamination of nearby residential, agricultural and business property. The presiding officer found that radioactivity levels onsite at the Parks Township, PA, facility were consistently below even the most conservatively applied maximum permissible concentrations permitted under the Commission's regulations and that no reportable releases in excess of NRC regulatory limits occurred during the period 1976 through 1993. He also found that B&W could be expected to keep exposure rates to members of the general public at very low levels. Based on these findings, he concluded that the licensee is fully qualified to maintain radioactive effluent releases within regulatory limits so that the public health and safety and the environment are not threatened. The presiding officer also rejected a number of subsidiary arguments raised by the intervenors. LBP-94-12, 39 NRC 215 (1994).

On appeal, the intervenors raised factual, legal and public interest challenges to the presiding officer's order. The Commission found no obvious factual error, novel legal question, or important policy issue requiring appellate review under 10 C.F.R. § 2.786(b)(4). The Commission also declined to consider the intervenors' late-filed and unsupported assertion that the "latest readings" of concentration levels of uranium in ash samples taken from the Kiski Valley Water Pollution Control Authority's lagoon exceeded Commission standards, but indicated that the intervenors were free to raise this issue directly with the NRC staff and to provide supporting documentation. CLI-95-4, 41 NRC 248 (1995).

In the second case where the Commission denied review, *Kenneth G. Pierce* (Shorewood, IL), the Licensing Board had issued an Initial Decision overturning an enforcement order of NRC staff prohibiting Mr. Kenneth G. Pierce from involvement in NRC-licensed activities for three years, with an additional two-year reporting period. LBP-95-4, 41 NRC 203 (1995).

On appeal, the Commission granted a motion by Commonwealth Edison Company (ComEd) to file an *amicus curiae* brief, but then rejected the arguments of both ComEd and the NRC staff that the Licensing Board's Initial Decision contained "clearly erroneous" factual findings, *i.e.*, that the Board's findings were not "plausible in light of the record viewed in its entirety." The Commission concluded that ComEd and the staff had instead demonstrated only that the record evidence in this case could be understood to support a view sharply different from that of the Board. Such a showing was insufficient to trigger discretionary review by the Commission. CLI-95-6, 41 NRC 381 (1995).

In addition to the nine decisions summarized above, the Commission also issued orders in *Georgia Power Co.*, CLI-94-15, 40 NRC 319 (1994); *Dr. James E. Bauer*, CLI-95-3, 41 NRC 245 (1995); *Georgia Power Co.*, CLI-95-5, 41 NRC 321 (1995); *Louisiana Energy Services*, CLI-95-7, 41 NRC 383 (1995); and *Georgia Power Co.*, Docket Nos. 50-424-OLA-3 & 50-425-OLA-3 [no CLI number, unpublished] (9/13/95).

JUDICIAL REVIEW

The more significant litigation involving the Commission during fiscal year 1995 is summarized below.

PENDING CASES

General Atomics v. NRC (S.D. Cal. 1995) (9th Cir. Appeal Pending)

General Atomics brought this lawsuit in federal district court in San Diego seeking to halt an ongoing NRC licensing board proceeding. In that proceeding the NRC staff seeks to establish the agency's right to hold General Atomics financially accountable for the cleanup of a facility owned by a General Atomics subsidiary, Sequoyah Fuels Corporation. General Atomics' suit claimed that the NRC has no authority to hold a corporate parent liable for its subsidiaries' actions. We filed a motion to dismiss arguing that the district court lacked jurisdiction. General Atomics opposed that motion and asked that the district court enter a preliminary injunction halting further NRC proceedings.

In a thorough opinion, the district court agreed with our position in full. The court found that federal district court was not the proper forum for General Atomics' suit because the Hobbs Act vests exclusive jurisdiction in the courts of appeals over licensing-related suits like General Atomics. The court also ruled that, in the alternative, General Atomics was not free to go to court to challenge a Licensing Board proceeding in the middle of the proceeding. The court held General Atomics to the usual doctrine that only *final* agency decisions are reviewable in court.

General Atomics has appealed the case to the Ninth Circuit.

SIGNIFICANT JUDICIAL DECISIONS

Citizens Awareness Network, Inc. v. NRC, 59 F.3d 284 (1st Cir. 1995)

Petitioner brought this lawsuit to challenge the Commission's rejection of a request for a hearing on the "component removal project" ("CRP") implemented by the Yankee Atomic Electric Company in decommissioning its nuclear power reactor at Rowe, Massachusetts. After protracted settlement talks proved unsuccessful, the parties filed briefs, and the court heard oral argument in January 1995. On July 20 the court issued a decision setting aside the NRC's rejection of petitioner's hearing request.

Using strong rhetoric, the court said that the NRC's "abrupt" shift in decommissioning policy in 1993 "appears utterly irrational" and is "inconsistent" with the Commission's statutory obligation to provide "notice and hearing" when modifying rules. 59 F.3d 284, 291-292 (1st Cir. 1995). The court also found that the NRC staff's various "grants of permission" to Yankee Atomic, especially the NRC's "approval" of CRP expenditures from the decommissioning trust fund, required an environmental review under NEPA. *Id.* at 292-293. Finally, after brushing aside petitioner's claim under the Fifth Amendment's Takings and Due Process Clauses as too "bare" and "vague" (*Id.* at 293-294), the court held the Staff's "approval" of the CRP, as well as the agency's shift in decommissioning policy, amounted to granting a license amendment and triggered a right to a hearing under § 189a of the Atomic Energy Act (*id.* at 294-295).

Kelley v. Selin, 42 F. 3d 1501 (6th Cir. 1995), *cert. denied*, 115 S. Ct. 2611 (1995).

In this case a panel of the Sixth Circuit upheld an NRC rule approving the use of a VSC-24 concrete cask for storage of spent nuclear fuel. The Attorney General of Michigan, two citizens' groups in Michigan, and several individuals had filed suit based on their concern over the use of the VSC-24 at the Palisades power reactor.

The court found the NRC's VSC-24 rule consistent with Congress' intent in enacting the Nuclear Waste Policy Act of 1982 and viewed petitioners' argument as "essentially an attack on the policy choice made by the Congress" to encourage dry cask storage. 42 F. 3d 1501, 1521 (6th Cir. 1995). In reaching this result, the court made a number of significant rulings:

First, the court held that "not every proposed action" calls for an adjudicatory hearing. *Id.* at 1511." [T]o prevail on a claim that the NRC is bound to conduct its proceedings in a particular manner, a petitioner "must point to a statute specifically mandating that procedure..." *Id.* at 1511 (citation omitted). *See also id. at* 1514 ("the right to automatic participation applies only when the agency acts in a manner provided for in § 189a").

Second, the court held that "NRC decision-making, and in particular the procedure used by the agency in the course of its decisionmaking, is entitled to substantial deference by this court." *Id.* at 1513. Pointing to the NRC's consideration of public comments and to the agency's three-hour public meeting, the court refused "to micro-manage NRC decisionmaking" and rejected "petitioners' assertion that the NRC attempted to shut them out of meaningful participation." *Id.* at 1513. The court also suggested that an informal public meeting might constitute the "hearing" required by statute, as "nothing in the applicable statutes or the relevant precedents compels the NRC to hold a formal adjudicatory hearing." *Id.* at 1513.

Third, the court rejected the argument that the agency's process for licensee safety evaluations under 10 C.F.R. § 50.59 amounted to "self-regulation," finding the approach instead "consistent with the NRC's historical method of regulation, which has long allowed licensees to make initial determinations about changes to their facilities and has enabled the agency to retain its enforcement power." *Id.* at 1515.

Fourth, the court found no NEPA problems in the NRC's "tiering" of its environmental assessment for the VSC-24 on prior generic environmental reviews and on prior environmental reviews for individual reactor sites. *Id.* at 1516.

Finally, the court declined to consider petitioners' effort to challenge the NRC's 1990 rule setting up a generic rulemaking process for dry cask storage approval, on the ground "that petitioners should have asserted such a claim within the 60-day period allowed by the Hobbs Act." *Id.* at 1515, n.3.

The Supreme Court denied *certiorari* on June 26, 1995. 115 S. Ct. 2611 (1995).

United States v. Oncology Services Corp., 60 F. 3d 1015 (3d Cir. 1995)

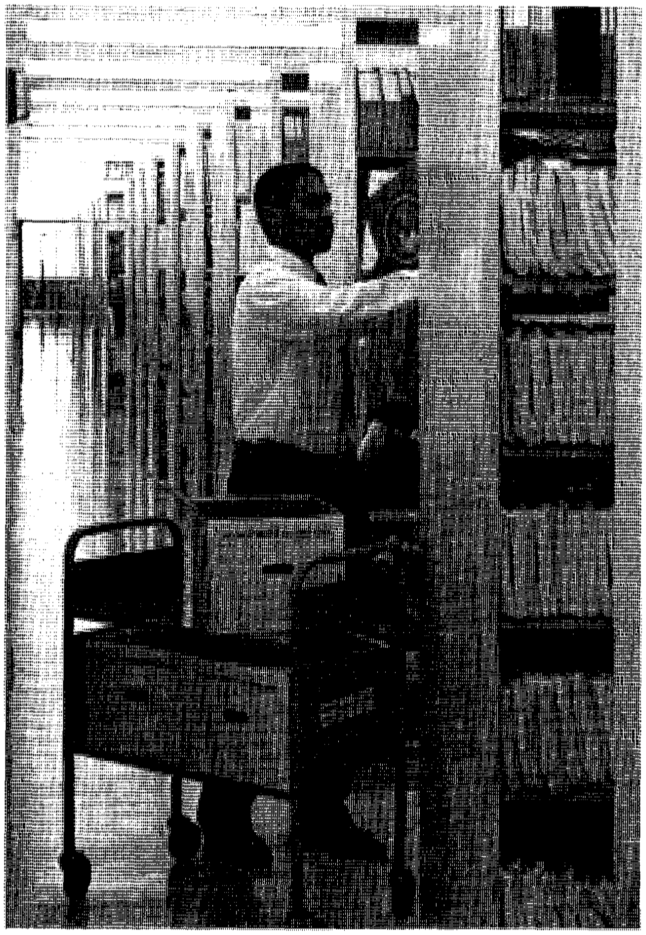
This is a longstanding subpoena enforcement suit that a district court in Pennsylvania dismissed as moot late in 1994. The subpoena was issued during an Office of Investigation inquiry into the activities of a medical licensee. It sought documents bearing on the licensee's compliance with NRC regulations.

The district court initially took enforcement of the subpoena under advisement, and indicated it would review the subpoened material *in camera*. Ultimately, because OI later "closed" its investigation and issued its report, the court found the enforcement of the subpoena moot, despite a pleading filed by the NRC indicating its continued interest in the subpoened materials. The district court indicated that it would regard any appeal by the government "frivolous." We nonetheless obtained authorization from the Solicitor General for an appeal.

The court of appeals reversed the district court decision. The court of appeals held, as we had argued, that the "mere possibility of a new or continued investigation from the NRC's review of the disputed documents provided a sufficient to seek judicial enforcement of the NRC subpoena." 60 F. 3d 1015, 1019 (3d Cir. 1995). The court saw no significance in OI's administrative "closing" of its investigation in view of the agency's continued interest in the documents and its ongoing right "to assure that there were no violations of NRC regulations." *Id.* at 1019.

The court therefore remanded the case to the district court and advised that court to enforce the NRC subpoena unless it were found plainly "irrelevant to *any* lawful purpose of the NRC." *Id.* at 1019. The court also stated that the "NRC is best able to determine what is relevant," and expressed considerable skepticism about the district court's *in camera* review approach. *Id.* at 1020.

Because the WNRC does not charge the NRC for record storage, the actual savings to the agency is approximately $638,507 per year (see the following photograph).



Preparing documents for delivery to the Washington National Records Center is NRC staff member Dave Pinckney.

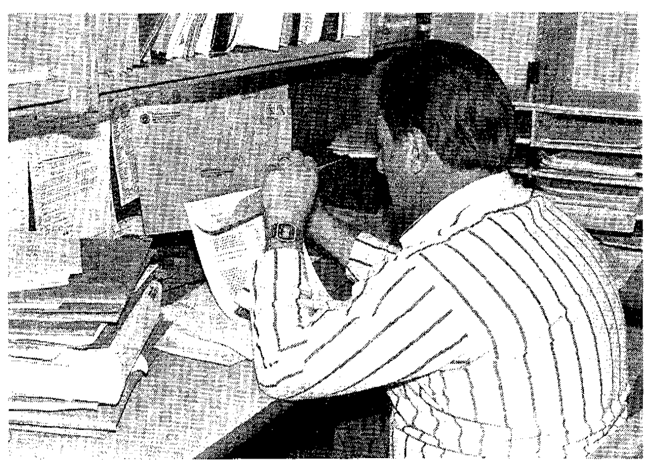
NRC DOCUMENT CONTROL DESK

The NRC's Document Control Desk (DCD) is the agency's central point of receipt and control for correspondence, reports, and applications from NRC licensees, applicants, nuclear vendors, and members of the public. A separate receipt and control function is performed by the Office of the Secretary for legal filings relevant to NRC adjudicatory proceedings and public comments on Commission rulemakings.

On a daily basis, the DCD staff scans several hundred pieces of agency mail, identifies the documents that should be placed in the NRC's central document search and retrieval system (NUDOCS), and assigns a distribution code to each document. The distribution code determines which persons and organizations internal and external to the NRC will receive copies of a document. NRC documents are routinely disseminated to selected technical staff within the agency program offices, the NRC Public Document Room, national laboratories, and NRC contractors.

Documents created by NRC staff are also forwarded to the DCD for placement in the central document management system and the appropriate official file location. In FY 95, the DCD's document flow resulted in the addition of more than 90,000 unique records to the central document database and the distribution of over 16 million pages of information to NRC staff and others.

The DCD personnel also support the NRC staff by serving as the point of contact for those who have questions about whether the NRC received a particular submittal (see the following photograph). They also assist the NRC staff in



NRC staff member James McKnight reviews a document at the NRC Document Control Desk.

CHAPTER 11

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 resources program; activities in the facilities, Freedom of Information, Local Public Document Room, security, and contracts management programs; audits and investigations of the Office of the Inspector General, contracts awarded by the Office of Small Business and Civil Rights, and events sponsored by the Federal Women's Program at NRC.

PERSONNEL MANAGEMENT

1995 NRC STAFF-YEARS EXPENDED

During fiscal year 1995 (FY 95), the NRC expended a total of 3167 staff-years in carrying out its mission. This total included permanent full-time staff and part-time staff, temporary workers, consultants, and cooperative education and "stay-in-school" employees.

RECRUITMENT

During the report period, the NRC hired 59 permanent full-time employees and lost 175 permanent full-time employees, the latter figure representing an attrition rate of 5.7 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, etc.). Applications received by the agency are managed and controlled through an automated applicant tracking system.

AWARDS AND RECOGNITION

In FY 95, the NRC continued to recognize and commend employees for excellent performance. At its Annual Awards Ceremony on April 26, 1995, the NRC presented employees with 2 NRC Distinguished Service Awards and 38 Meritorious Service Awards. During FY 95, NRC employees also received 662 Performance Awards, 559 Special Act Awards, and 316 High Quality Performance Salary Increases. Thirteen NRC employees and eight NRC offices were nominated for awards sponsored by other Federal agencies and national organizations. Three NRC employees received Presidential Distinguished Executive Rank Awards, 11 received Presidential Meritorious Executive Rank Awards, 89 received Senior Executive Service (SES) bonuses, and 12 received SES pay-level increases. Eight senior level employees received performance-based cash awards, and seven received performance-based pay level increases.

BENEFITS

Thrift Savings Plan open seasons were conducted from November 15, 1994, to January 31, 1995, and from May 15, 1995, to July 31, 1995. A Health Benefits open season was conducted from November 14, 1994, to December 12, 1994. A Health Insurance Fair was conducted on November 15, 1994, in conjunction with the open season. Approximately 300 NRC employees attended this fair.

A limited open season for Federal Employees' Group Life Insurance was conducted from May 22, 1995, to July 21, 1995, allowing employees who were not currently enrolled to elect "basic insurance". The open season was not a regularly scheduled event, but was provided by law to establish "living benefits" for terminally ill employees and retirees.

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. Twelve employees qualified as leave recipients during this reporting period.

To achieve its streamlining goals, the agency offered voluntary separation incentive payments (VSIPs) during FY 95. A total of 31 employees took advantage of this provision (14 early-out retirements and 17 optional retirements). During FY 95, the NRC conducted eight 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 expands the scope of bargaining and calls for a more cooperative and less confrontational relationship between labor and management. Pursuant to the order, the agency, and the union, have 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 in a dispute to work together in framing possible resolutions.

NATIONAL PERFORMANCE REVIEW

The Office of Personnel (OP) has been carefully reviewing the human resources management recommendations in the *National Performance Review* (NPR) report, published in September 1993 and the follow-on report, *Reinventing Human Resources Management*. While many NPR recommendations require changes in the law or in OPM regulations, others may be implemented without delay. OP has already begun to implement some of the suggested changes. Two of the changes that will have an impact on the agency are (1) the reduction in staff size and the ratio of supervisors and managers to employees, and (2) the elimination or reduction of personnel directives and processes. While the former change will affect the nature of supervisory relationships, the latter will provide management with more flexibility and fewer procedural barriers in managing the NRC's human resources. During FY 95, the ratio of supervisors and managers to employees was decreased from 1:4.8 to 1:5.4 (a decrease of 12.5 percent), and seven Management Directives were eliminated.

TRAINING AND DEVELOPMENT

During FY 95, OP provided more than 100 different onsite courses in executive, management, supervisory, and administrative skills, as well as 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.

A new agency offering this year was a four-part Planning for Retirement Program: (1) Beginning Federal Service for employees with less than one year of federal service (2) Mid-Career Retirement Planning Seminar for employees in mid-career status with ten to fifteen years of Federal service

(3) Planning for Retirement Seminar for individuals within five to ten years of retirement (4) Retirement Planning Review targeting individuals within six months of retirement.

The computer applications curriculum continued to be revised so that employees could learn how to use the latest computer resources available at the NRC, and how to upgrade to a local-area network (LAN) environment based on Microsoft Windows. Examples of new or updated courses include WordPerfect, WordPerfect Office for Windows, Windows, and the Internet and Mosaic/Netscape. Offices using advanced computer technologies received instruction in advanced office system capabilities and application training in UNIX, S–PLUS, and EarthVision.

The Individualized Learning Center continued to provide employees with convenient access to training through the latest in audio/video, computer-based, and multimedia programming. In FY 95, NRC employees had access to more than 300 programs (an increase of 50 programs since FY 94) in project management, communication, management and supervision, computer skills, secretarial skills, and employee assistance.

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 AND HEALTH PROGRAMS

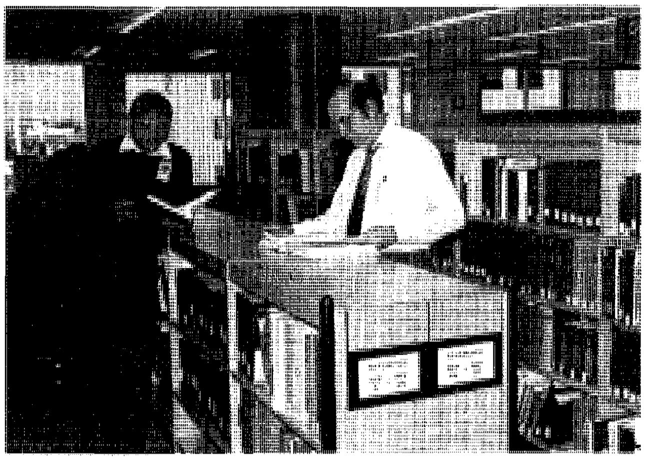
During FY 95, the Employee Assistance Program (EAP) continued to give individual counseling and referral assistance to NRC personnel with such problems as chemical dependency, job stress, chronic illness, sexual harassment, and family issues. The agency continued to make EAP services readily accessible to regional and field personnel through contract providers. Seventy-two percent of employees received training on HIV/AIDS in the workplace and approximately 50 percent of employees received education concerning the EAP and the Drug-Free Workplace. In addition, the agency provided information on a variety of substance abuse and mental health topics.

An 11-room health center was constructed and opened at the NRC headquarters during FY 95. Hummer Associates operates the center, having been awarded a 1-year contract with 4 option years. The staff consists of a full-time medical officer, two full-time nurses, and a medical receptionist. Services provided include limited treatment and referral for on-the-job illness or injury; screening for diabetes, glaucoma, high blood pressure, and cancer; mammography testing; immunizations; and health awareness programs on topics such as breast cancer, prostate cancer, and smoking cessation.

INFORMATION RESOURCES MANAGEMENT

NRC TECHNICAL LIBRARY

The NRC Technical Library was established in 1975 with a unique collection of scientific and technical books from the Library of the Atomic Energy Commission (AEC). Since its inception, the Library has continually expanded its collection and services for NRC Headquarters, Regional, and Technical Training Center staff (see the following photograph). The Library maintains over 22,000 books, and 800 journals and newsletters, in addition to the AEC's collection of foreign and domestic journals and unclassified research reports. It also houses collections of references and International Atomic Energy Agency (IAEA) publications, an archival collection of NUREGs, and about 500,000 technical research reports dating back to the 1950s. In addition, the Library's collection includes historical and current industrial codes and standards issued by a variety of Government and



The NRC Technical Library.

professional societies, especially those standards that the NRC approves for incorporation by reference in its own regulations. While its primary mission is service to NRC staff, the Library has always made its unique resources accessible to all segments of the public for onsite use and via through to other libraries.

Electronic information resources continue to expand information available to the staff, either online to Internet and commercial resources or inhouse on compact disc/read-only memory (CD–ROM). Examples include the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, civilian and Defense research reports and databases, Department of Energy and IAEA nuclear-related databases, and over 400 other electronic information sources. These resources provide access to bibliographic citations, full-text documents, and statistical data. Some services allow online requests for documents or borrowing materials from other libraries nationwide.

Since the NRC Library opened its new White Flint location in June 1994, the number of onsite users has risen. There is also a wider range of users and queries from the NRC offices, as evidenced by dramatic increase in the number of online database queries. Collocation with all headquarters staff has allowed the Library to operate more economically by reducing the need to purchase multiple copies of printed media. Given the increased costs of books, serials, and electronic information, these efficiencies are critical to maintaining the range of information resources and services required by the NRC staff.

The NRC Library continues to study the costs and benefits of providing commercial information directly to NRC staff via the NRC local-area network. These considerations include costs to acquire and maintain publications that are core to the NRC mission, as contrasted with costs to provide expanded access to a wider range of commercial and nonprofit electronic information. The broader emphasis on electronically available information will benefit the agency in many ways, including increased staff efficiency, reduced elapsed time between a perceived information need and the provision of that information, and access to a larger body of knowledge.

The NRC Library is positioned to provide these information resources today, as well as into the future.

THE WASHINGTON NATIONAL RECORDS CENTER

In addition to its own onsite and offsite records storage areas, the NRC makes use of other Federal facilities. As part of the National Archives and Records Administration (NARA), the Federal Government has established a nationwide system of Federal archives and records centers operated by the NARA Office of Federal Records Centers. The system consists of 14 Federal records centers throughout the United States, including the Washington National Records Center (WNRC) in Suitland, Maryland, for the economical, interim storage of noncurrent Federal agency records pending transfer to the National Archives or other disposition authorized by law. The WNRC has some 800,000 square feet of storage space and serves several hundred Federal agencies and bureaus in Maryland, Virginia, West Virginia, and the Nation's Capital.

The NRC is presently using the WNRC to store 14,849 cubic feet of records that are no longer needed for current business. The WNRC affords the NRC considerable economies in both space and equipment. Based on an average annual cost of $43 per cubic foot for NRC office space and $1.62 per cubic foot for WNRC storage space, the WNRC saves taxpayers approximately $614,452.

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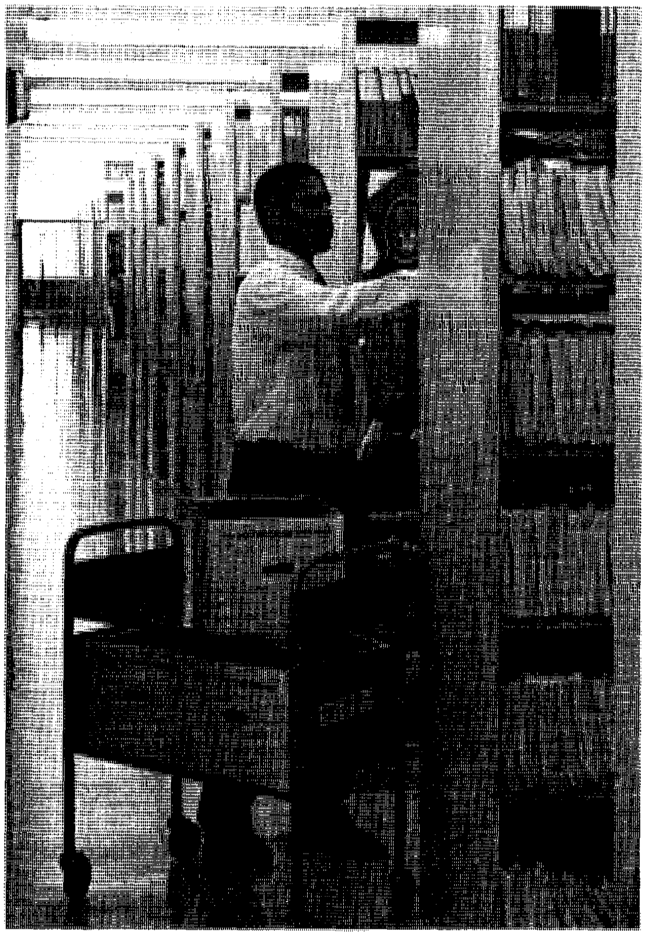

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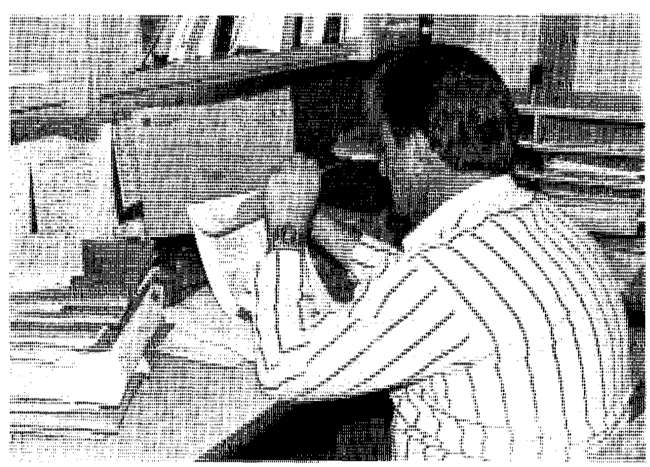

NRC staff member James McKnight reviews a document at the NRC Document Control Desk.

developing new distribution patterns to fulfill specific program needs. The DCD also identifies documents containing sensitive information (proprietary, safeguards, or personal/privacy information) that has been improperly marked, refers those documents to the appropriate contact for resolution, and prevents the inadvertent mishandling of sensitive information.

NETWORK SOFTWARE UPGRADE

The NRC initiated a program to upgrade the personal computer (PC) workstation software used to access the Agency Upgrade of Technology for Office Systems (AUTOS) office automation network. These upgrades were implemented in a two-phased approach.

In the first phase, the WordPerfect Office character-based menu system on each of the agency's approximately 3500 PC workstations was replaced with the Microsoft Windows graphical user interface configured for the AUTOS network [see Figure 4.] This interface permits the staff to efficiently access and move among current applications; it also provides support needed for graphical applications.

During the second phase, DOS versions of the WordPerfect e-mail, calendar, and scheduler software applications were replaced with WordPerfect Office for Windows, an integrated Windows-based application.

COMPUTER VIRUSES

Since the early 1990s, the NRC has taken a very aggressive approach to deal with both real and potential computer virus problems. A virus incident team was established to quickly respond to reported virus incidents by eradicating the virus to keep it from spreading. A site license was obtained for virus scanning software, which was then installed on all AUTOS servers to scan each user workstation at logon, and to give users the capability to scan their own diskettes and hard drives on demand. The software constantly monitors file server and workstation activities by checking incoming and outgoing files for viruses. Infected programs can be stopped, moved offline, or deleted.

The NRC staff is also made aware of the potential for virus problems through seminars, training classes, articles published in the IRM newsletter, Computer Security Day activities, and the development and distribution of a variety of awareness materials. Although the NRC has experienced some incidents of computer virus infection, the extensive awareness program and use of sophisticated detection and eradication tools have made such events increasingly rare and substantially less disruptive.

ADMINISTRATIVE SERVICES

FACILITIES PROGRAM

During fiscal year 1995 (FY 95), several special facilities were completed on the plaza level of the Two White Flint North (TWFN) complex in Rockville, Maryland. First, a newly renovated Health Unit opened in May 1995 in the One White Flint North building for use of employees within the complex. Second, an 8000-square foot, 300-seat, full-service cafeteria capable of serving approximately 1500 people daily, opened in June 1995. A fitness center, opened in September 1995, offering a comprehensive wellness and fitness program to accommodate individual needs. Also, in September 1995, the Maryland Blind Industries opened a "Snack 'N Go" store, specifically to sell sundries such as cards, chips, and sodas.

To enhance the safety and comfort of employees walking from one building to the other, the White Flint Limited Partnership, Inc. awarded contracts to design and construct an enclosed link between Two White Flint and One White Flint. Construction is expected to be completed by the end of September 1996.

In March 1995, the NRC's Office of Administration (ADM) published its policy concerning public use of the auditorium in Two White Flint North.

PROPERTY MANAGEMENT PROGRAM

Executive Order 12821, "Improving Mathematics and Science Education in Support of the 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 an aggressive program for donating computer equipment to school systems nationwide. In FY 95, the NRC donated more than 4700 pieces of computer equipment, including color monitors, system units, and printers with an acquisition value of about $5.4 million.

FREEDOM OF INFORMATION ACT PROGRAM

The NRC Freedom of Information Act (FOIA) program operates under requirements established by statutory law 5 U.S.C. 552 and Department of Justice policy guidance. In FY 95, the NRC received 528 initial requests for information and 22 appeals related to initial decisions. During the same period, the NRC completed 559 initial requests and 22 appeals.

SECURITY PROGRAM

Executive Order 12958

On April 17, 1995, President Clinton signed Executive Order 12958, "Classified National Security Information" (NSI), which revised the Federal Government's system for protecting NSI to emphasize declassification of information. The Administration's intent was to strike a balance between an open Government accessible to the people, and the need to protect information. As a result of Executive Order 12958, the NRC is required to declassify NSI that is 25 years old or older.

National Industrial Security Program

On October 31, 1994, the Deputy Secretary of Defense, acting as the Executive Agent for the National Industrial Security Program (NISP), approved the NISP Operating Manual (NISPOM). This manual establishes Government-wide requirements for protecting classified NSI and restricted data at industrial facilities, including NRC contractors, and to the extent feasible within regulatory requirements, NRC licensees and certificate holders. The NRC was one of the four major agencies involved in this document. The other agencies were the Department of Defense, Department of Energy, and the Central Intelligence Agency.

ADP Personnel Screening Program

During FY 95, the NRC's Division of Security (SEC) implemented Commission policy, which provided for the SEC to assume responsibility for operating a Government-sponsored personnel screening program for computer-related contractors. This program will ensure that contractor employees are eligible for access to the agency's sensitive automated data processing (ADP) systems and data through the same type of background investigation used for NRC employees with comparable access. This screening program is based on the requirements in Office of Management and Budget (OMB) Circular A–130, "Management of Federal Information Resources," and Public Law 100–235, "Computer Security Act of 1987."

In implementing this significant new area of responsibility, the NRC conducted more than 200 face-to-face security assurance interviews and granted temporary access approval to more than 200 contractor employees.

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," which established guidelines for Federal facilities to follow to enhance security. The NRC quickly conducted facility security surveys of NRC Headquarters, all regional offices, the Walnut Creek Field Office, and the Technical Training

Center, using the DOJ guidance to formulate recommendations for upgraded security at each facility. On the basis of these surveys, the NRC has initiated the following efforts:

- procurement of x-ray package screening equipment for NRC facilities
- procurement of walk-through metal detectors for use at various NRC meetings and hearings
- assessment of exterior lighting at NRC Headquarters, with recommendations for increasing the level of lighting
- planning for a security fence along a portion of the NRC Headquarters' property line
- increased guard patrols
- increased control over vehicle access to NRC Headquarters' property

CONTRACT MANAGEMENT

During FY 95, ADM continued its efforts to streamline the acquisition process consistent with objectives of the National Performance Review. Under the Agency's Procurement Reinvention Laboratory, established in late 1993, the NRC has improved procurement lead time and conserved staff effort through a variety of streamlining initiatives for contracting with commercial firms, non-profit organizations, and universities.

Procurement innovations implemented under the Procurement Reinvention Laboratory include use of an oral proposal process, establishment of smaller source evaluation panels, increased delegation of contractual authority, restrictions on written proposal content, and waivers of pre-award audits. The NRC also obtained a waiver of the requirement to synopsize certain technical assistance and research projects in the *Commerce Business Daily*. These innovations have helped the NRC to reduce the processing time for each negotiated new procurement by an average of 1 month (compared to previous procurements).

During FY 95, the NRC considerably expanded the BankCard program, which the Commission implemented in July 1994 as a means of streamlining the acquisition process for purchases below $25,000. Most NRC offices now actively participate in the program, which resulted in a total of 1,707 BankCard transactions valued at $1,143,451 in FY 95.

In addition, ADM acquired and tested electronic commerce software that will enable the agency to gain access to the Government-wide Federal Acquisition Computer Network (FACNET). This capability will enable the NRC to electronically conduct simplified acquisitions.

Under pledges by the NRC's Senior Procurement Executive, ADM participated in Government-wide efforts to use past performance as a key contractor selection criterion, to increase the use of performance-based service contracting, and to use alternative dispute resolution procedures where appropriate. ADM negotiated approximately $100 million in commercial contracts for FY 95.

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 accomplished its mission by performing audits, special evaluations, 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 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.

Some of OIG's accomplishments during FY 1995 included updating the publication entitled *The IG at the NRC.* This revised edition provides, in addition to information on the structure and function of the NRC OIG, detailed policies and procedures for initiating and processing audits, investigations, and regulatory commentaries. It also defines the purpose and substance of the OIG's documentary products and discusses the NRC employee's role in the OIG mission. The OIG also published another pamphlet, *Financial Management at the U.S. Nuclear Regulatory Commission and the Role of the Inspector General.* This publication provides an overview of financial management initiatives at the NRC. In addition, it supplies information about NRC's financial management process and the statutory and procedural requirements that underlie the need for complete and accurate financial information.

Toward the goal of helping the agency to improve its effectiveness, the OIG completed 16 audits of NRC's programs and operations, analyzed 55 contract audit reports, and made 25 recommendations to NRC management. Also during FY 1995, the OIG received 434 allegations, initiated 82 new investigations, and closed 105 cases. In addition, 91 referrals were made to NRC management. OIG also completed regulatory reviews of approximately 165 agency documents, and forwarded more than a dozen regulatory commentaries to the agency with substantive comments on their effect on agency programs and operations.

OIG FISCAL YEAR 1995 AUDITS

The following are representative of the results of our audit work for the year:

Chief Financial Officers Act Audit

The OIG audit of the NRC's principal statements for the fiscal year ending September 30, 1994, was issued on March 29, 1995. This audit included an assessment of the agency's internal control structure and its compliance with laws and regulations.

OIG's independent auditor issued an unqualified opinion on the NRC's principal statements, including the statements of financial position, operations and change in net position, cash flows, and budget to actual for the fiscal year ending Sepember 30, 1994.

The independent auditor's Internal Control Report for FY 1994 contained no material weaknesses. However, there were two reportable conditions that had previously been characterized as material weaknesses. These concerned NRC funds spent at the DOE's national laboratories and NRC's failure to bill licensees for 10 CFR Part 170 services in a timely manner.

The independent auditor's report on compliance with laws and regulations addressed the issue of implementing controls to ensure that licensees are billed correctly for services that directly benefit them in accordance with the requirements in 10 CFR Part 170.

Federal Managers' Financial Integrity Act Audit

In compliance with the Federal Manager's Financial Integrity Act (FMFIA), the OIG annually performs a review of the process used by the NRC to evaluate its internal controls and financial management systems.

In this 1994 review issued on December 19, 1994, OIG found that NRC complied with the requirements of the FMFIA during FY 1994. The OIG also found that changes were proposed in NRC's management control program during the past year to anticipate OMB's revised Circular A-123. An Executive Committee for Management Controls was established to oversee changes to the program and to provide continuous attention to efficiency and effectiveness through management controls.

The NRC completed corrective action for three previously reported material weaknesses that were included in the 1993 review of the implementation of FMFIA. These weaknesses related to NRC's computer security program, management of Department of Energy projects, and timely billing of NRC fees.

NRC Needs To Provide Strong Direction for the Licensing Support System

The Nuclear Waste Policy Act of 1982 requires the NRC to approve or disapprove the construction of a high-level waste repository within 3 to 4 years of receiving a Department of Energy (DOE) construction license application. To help meet this deadline, NRC enacted a negotiated rule requiring the development of an electronic information management system called the Licensing Support System (LSS). The rule requires NRC to operate and maintain the system that DOE designs and develops. The OIG reviewed the status of the LSS.

The LSS program has stalled over the past 5 years primarily resulting from delays in the DOE license application schedule, personnel changes at DOE and NRC, changes in program direction, and funding discrepancies. Additional delays have ensued from the lack of a clear definition and agreement on the roles and responsibilities between DOE and NRC. As a result, only 6 years remain in which to develop and implement an LSS before the scheduled repository license application date of 2001.

Because NRC is mandated to conduct a timely licensing proceeding, the agency needs to take a strong, aggressive leadership role. The OIG believes it is crucial that the LSS not impede the license application process. Therefore, OIG recommended that NRC work with DOE to develop a formal agreement on key issues, resolve principal internal management requirements, and develop a contingency plan for resolving important interagency issues that remain unresolved after a reasonable period.

Review of NRC's 2.206 Petition Process

The OIG reviewed the NRC's petition process outlined in Section 2.206 of Part 2 of Title 10 of the Code of Federal Regulations (10 CFR 2.206) to assess the receipt, handling, and tracking of petitions. OIG also examined NRC's response to several additional concerns raised by the public. Under NRC regulations, anyone may request the NRC to initiate a proceeding against an NRC licensee to modify, suspend, or revoke a license, or to request any other such action as may be appropriate.

In July 1993, the NRC staff initiated a review of the 2.206 petition process to assess its effectiveness and credibility, as well as its comprehension by the general public. The staff found a need for improvement in areas that included (1) tracking, handling, and processing petition evaluations; (2) the petitioners involvement in the evaluation process; (3) the independent review of petitions by NRC staff; and (4) NRC's internal procedures for handling petitions. As a result, the staff developed several enhancements to improve the petitioner's participation in the process and to foster communications between the petitioner and the NRC.

The OIG found that the staff's enhancements should result in an improved process for petitioners. The OIG also noted that NRC and the petitioners appear to interpret the 2.206 process differently. To further enhance the credibility and effectiveness of this process, OIG recommended that the NRC initiate actions to familiarize the public with the best method of bringing their concerns to the Commission and that provisions be established to enable petitioners to obtain a copy of NRC's Management Directive 8.11, "Review Process for 10 CFR 2.206 Petitions."

Review of NRC's Research Program Management

Research management is a joint responsibility shared by the NRC's Office of Nuclear Regulatory Research (RES) and other NRC program offices, principally the Office of Nuclear Materials Safety and Safeguards (NMSS) and the Office of Nuclear Reactor Regulation (NRR). The NRC's former Chairman asked OIG to assess the agency's overall management and oversight of its research program.

The OIG previously recommended that the agency strengthen its research management by developing criteria to more accurately measure the performance of research programs and by supporting projects and establishing stronger internal controls to periodically assess research efforts. In response to OIG's report, RES agreed to implement several important changes to its research management process.

The OIG review disclosed that the agency has improved its research management process, but the linkage between the programs in other offices and RES's support for these programs needed to be strengthened in order for the agency to develop a more focused institutional approach to research management. The OIG recommended the use of a conceptual model consisting of "building blocks" or essential elements to help accomplish this objective.

Review of NRC's Implementation of Inspection Manual Chapter 1245 Training Requirements

The OIG reviewed the implementation of the training requirements in NRC Inspection Manual Chapter (MC) 1245. The NRC's reactor and materials inspection programs are essential to the agency's mission of protecting public health and safety. The NRC established formal training requirements to ensure that the inspectors who oversee the operating reactors and material licensees meet minimum knowledge and qualification standards for performing their duties.

MC 1245 provides the training guidelines required for personnel to achieve initial certification as an NRC inspector and maintain knowledge through post-qualification training. In 1989, NRC senior management conducted the Regulatory Impact Survey (RIS) to obtain industry and regulatory staff opinions about the effect of NRC's activities on the safe operation of nuclear power plants and to assist the staff in determining if its regulatory programs need modification. From the RIS, the staff identified three specific regulatory areas needing improvement, which included the areas of "training, preparation, and management of inspectors." Because of the RIS, NRC revised MC 1245 in September 1991 to expand its formal training requirements for inspectors.

The OIG review found that the agency is complying with the initial qualification requirements; however, our audit disclosed that the mandatory post-qualification training requirements were not being fully met, and needed clarification. In addition, the agency's database was deemed inadequate for tracking the training requirements and the inspectors' progression through required training. To improve the implementation of MC 1245, OIG recommended that the NRC's Executive Director for Operations institute steps to ensure that the post-qualification requirements are fully met, revise MC 1245 to clearly identify which inspectors must meet current post-qualification requirements, and ensure that the new training and tracking system meets management needs.

Inspector Training Program: Improved Coordination and Communication Needed

NRC has established training requirements to ensure that its inspectors meet minimum knowledge and qualification standards. An internal study has shown the need to improve inspector training, and the agency expanded its formal training requirements for inspectors. The objective of this review was to assess NRC's management of inspector training.

The OIG noted that NRC generally achieved overall management objectives for the inspector training program. However, enhanced coordination and communication of the planning and delivery processes was needed to improve the efficiency of the program. Breakdowns in communication have caused inefficient resource usage, including revisions to inspection schedules at some increased costs. To enhance training efficiency and effectiveness, OIG recommended that the expectations of training coordinators be clarified, enrollment confirmation data be given to managers and participants on a more timely basis, and that managers be held accountable for developing training requirements and supporting scheduled training.

Improvements Needed in NRC's Oversight of Parking Garage Management Services

Headquarters parking garage management is one of several functions NRC has contracted out. The OIG reviewed the agency's oversight of this contract and the contractor's billings for services during the first year of operations.

Our review disclosed that NRC did not adequately review parking fee collections or contractor charges for managing the garage. These conditions led to unreported monthly permit sales, inconsistent and uncollected daily charges, and inaccurate contractor fees. The review also disclosed that the contractor failed to establish adequate financial controls over parking garage receipts that resulted in unreported monthly sales of $9,314. OIG recommended that NRC formally review and approve contractor remittances for parking garage collections, update and clarify contract terms, and review prior daily parking logs to determine if additional monies are due NRC.

OIG FISCAL YEAR 1995 INVESTIGATIONS

Inadequate NRC Inspection of an Accident at Sequoyah Fuels Corporation

OIG conducted an investigation into allegations in a report generated by Native Americans for a Clean Environment (NACE) entitled "Silent Sirens." NACE's investigative report focused on a November 1992 accident that occurred at Sequoyah Fuels Corporation (SFC), a uranium processing plant in Gore, Oklahoma. The accident released toxic gases that caused injuries to a number of SFC employees and local tree farm workers. OIG investigated 12 of the allegations contained in NACE's report relating to the adequacy of NRC's examination of the accident and fully substantiated 3 of the allegations.

OIG concluded that (1) SFC should have activated offsite sirens to alert the Gore community of the accident, (2) the NRC did not enforce SFC's commitment to seal its control room, and (3) the NRC regional office mistakenly maintained an unapproved version of the SFC's Contingency Plan in Region IV's Incident Response Center.

Alleged Falsification of Radiation Safety Training Records and the NRC's Staff Failure to Adequately Regulate an Agreement

The OIG received information that an NRC Agreement State had failed to adequately investigate allegations regarding the validity of radiation safety training certificates issued to four physicians by the Institute for Nuclear Medical Education (INME). Further, it was alleged that the NRC failed to take any action even though the State did not conduct an adequate investigation.

The OIG investigation substantiated that the State failed to thoroughly investigate an allegation about completion of a radiation safety training program presented in 1988. The OIG investigation determined that records concerning the 1988 training class were incomplete and interviewees were unable to remember relevant details. Because of the inadequate records and the elapsed time before the allegation was appropriately addressed by the NRC, OIG was unable to determine whether the training consisted of the required 200 hours or whether the physicians satisfactorily completed the training program.

OIG's investigation also revealed that the NRC knew of the allegation but failed to ensure that the State's investigation fully addressed the issues. As a result, the NRC did not detect the major shortcomings of the State's investigation.

Fabrication of Friction Test Data Submitted to the NRC by an Idaho National Engineering Laboratory Employee

The Office of Nuclear Regulatory Research (RES) notified the OIG of an allegation that an engineer working for INEL had submitted falsified friction test results. OIG conducted an investigation which revealed that as part of an NRC research contract, the engineer submitted to NRC numerous false and fictitious documents, which included friction test results. OIG referred the matter to the United States Attorney for the District of Idaho to consider for prosecution.

On June 14, 1995, a seven-count indictment was returned against the former laboratory employee for violations of Title 18, United States Code, Section 1001. On August 29, 1995, the former employee pleaded guilty to one charge of making a false statement in U.S. District Court.

As a result of the OIG investigation, the Commission asked the NRC staff to address the broader ramifications of this case, including such issues as: (1) NRC confidence in the integrity of other data supplied by the contractor, (2) the NRC's management control process on this and other contractors, and (3) NRC assurance of adequate management controls within the contractor organization.

Alleged NRC Coverup Involving Ward Valley Waste Site

The National Academy of Sciences (NAS) requested that the NRC review a dispute over the amount of plutonium projected for disposal at the proposed Low-Level Waste Repository (LLWR) situated at Ward Valley, California. The dispute was over a plutonium estimate submitted by the licensee and raised by opponents of the Ward Valley site and a considerably lower estimate projected by the State regulator. The NRC was asked to determine which of these estimates was reasonable.

In their initial response to NAS, the NRC staff concurred with the regulator's lower estimate. A second letter from the NRC advised NAS that the staff further examined the basis for the plutonium waste disposal amount projected by the licensee. According to the staff, the licensee's higher plutonium estimate was based on an NRC document containing a typographical error.

The OIG investigated several allegations that the NRC staff had failed to use NRC official guidance for estimating radioactive waste and had provided misleading information to NAS. This allegedly allowed the NRC to assist the licensee in gaining approval to operate the Ward Valley LLWR site.

No evidence was found to indicate that any NRC staff member intentionally distorted information to assist the licensing of the Ward Valley LLWR site. Further, OIG did not find evidence that the staff attempted to mislead NAS.

Theft of Computer Equipment

The OIG initiated an investigation when it received a report that numerous computer memory chips were disappearing from individual computers throughout the NRC. During this investigation, OIG identified an NRC contractor employee who stole at least $4,000 worth of NRC computer equipment over an 18-month period. OIG was able to retrieve most of the stolen property. OIG referred this case to the United States Attorney's Office for the District of Maryland. In November 1995, the contractor employee pleaded guilty to theft of government property. Since all the missing computer equipment was not accounted for, OIG is continuing to investigate the possible theft of other pieces of equipment.

Prosecution of NRC Advisory Committee Member

The OIG issued an investigative report about a former member of an NRC Advisory Committee in August 1994. In this report, OIG concluded that while with the Committee, the member received reimbursements as a result of 17 false claims he submitted to the NRC for office rental expenses and the cost of secretarial services provided by his spouse.

OIG referred this matter to the U.S. Department of Justice, Public Integrity Section, to consider for criminal prosecution. On August 22, 1995, the former member pleaded guilty to a one-count Information (filed in lieu of an indictment), that charged him with theft of public money in violation of Title 18, United States Code, Section 641. The former Advisory Committee member entered his plea in the United States District Court for the District of Wyoming. The former member was sentenced to serve one-year of probation, fined $3,000, and ordered to pay restitution of $4,280.

Misuse of American Express Government Travel Card

The OIG initiated an investigation of a reactor inspector intern after receiving information from the Division of Accounting and Finance regarding overdue and suspended credit cards. From the investigation, the OIG determined that the intern had used the government credit card on numerous occasions for personal use. It was further determined that the employee's charge privileges had been suspended after submitting a check for payment that was returned for insufficient funds.

The NRC directive governing official travel restricts use of the charge card to official travel purchases. Further, full payment by employees must be made upon receipt of the monthly statement.

As a result of this abuse, the employee was terminated.

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 fiscal year 1995 (FY 95).

- The NRC estimated that $85,000,000 in total prime contracts would be awarded during FY 95. The actual total for prime contract awards was $91,008,000.
- The NRC estimated that small business prime contract awards would total $40,000,000, or 47.06 percent of the estimated total prime contract awards. The actual achievement for small business prime contract awards was $46,908,000, or 51.54 percent of the actual awarded dollar amount reflected above.
- The NRC estimated that awards to "8(a) firms" would total $22,000,000, or 25.88 percent of FY 95 prime contracts. Awards to "8(a) firms" actually totalled $28,003,000, or 30.77 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 $300,000, or 0.35 percent. The actual achievement was $216,000, or 0.24 percent of the actual awarded amount reflected above.
- The estimate for NRC prime contract awards to small business concerns owned and operated by women was $2,000,000, or 2.35 percent. Awards to such firms came to $872,000 or 0.96 percent of the total dollar amount of all prime contract awards.

- The NRC's total subcontract goal in FY 95 was $3,000,000. The NRC's actual subcontract dollar awards were $1,983,000.
- The NRC goal for small business subcontract awards was $1,950,000, or 65 percent of the total estimated subcontract awards. Subcontract awards to small businesses actually totalled $1,269,000, or 64 percent of the total subcontract dollars awarded.
- The NRC goal for subcontract awards to small, disadvantaged businesses was $375,000, or 12.5 percent of the total estimated subcontract awards. Subcontract awards to small, disadvantaged businesses actually totalled $221,000, or 11.14 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 $100,000, or 3.33 percent of the total estimated subcontract dollars. Women-owned businesses actually received subcontracts in the amount of $24,000, or 1.21 percent of the total subcontract dollars awarded.

During FY 95, 200 interviews were conducted with firms wanting to do business with the NRC, and 30 followup meetings were arranged with NRC technical personnel. The staff of The Office Small Business and Civil Rights (SBCR) also participated in five major small business conferences. Most noteworthy among these were the Small Business Week in May 1995, and the Minority Enterprise Development Week in October 1995.

CIVIL RIGHTS PROGRAM

On January 19, 1995, the Chairman signed and forwarded to the Equal Employment Opportunity Commission (EEOC) the update to the NRC's Affirmative Action Program for hiring, placing, and advancing of individuals with disabilities. This update included an analysis of the NRC workforce by grade level, identifying the number of individuals in professional; administrative; technical; clerical, other white collar; supervisory; and leadership; and nonsupervisory blue collar (PATCOB) positions and assessing their promotions and career development.

On February 3, 1995, the Chairman signed and forwarded to the EEOC the NRC's annual *Multi-year Affirmative Action Program Accomplishment Report.* This report provided statistical analyses comparing NRC's employment accomplishments with census availability data in the following major NRC occupations:

- GG-343, Management and Program Analysts
- GG-801, General Engineers
- GG-840, Nuclear Engineers
- GG-1301, General Physicists
- GG-1306, Health Physicists

The report also addressed actions taken to achieve the following main affirmative action objectives:

- Increase the representation of women and minorities in professional occupations and in supervisory, management, and executive positions
- Increase the number of Hispanic employees in all occupations
- Increase the number of disabled employees hired and retained.

The (SBCR) continues to hold meetings once every other month with representatives from the Equal Employment Opportunity (EEO) Advisory Committees and key staff members from the NRC Office of Personnel (OP). These meetings provide an opportunity for the EEO Advisory Committees to bring their concerns to the attention of NRC management before the semiannual EEOC briefings. They also provide an opportunity for the SBCR and OP to apprise the EEO Advisory Committees of management's accomplishments regarding the EEO.

On April 19, 1995, the Commission was briefed concerning the NRC's EEO and Affirmative Employment Programs, goals, and accomplishments. The SBCR and OP jointly coordinated and participated this briefing. Each of the following seven EEO Advisory Committees provided input

Wars I and II, the Korean War, the Vietnam War, and the Persian Gulf War.

In conjunction with the Asian/Pacific American Advisory Committee (APAAC), the SBCR sponsored the annual Asian/Pacific American Heritage Month Program on May 18, 1995. The theme of the program was "Equality, Empowerment, Excellence." Dr. Narain G. Hingorani, President of Hingorani Power Electronics, was the keynote speaker. Ms. Ginny Gong, National President of the Organization of Chinese Americans (OCA), was the guest speaker. Dr. Hingorani shared the story of his career, from its start as an engineer in India to his current position as president of Hingorani Power Electronics. Ms. Gong described some of her efforts through the organization to help ensure and secure the rights of Chinese and other Asian Americans.

In conjunction with the Hispanic Employment Program Advisory Committee (HEPAC), SBCR sponsored a poster exhibit in recognition of National Hispanic Heritage Month. The theme of this exhibit was "Rising To The Top: Notable Hispanic Americans." This exhibit featured Hispanic Medal of Honor recipients, as well as Hispanics in business, politics, community action, and science.

The Affirmative Action and Federal Women's Program Manager offered career development counseling and assistance to employees upon request. These sessions, conducted for approximately 1 hour with each employee, consisted of a background review of experiences and skills, identification of goals and objectives, an outline of a strategy to achieve goals and objectives, and the identification of potential contacts needed. The Individual Development Plan and the Mentoring Program were also reviewed in these sessions.

From left to right is the speaker for the Annual Women's History Month Program, Dr. Adele Scheele, Commissioner de Planque, Commissioner Rogers, and Vandy L. Miller, Director, Office of Small Business and Civil Rights.

Only 18 of the 116 instances of persons consulting with an EEO counselor in FY 95 resulted in formal discrimination complaints. Age was the dominant basis on which complaints were filed, with promotion/non-selection dominating the issues.

AFFIRMATIVE ACTION AND FEDERAL WOMEN'S PROGRAM

During FY 95, SBCR implemented 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 OP. The summaries below highlight the activities completed in FY 95.

During November 1995, SBCR sponsored a video presentation entitled "Native Americans: The History of a People." This video was shown twice during the day on television monitors in both White Flint One and Two. This video presentation reflected upon the contributions and struggles of Native Americans both during the founding years of the American culture, and also today. A related poster exhibit depicted Native American employees at the NRC, and provided a historical summary of the life of Native Americans in North America.

In conjunction with Blacks In Government (BIG), SBCR sponsored the annual Black History Month Program on February 16, 1995. The theme was "Yesterday's Dream, Today's Reality, and Tomorrow's Hope." The guest speaker was Dr. Freeman A. Hrabowski, President, University of Maryland, Baltimore County. Dr. Hrabowski's message about educating our youth was a reminder and wake-up call for our sense of responsibility. The program also featured guest choir director, Mr. Mitchell Fleming (nationally known for his combined gospel choir), and gospel vocalist, Mr. Steven Hurd. A 6-foot poster exhibit portrayed legendary African-American heroes of the past; names of all AfricanAmerican employees at the NRC, representing the present; and pictures of African-American babies and youth representing the future. This exhibit was consistent with the theme that depicted passing a torch from one generation to the next.

In coordination with OP and SBCR, the NRC's Office of Nuclear Reactor Regulation (NRR), held a meeting with the NRR secretaries to discuss future career growth and potential career opportunities for secretaries and administrative staff. The discussion highlighted NRC's and NRR's strategic plans, along with information regarding NRC's developmental programs, and a review of the merit staffing process. Subsequently, a task force was established to address the issues and develop recommendations to resolve problems. Some of the recommendations of this task force were implemented.

FY 95 highlights included the second session of EEO Advisory Committee training, conducted by Ms. Delores Burton, President, DPI Associates. All EEO Advisory Committee members in Headquarters and the regions were invited to attend. This session covered the history of EEO, the roles and responsibilities of advisory committees, program planning, the identification of barriers, and affirmative employment programs. The coverage of these topics was highly rated in an evaluation by the Committee members.

In conjunction with the Federal Women's Program Advisory Committee (FWPAC), SBCR sponsored the annual Women's History Month Program in March 1995. The featured speaker was Dr. Adele Scheele, nationally renowned author of several books including *Skills for Success*. As a successful columnist, Dr. Scheele also writes a monthly column for *Working Woman* magazine, and has appeared in *Newsweek, The Reader's Digest, McCalls, Vogue*, and *Money* magazines. In addition, she is a television consultant for NBC's weekend "Today Show," and a noted change-management expert. The theme for the program was "Up, Up, and Away With Skills For Success." (See the following photograph.) Dr. Scheele's topics included developing women's self-esteem, finding and keeping jobs, discovering innate abilities, and turning obstacles into opportunities. A wonderful poster exhibit featured during the month of March highlighted the contributions of women in the arts, science, community action, and politics.

A poster exhibit for Women's Equality Day was displayed in August 1995. The theme of the exhibit was "200 Years of Women in the Military." This exhibit depicted the role of women in World

Wars I and II, the Korean War, the Vietnam War, and the Persian Gulf War.

In conjunction with the Asian/Pacific American Advisory Committee (APAAC), the SBCR sponsored the annual Asian/Pacific American Heritage Month Program on May 18, 1995. The theme of the program was "Equality, Empowerment, Excellence." Dr. Narain G. Hingorani, President of Hingorani Power Electronics, was the keynote speaker. Ms. Ginny Gong, National President of the Organization of Chinese Americans (OCA), was the guest speaker. Dr. Hingorani shared the story of his career, from its start as an engineer in India to his current position as president of Hingorani Power Electronics. Ms. Gong described some of her efforts through the organization to help ensure and secure the rights of Chinese and other Asian Americans.

In conjunction with the Hispanic Employment Program Advisory Committee (HEPAC), SBCR sponsored a poster exhibit in recognition of National Hispanic Heritage Month. The theme of this exhibit was "Rising To The Top: Notable Hispanic Americans." This exhibit featured Hispanic Medal of Honor recipients, as well as Hispanics in business, politics, community action, and science.

The Affirmative Action and Federal Women's Program Manager offered career development counseling and assistance to employees upon request. These sessions, conducted for approximately 1 hour with each employee, consisted of a background review of experiences and skills, identification of goals and objectives, an outline of a strategy to achieve goals and objectives, and the identification of potential contacts needed. The Individual Development Plan and the Mentoring Program were also reviewed in these sessions.

From left to right is the speaker for the Annual Women's History Month Program, Dr. Adele Scheele, Commissioner de Planque, Commissioner Rogers, and Vandy L. Miller, Director, Office of Small Business and Civil Rights.

Once every other month, the Affirmative Action and Federal Women's Program Manager, holds working meetings with the EEO Advisory Committee Chairpersons. During these meetings, the chairpersons strategize on ways to address issues of concern to their various constituencies.

Two workshops on image and communication were also presented during FY 95 by Ms. Lisa Valenti, a trainer with National Seminars. The topics included Image (how others see you), self-esteem (how you see yourself), communication (words chosen and spoken, posture, and facial and eye expressions), expression (between men and women and among cultures), self-promotion (projection), and networking (contacts and mentoring). For each workshop, two sessions were held, one in the morning and one in the afternoon. Employees in all occupations and at all grade levels through SES attended the sessions. Employees rated the sessions very highly, and requested a repeat performance.

On June 22, 1995, SBCR sponsored a joint meeting on managing diversity with other Federal agencies and county government staff. Guest presenters for this meeting included Mr. Cleveland Clark, President AILC, Inc., and Dr. Vanessa Weaver, President of Alignment Strategies, Inc. Both speakers have worked extensively in managing diversity in the private and public sectors. Agencies represented at this meeting included the Office of the Secretary of Defense, Farm Credit Administration, Department of Energy, Comptroller of the Currency, Defense Mapping Agency, International Trade Commission, U.S. Air Force, and Montgomery County, Maryland, Government.

In conjunction with several EEO Advisory Committees, SBCR sponsored "brown-bag" workshops focusing on enhancing the career awareness and career development of employees. FWPAC sponsored the workshop, which featured as its guest presenter, Ms. Marilyn White, a career specialist. Ms. White's topics included "Women in the Workplace, Visioning for the Future, and Metaforces Within." Employees rated this workshop highly, and requested a return visit from Ms. White. The Asian/Pacific American Advisory Committee also sponsored a "brown-bag" awareness session with Asian American employees to inform them of the committee's role and their relationship with the SBCR to share career development information, and to discuss specific concerns that affect Asian American employees.

Appendix 1

NRC Organization

(As of December 31, 1995)

COMMISSIONERS

Shirley Ann Jackson, Chairman
Kenneth C. Rogers

The Commission Staff

Office of Commission Appellate Adjudication, John F. Cordes, Jr., Acting Director
Office of Congressional Affairs, Dennis K. Rathbun, Director
General Counsel, Karen D. Cyr
Office of the Inspector General, Leo J. Norton, Acting 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

Other Offices

Advisory Committee on Nuclear Waste, Dr. Paul W. Pomeroy, Chairman
Advisory Committee on Reactor Safeguards, Dr. Thomas S. Kress, Chairman
Atomic Safety & Licensing Board Panel, B. Paul Cotter, Jr., Chief Administrative Judge

EXECUTIVE DIRECTOR FOR OPERATIONS

Executive Director for Operations, James M. Taylor
Deputy Executive Director for Nuclear Reactor Regulation,
Regional Operations and Research, James L.Milhoan
Deputy Executive Director for Nuclear Materials Safety,
Safeguards and Operations Support, Hugh L. Thompson, Jr.
Assistant for Operations, James L. Blaha

Program Offices

Office of Nuclear Material Safety and Safeguards, Carl J. Paperiello, Director
Office of Nuclear Reactor Regulation, William T. Russell, Director
Office of Nuclear Regulatory Research, David L. Morrison, Director

Staff Offices

Office of Administration, Patricia G. Norry, Director
Office for Analysis and Evaluation of Operational Data, Edward L. Jordan, Director
Office of the Controller, Ronald M. Scroggins, Controller
Office of Enforcement, James Lieberman, Director
Office of Information Resources Management, Gerald F. Cranford, Director
Office of Investigations, Guy P. Caputo, Director
Office of Personnel, Paul E. Bird, Director
Office of Small Business and Civil Rights,Vandy L. Miller, Director
Office of State Programs, Richard L. Bangart, Director

Regional Offices

Region I—Philadelphia, Pa., Thomas T. Martin, Regional Administrator
Region II—Atlanta, Ga., Stewart D. Ebneter, Regional Administrator
Region III—Chicago, Ill., Hubert J. Miller, Regional Administrator
Region IV—Dallas, Tex., Leonard Joe Callan, Regional Administrator

The NRC is responsible for licensing and regulating nuclear facilities and materials and for conducting research in support of the licensing and regulatory process, as mandated by the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; the Nuclear Nonproliferation Act of 1978; and in accordance with the National Environmental Policy Act of 1969, as amended, and other applicable statutes. These responsibilities include protecting public health and safety, protecting the environment, protecting and safeguarding materials and plants in the interest of national security, and assuring conformity with antitrust laws. Agency functions are performed through standards-setting and rulemaking; technical reviews and studies; conduct of public hearings; issuance of authorizations, permits and licenses; inspection, investigation and enforcement; evaluation of operating experience; and confirmatory research. The Commission itself is composed of five members, appointed by the President and confirmed by the Senate, one of whom is designated by the President as Chairman. The Chairman is the principal executive officer and the official spokesman of the Commission.

The Executive Director for Operations is the chief operational, financial, and administrative officer of the Commission and is authorized and directed to discharge such licensing, regulatory, financial, and administrative functions of the NRC and to take actions as are necessary for day-to-day operations of the agency. The Executive Director for Operations (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 the 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 as well as adjudicatory and rulemaking dockets, directs and administers the NRC Historical Program, and operates and manages the NRC Public Document Room and its electronic systems for providing access to NRC's publicly available documents. 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, Commission and 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, Commission and 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 assures that all international activities carried out by the Commission and 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; operates and manages the NRC Public Document Room and its Bibliographic Retrieval System for providing access to members of the public and designated foreign countries to NRC's publicly available documents; and functions as the Federal Advisory Committee Management Officer.

Support Staff

The Office of Administration directs the agency's programs for contracting and procurement; document services, including preparation and publication of the NRC's annual report to the President and the Congress, and administration of the Freedom of Information Act and Privacy Act requests; transportation services; security of personnel, facilities and information; administration of local public document rooms; 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. 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 data base 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 (LSSA) and the Department of Energy (DOE) 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

JUDGE IVAN W. SMITH, Legal, 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, 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, Sunriver, 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, Daytona Beach, Florida

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, Legal Support Staff, U.S. Nuclear Regulatory Commission, Rockville, Maryland

JACK G. WHETSTINE, Director, Program Support and Analysis Staff, U.S. Nuclear Regulatory Commission, Rockville, Maryland

Appendix 3

NRC 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 January 1995, 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. JAMES C. CARROLL, retired Manager, Nuclear Operations Support Department, Pacific Gas & Electric, San Francisco, California.

DR. IVAN CATTON, Professor, 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.

MR. WILLIAM J. LINDBLAD, retired President, Portland General Electric, Portland, Oregon.

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.

DR. CHARLES J. WYLIE, retired Chief Engineer, Electrical Division, Duke Power Company, Charlotte, North Carolina.

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 January 1995, the ACNW included the following members:

CHAIRMAN: DR. PAUL W. POMEROY, President, Rondout Associates, Incorporated, Stone Ridge, New York.

VICE-CHAIRMAN: DR. B. JOHN GARRICK, President, PLG, Inc., Newport Beach, California.

DR. MARTIN J. STEINDLER, Senior Chemist/Senior Technical Advisor, Chemical Technology Division, Argonne National Laboratory, Argonne, Illinois.

DR. WILLIAM J. HINZE, Professor, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana.

Advisory Committee on Medical Uses of Isotopes

The Advisory Committee on Medical Uses of Isotopes (ACMUI) was established in July 1958. Comprised of 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 NRC staff on matters of policy. Members are appointed to serve 2-year terms, and are employed under yearly personal services contracts. Members may serve a maximum of three terms.

As of October 31, 1995, the ACMUI included the following appointed members:

CHAIRMAN: DR. BARRY A. SIEGEL, Nuclear Medicine Physician, Mallinckrodt Institute of Radiology, St. Louis, Missouri.

DR. DANIEL S. BERMAN, Cedar Sinai Medical Center, Los Angeles, California.

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's 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. ROBERT M. QUILLIN, Agreement States Program, State of Colorado, Denver, Colorado.

DR. JUDITH ANNE STITT, University of Wisconsin Hospital, Department of Human Oncology, Madison, Wisconsin.

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.

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 November 12, 1995, 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. STEVE FRISHMAN, State of Nevada.

MR. HARRY W. SWAINSTON, State of Nevada.

MR. ROBERT I. HOLDEN, Director, National Congress of American Indians.

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. ARLO K. FUNK, Commissioner, Mineral County Commission, Nevada.

MR. FIDEL GOMEZ, Commissioner, Mineral County Commission, Nevada.

MR. VERNON POE, Director, Office of Nuclear Projects, Mineral County, Nevada.

MR. JAMES REGAN, Churchill County Commission, Nevada.

MS. HEATHER ESTES, 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 & Towbridge, Washington, D.C.

MR. CHRISTOPHER J. HENKEL, Nuclear Energy Institute, Washington, D.C.

MR. DAVID COPENHAFER, 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 the NRC's nuclear safety research programs.

As of November 1995, 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, 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 Act/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 Risseeuw, 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
  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

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

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. Vonnie Shelton
  Paducah Public Library
  555 Washington Street
  Paducah, Ky. 42003
  Paducah Gaseous Diffusion Plant

LOUISIANA

- Ms. Rebecca Lubas
  Government Documents Department
  Troy H. Middleton Library
  Louisiana State University
  Baton Rouge, La. 70803
  River Bend nuclear plant

- Mr. Kenneth E. Owen, Head
  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

- Mr. Carl Katafiasz
  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 Public Library
  1118 15th Street
  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

- Mr. Sidney Watson
  James R. Dickinson Library
  University of Nevada-Las Vegas
  4505 Maryland Parkway
  Las Vegas, Nev. 89154
  Yucca Mountain high-level waste
  geologic repository site

- Mr. Duncan Aldrich
  Government Publications Dept.
  University Library
  University of Nevada-Reno
  Reno, Nev. 89557
  Yucca Mountain high-level waste
  geologic repository site

NEW HAMPSHIRE

- Ms. Pamela Gjettum
  Exeter Public Library
  Founders Park
  Exeter, N.H. 03833
  Seabrook nuclear plant

NEW JERSEY

- Ms. Colette S. Haldeman
  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

- Ms. Laurie Strick
  Shoreham-Wading River Public Library
  Route 25 A
  Shoreham, N.Y. 11786
  Shoreham nuclear plant

- 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
  911 Church Street
  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

RHODE ISLAND

- Ms. Ann Crawford, Director
  Cross Mill Public Library
  4417 Old Post Road
  Charlestown, R.I. 02813
  Wood River Junction*

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

*Closed effective February 2, 1996.

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 1995

REGULATIONS AND AMENDMENTS PUT INTO EFFECT—FY 1995

NRC Library; Address Change—Parts 34, 35, 50, 73, and 110

On October 5, 1994 (59 FR 50688), the NRC published an amendment to regulations that reference the availability of materials that the Director of the Federal Register has approved for incorporation by reference. This amendment, effective immediately, gives the current location where this material is available for inspection.

Change in Organizational Title and Telephone Numbers—Part 2

On November 25, 1994 (59 FR 60551), the NRC published an amendment to its regulations, effective immediately, to provide the current title of the organization within the NRC and the current telephone numbers for a prospective petitioner to contact before filing a petition for rulemaking.

Preparation, Transfer for Commercial Distribution, and Use of Byproduct Material for Medical Use—Parts 30, 32, and 35

On December 2, 1994 (59 FR 61767), the NRC published an amendment to its regulations, effective January 1, 1995. This amendment allows properly qualified nuclear pharmacists and authorized physicians to use greater discretion in preparing radioactive drugs containing byproduct material for medical use. This action is in response to a petition for rulemaking submitted by the American College of Nuclear Physicians and the Society of Nuclear Medicine (PRM-35-9).

Statement of Organization and General Information; Agency Consolidation and Minor Amendments—Part 1

On December 12, 1994 (59 FR 63881), the NRC published an amendment to its regulations, effective immediately, reflecting the completion of the NRC headquarters consolidation effort. Specifically, this consolidation included merger of the Office of Administration and the Office of Consolidation, and reconstitution of the Office of the Licensing Support System Administrator as an organizational unit of the Office of Information Resources Management. The consolidation also transferred responsibility for administering the licensing support system from the Commission staff to the Office of the Executive Director for Operations.

Notification of Events—Part 72

On December 14, 1994 (59 FR 64283), the NRC published an amendment to its regulations to revise licensee reporting requirements regarding the notification of events related to radiation safety at independent spent fuel storage installations and a monitored retrievable storage installation. This amendment, effective January 13, 1995, is necessary to ensure that significant occurrences at these licensed facilities are promptly reported to the NRC. Such timely reporting enables the Commission to evaluate whether the licensee has taken appropriate actions to protect the public health and safety, and whether prompt NRC action is necessary to address generic safety concerns.

List of Approved Spent Fuel Storage Casks: Addition—Part 72

On December 22, 1994 (59 FR 56898), the NRC published an amendment to its regulations to add the standardized NUHOMS horizontal modular system to the list of approved spent fuel storage casks. This amendment, effective January 23, 1995, allows the holders of power reactor operating licenses to store spent fuel in this approved cask under a general license.

Preparation, Transfer for Commercial Distribution, and Use of Byproduct Material for Medical Use—Part 32

On January 4, 1995 (60 FR 322), the NRC published an amendment to its regulations to clarify the final rule, "Preparation, Transfer for Commercial Distribution, and Use of Byproduct Material for Medical Use," published in the *Federal Register* on December 2, 1994. This amendment, effective January 1, 1995, reduces the requirements for the information to be included on labels for radioactive drugs to be transferred for commercial distribution.

Requirement To Report Transfers of Devices to Generally Licensed Persons—Part 32

On January 19, 1995 (60 FR 3735), the NRC published an amendment to its regulations governing the reporting of device transfers to generally licensed persons. This amendment, effective December 31, 1994, relieves initial distributors of the devices from the requirement to provide copies of the transfer reports to each appropriate NRC regional office.

Frequency of Medical Examinations for Use of Respiratory Protection Equipment—Part 20

On February 10, 1995 (60 FR 7900), the NRC published an amendment to its regulations, effective March 13, 1995, to reduce the frequency at which medical fitness determinations are required to ensure the safe use of respiratory protection equipment.

Reduction of Reporting Requirements Imposed on NRC Licensees—Parts 50, 55, and 73

On March 14, 1995 (60 FR 13615), the NRC published an amendment to its regulations, effective April 13, 1995, to reduce the reporting requirements currently imposed on licensees of water-cooled nuclear power reactors, research and test reactors, and nuclear materials.

Low-Level Waste Shipment Manifest Information and Reporting—Parts 20 and 61

On March 27, 1995 (60 FR 15649), the NRC published an amendment to its regulations to improve the quality and uniformity of information contained in manifests that are required to control transfers of low-level waste (LLW) ultimately intended for disposal at a land disposal facility. This amendment, effective March 1, 1998, will establish a set of forms to allow LLW to be tracked from its origin, and to serve as a national uniform low-level radioactive waste manifest to meet NRC, Department of Transportation, and State and Compact information requirements. This amendment also requires LLW disposal site operators to electronically store container-specific manifest information, and requires the disposal site operators to be capable of reporting the stored uniform manifest information on a computer-readable medium.

NRC Size Standards; Revision—Part 2

On April 11, 1995 (60 FR 18344), the NRC published an amendment to the size standards used to qualify an NRC licensee as a "small entity" under the Regulatory Flexibility Act. This amendment, effective May 11, 1995, establishes a separate standard to be used to determine whether a manufacturing licensee would qualify as a small entity, adjusts the receipts-based standard to account for the effects of inflation since 1985, and eliminates the separate $1 million size standard for private practice physicians, applying the revised receipts-based size standard of $5 million to this class of licensees.

Standards for Protection Against Radiation; Clarification—Part 20

On April 25, 1995 (60 FR 20183), the NRC published an amendment to its regulations, effective immediately, that reinstates requirements to retain records generated under the previously existing provisions of Part 20 that were inadvertently omitted in a Federal Register notice published in the *Federal Register* on December 22, 1993 (58 FR 67657).

Interim Storage of Spent Fuel in an Independent Spent Fuel Storage Installation at a Reactor Site; Site-Specific License to a Qualified Applicant— Parts 2 and 72

On April 28, 1995 (60 FR 20879), the NRC published an amendment to its regulations to permit the Director of Nuclear Material Safety and Safeguards to issue a site-specific license to a qualified applicant. Such licenses permit interim storage of spent fuel in an independent spent fuel storage installation (ISFSI) at a reactor site following satisfactory completion of NRC safety and environmental reviews and after any public hearing on the application. This amendment, effective May 30, 1995, eliminates the need for express Commission authorization for each ISFSI license. However, the amendment does not affect the scope of NRC review of an ISFSI license application, or the present opportunity for public hearing provided for in the NRC rules of practice.

Nuclear Power Plant License Renewal; Revisions—Parts 2, 51, and 54

On May 8, 1995 (60 FR 22461), the NRC published an amendment to its regulations to revise the requirements that an applicant must meet for obtaining the renewal of a nuclear power plant operating license. This amendment, effective June 7, 1995, also clarifies the required information that must be submitted for review so that the NRC can determine whether those requirements have been met and changes the administrative requirements that a holder of a renewed license must meet.

Changes to NRC Addresses and Telephone Numbers—Parts 2, 19, 20, 30, 32, 40, 50, 51, 60, 61, 70, 71, 72, 73, 74, 76, and 150

On May 9, 1995 (60 FR 24549), the NRC published an amendment to its regulations, effective immediately, to reflect the current addresses, telephone numbers, and organizational titles within the NRC, following consolidation of Headquarters employees to Rockville, Maryland.

NRC Licensee Renewal/Reinvestigation Program—Parts 11 and 25

On May 17, 1995 (60 FR 26355), the NRC published an amendment to its regulations to eliminate the 5-year expiration date for licensee "U" and "R" special nuclear material access authorizations and "Q" and "L" access authorizations. This amendment, effective June 16, 1995, also requires the licensee to submit NRC renewal application paperwork only for an individual who has not been reinvestigated by the Department of Energy or another Federal agency within the 5- to 7-year span permitted in the regulations.

Performance Requirements for Radiography Equipment—Part 34

On May 31, 1995 (60 FR 28323), the NRC published an amendment to its regulations pertaining to performance requirements for radiography equipment. This amendment, effective June 30, 1995, permits a licensee to use an alternative torque value for the performance testing criteria.

Revision of Fee Schedules; 100% Fee Recovery, FY 1995—Parts 170 and 171

On June 20, 1995 (60 FR 32218), the NRC published an amendment to its regulations to change the licensing, inspection, and annual fees charged to its applicants and licensees. This amendment, effective July 20, 1995, is necessary 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 1995, less amounts appropriated from the Nuclear Waste Fund.

Emergency Planning Licensing Requirements for Independent Spent Fuel Storage Facilities (ISFSI) and Monitored Retrievable Storage Facilities (MRS)—Part 72

On June 22, 1995 (60 FR 32430), in accordance with the Nuclear Waste Policy Act of 1982, the NRC published an amendment to its regulations regarding the emergency planning licensing requirements for independent spent fuel storage facilities and monitored retrievable storage facilities. This amendment, effective September 20, 1995, ensures that local authorities will be notified in the event of an accident so that they may take appropriate action.

Radiation Protection Requirements: Amended Definitions and Criteria—Parts 19 and 20

On July 13, 1995 (60 FR 36038), the NRC published an amendment to its regulations to revise the radiation protection training requirement so that it applies to workers who are likely to receive an occupational dose in excess of 10 mrem (1 mSv) in a year. This amendment, effective August 14, 1995, also revises the definition of "member of the public" to clarify that a worker receiving an occupational dose is not included; revises the definition of "occupational dose" to delete reference to location so that the occupational dose limit applies only to workers whose assigned duties involve exposure to radiation and not to members of the public; and revises the definition of "public dose" to apply to dose received by members of the public from material released by a licensee or from any other source of radiation under the control of the licensee. In addition, the amendment ensures that prior dose is determined for anyone subject to the monitoring requirements in 10 CFR Part 20 and retains a requirement that known overexposed individuals receive copies of any reports of the overexposure that are required to be submitted to the NRC.

Technical Specifications—Part 50

On July 19, 1995 (60 FR 36953), the NRC published an amendment to its regulations, effective August 18, 1995, to codify criteria for determining the content of technical specifications for nuclear power reactors.

Import and Export of Radioactive Waste—Part 110

On July 21, 1995 (60 FR 37556), the NRC published an amendment to its regulations to establish specific licensing requirements for importing and exporting radioactive waste, and to clarify the requirements for importing and exporting incidental radioactive material coming into or leaving the United States. This amendment, effective August 21, 1995, conforms the policies of the United States to the guidelines of the International Atomic Energy Agency Code of Practice on the International Transboundary Movement of Radioactive Waste.

Clarification of Decommissioning Funding Requirements—Parts 30, 40, 70, and 72

On July 26, 1995 (60 FR 38235), the NRC published an amendment to its regulations, effective November 24, 1995, requiring that nonreactor licensees who have been in timely renewal since the promulgation of the earlier decommissioning funding rule or who have ceased operation without having adequate decommissioning funding arrangements in place must provide the NRC with certification of adequate financial assurance for decommissioning by November 24, 1995.

Changes to Nuclear Power Plant Security Requirements Associated With Containment Access Control—Part 73

On September 7, 1995 (60 FR 46497), the NRC published an amendment to its regulations, effective October 10, 1995, relieving nuclear power plant licensees of the security requirement to separately control access of personnel and materials to reactor containments during periods of high traffic, such as refueling and major maintenance.

Procurement of Commercial Grade Items by Nuclear Power Plant Licensees—Part 21

On September 19, 1995 (60 FR 48369), the NRC published an amendment to its regulations to provide added flexibility in procuring commercial grade items for safety-related service by nuclear power plant licensees. This amendment, effective October 19, 1995, provides the requirements for the procurement of basic components, which will be procured initially as commercial grade items with subsequent dedication for safety-related service, in a manner that avoids unnecessary delay and expense while maintaining an adequate level of plant safety.

Medical Administration of Radiation and Radioactive Materials—Parts 20 and 35

On September 20, 1995 (60 FR 48623), the NRC published an amendment to its regulations, effective October 20, 1995, to clarify that the medical administration of radiation or radioactive materials to any individual, even an individual not supposed to receive a medical administration, is regulated by the NRC's provisions governing the medical use of byproduct material. Further, the amendment clarifies that such administration is not regulated by the dose limits in the NRC's regulations concerning standards for protection against radiation.

Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors—Part 50

On September 26, 1995 (60 FR 49495), the NRC published an amendment to its regulations to provide a performance-based option for leakage- rate testing of containments of light-water-cooled nuclear power plants. This amendment, effective October 26, 1995, allows test intervals to be based on system and component performance, and gives licensees greater flexibility for cost-effective implementation methods of regulatory safety objectives.

Compatibility With the International Atomic Energy Agency (IAEA)—Part 71

On September 28, 1995 (60 FR 50248), the NRC published an amendment to its regulations, effective April 1, 1996, to ensure that NRC regulations governing the transportation of radioactive material reflect accepted international standards and comply with current legislative requirements.

PROPOSED REGULATIONS AND AMENDMENTS

Fracture Toughness Requirements for Light-Water Reactor Pressure Vessels—Part 50

On October 4, 1994 (59 FR 50513), the NRC published a proposed amendment to its regulations that would clarify the pressurized thermal shock requirements, change the fracture toughness requirements and reactor vessel material surveillance program requirements, and provide new requirements for thermal annealing of a reactor pressure vessel.

Reactor Site Criteria Including Seismic and Earthquake Engineering Criteria for Nuclear Power Plants and Proposed Denial of Petition From Free Environment, Inc., *et al.*—Parts 50, 52, and 100

On October 17, 1994 (59 FR 52255), the NRC published a proposed amendment to its regulations that would update the criteria used in decisions regarding power reactor siting, including geologic, seismic, and earthquake engineering considerations for future nuclear power plants. The proposed rule would also deny the remaining issue in a petition filed by Free Environment, Inc., *et al.* (PRM-50-20).

Shutdown and Low-Power Operations for Nuclear Power Reactors—Part 50

On October 19, 1994 (59 FR 52707), the NRC published a proposed amendment to its regulations to establish substantial additional protection against the risk of a core-melt accident. The proposed amendment would require power reactor licensees to ensure coolant inventory when the plant was in either shutdown or low-power condition, and to preclude a loss of subcooled state in the reactor coolant system when subcooled conditions are normally being maintained. In addition, the proposed amendment would require licensees to ensure that containment integrity would be maintained or reestablished in a timely manner to prevent releases in excess of the current regulatory limits. Further, the proposed amendment would require licensees to establish controls in technical specifications or plant procedures for equipment that the licensee identified as necessary to perform safety functions during plant shutdown or low-power operation. The amendment would also require licensees to realistically evaluate the effect of fires stemming from activities conducted during cold shutdown or refueling conditions to determine whether these fires could prevent the normal decay heat removal capability, and if so, either provide measure to prevent loss of normal decay heat removal or establish a contingency plan that would ensure that an alternate decay heat removal capability existed. For licensees of pressurized-water reactors only, it would require the provision of instrumentation for monitoring the water level in the reactor coolant system during midloop operation.

Procurement of Commercial Grade Items by Nuclear Power Plant Licensees—Part 21

On October 24, 1994 (59 FR 53372), the NRC published a proposed amendment to its regulations that would clarify and add flexibility to the process of procuring commercial grade items for safety-related service by nuclear power plant licensees. The proposed rule responds to a petition for rulemaking (PRM-21-2) from the Nuclear Management and Resources Council, which is now incorporated into the Nuclear Energy Institute.

Reduction of Reporting Requirements Imposed on NRC Licensees—Parts 50, 55, and 73

On November 2, 1994 (59 FR 54843), the NRC published a proposed amendment to its regulations that would reduce reporting requirements currently imposed on licensees of water-cooled nuclear power reactors, research and test reactors, and nuclear materials.

NRC Size Standards; Proposed Revision—Part 2

On November 30, 1994 (59 FR 61293), the NRC published a proposed amendment to its regulations that would amend the size standards used to qualify an NRC licensee as a small entity under the Regulatory Flexibility Act.

NRC Licensee Renewal/Reinvestigation Program—Parts 11 and 25

On December 28, 1994 (59 FR 66812), the NRC published a proposed amendment to its regulations that would eliminate the 5-year expiration date for licensee "U" and "R" special nuclear material access authorizations and "Q" and "L" access authorizations. In addition, the amendment would require the licensee to submit NRC renewal application paperwork only for an individual who has not been reinvestigated by the Department of Energy or another Federal agency within the 5- to 7-year span permitted in the regulations.

Termination or Transfer of Licensed Activities: Recordkeeping Requirements—Parts 20, 30, 40, 61, 70, and 72

On December 28, 1994 (59 FR 66814), the NRC published a proposed amendment to its regulations that would require a licensee to transfer records pertaining to effectively decommissioning the facility and pertaining to public dose and waste disposal to the new licensee, if licensed activities were to continue at the same location. Similarly, the amendment would require the licensee to forward records pertaining to public dose and waste disposal to the NRC before the license is terminated.

Medical Administration of Radiation and Radioactive Materials—Parts 20 and 35

On January 25, 1995 (60 FR 4872), the NRC published a proposed amendment to its regulations that would clarify that the medical administration of radiation or radioactive materials to any individual, even an individual not supposed to receive a medical administration, is regulated by the NRC's provisions governing the medical use of byproduct material rather than the dose limits in the NRC's regulations concerning standards for protection against radiation.

Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors—Part 50

On February 21, 1995 (60 FR 9634), the NRC published a proposed amendment to its regulations that would provide a performance- based option for leakage rate testing of containments of light-water-cooled nuclear power plants. This amendment would allow test intervals to be based on system and component performance, and would give licensees greater flexibility for cost-effective implementation methods of regulatory safety objectives.

Revision of Fee Schedules; 100% Fee Recovery, FY 1995—Parts 170 and 171

On March 20, 1995 (60 FR 14670), the NRC published a proposed amendment to its regulations to change the licensing, inspection, and annual fees charged to its applicants and licensees. The proposed amendment 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 1995, less amounts appropriated from the Nuclear Waste Fund.

Disposal of High-Level Radioactive Wastes in Geologic Repositories; Design Basis Events—Part 60

On March 22, 1995 (60 FR 15180), the NRC published a proposed amendment to its regulations that would change the NRC's policy on the protection of public health and safety from activities conducted at a geologic repository operations area before permanent closure.

Petition for Rulemaking; Procedure for Submission—Part 2

On March 28, 1995 (60 FR 15878), the NRC published a proposed amendment to its regulations that would provide an incentive to submit sufficient supporting information in petitions for rulemaking to facilitate more expeditious disposition by the NRC, and would improve openness within the process by delineating priorities for review of the petitions.

Standard Design Certification for the U.S. Advanced Boiling Water Reactor Design—Part 52

On April 7, 1995 (60 FR 17902), the NRC published a proposed amendment to its regulations to approve a standard design certification for the U.S. advanced boiling water reactor design.

Standard Design Certification for the System 80+ Design—Part 52

On April 7, 1995 (60 FR 17924), the NRC published a proposed amendment to its regulations that would approve a standard design certification for the System 80+ design.

Production and Utilization Facilities; Emergency Planning and Preparedness Exercise Requirements—Part 50

On April 14, 1995 (60 FR 19002), the NRC published a proposed amendment to its regulations governing domestic licensing of production and utilization facilities, as necessary. This amendment would facilitate greater flexibility in the licensee's emergency preparedness training activities, during the off-year, for implementing the current requirement for annual exercise of the onsite emergency plan, which is conducted to evaluate major portions of licensees' emergency response capabilities.

Physical Security Plan Format Changes—Parts 50 and 70

On April 17, 1995 (60 FR 19170), the NRC published a proposed amendment to its regulations that would eliminate the requirement for applicants for power reactor and Category I fuel cycle licenses to submit physical security plans in two parts. As a result, the amendment would facilitate a quicker and more efficient review of the physical security plans.

Changes to Nuclear Power Plant Security Requirements Associated With Containment Access Control—Part 73

On May 10, 1995 (60 FR 24803), the NRC published a proposed amendment to its regulations that would relieve nuclear power plant licensees of the security requirement to separately control access of personnel and materials to reactor containments during periods of high traffic, such as refueling and major maintenance.

Decommissioning of Nuclear Power Reactors—Parts 2, 50, and 51

On July 20, 1995 (60 FR 37374), the NRC published a proposed amendment to its regulations on the decommissioning procedures that lead to the termination of an operating license for nuclear power reactors and release of the property. This amendment would clarify ambiguities in the current rule and codify practices that have been used for other licensees on a case-by-case basis.

Revision of Specific Exemptions Under the Privacy Act—Part 9

On July 26, 1995 (60 FR 38282), the NRC published a proposed amendment to its regulations that would implement the Privacy Act of 1974, as amended, to reflect the addition of exemptions in subsections (j)(2) and (k)(5) to an existing system of records and to update the list of exemptions that apply to specific NRC systems of records.

Safeguards for Spent Nuclear Fuel or High-Level Radioactive Waste—Parts 60, 72, 73, and 75

On August 15, 1995 (60 FR 42079), the NRC published a proposed amendment to its regulations that would clarify safeguard requirements for spent nuclear fuel or high-level radioactive waste stored at independent spent fuel storage installations, power reactors that have permanently ceased reactor operations, monitored retrievable storage installations, and geologic repository operations areas.

One-Time Extension of Certain Byproduct, Source, and Special Nuclear Materials Licenses—Parts 30, 40, and 70

On September 8, 1995 (60 FR 46784), the NRC published a proposed amendment to its regulations that would, on a one-time basis, provide a 5-year extension of certain byproduct, source, and special nuclear materials licenses. The proposed amendment also requests comments on the appropriate duration of materials licenses.

ADVANCE NOTICES OF PROPOSED RULEMAKING

Land Ownership Requirements for Low-Level Waste Sites—Part 61

On July 18, 1995 (60 FR 36744), the NRC published a notice of withdrawal regarding an advance notice of proposed rulemaking that presented a possible change to the NRC Federal or State land ownership requirements for low-level waste facility sites.

Acceptance of Products Purchased for Use in Nuclear Power Plant Structures, Systems, and Components; Withdrawal—Part 50

On September 19, 1995 (60 FR 48427), the NRC published a notice of withdrawal regarding an advance notice of proposed rulemaking that requested public comment on the need for additional regulatory requirements and for obtaining an improved understanding of alternatives to regulatory requirements.

Appendix 6

Regulatory Guides—Fiscal Year 1995

NRC regulatory guides describe methods acceptable to the NRC staff for implementing specific parts of the NRC's regulations. In some cases, the guides also 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, D.C. 20555-0001, or by fax at 301-415-2260. To reduce the burden on the taxpayer, the NRC has arranged 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, 1994, through September 30, 1995.

Division 1—Power Reactor Guides

1.84 Design and Fabrication Code Case Acceptability—ASME Section III, Division 1 (Revision 30)

1.85 Materials Code Case Acceptability—ASME Section III, Division 1 (Revision 30)

1.118 Periodic Testing of Electric Power and Protection Systems (Revision 3)

1.147 Inservice Inspection Code Case Acceptability—ASME Section XI, Division 1 (Revision 11)

1.160 Monitoring the Effectiveness of Maintenance at Nuclear Power Plants (Revision 1)

1.161 Evaluation of Reactor Pressure Vessels with Charpy Upper-Shelf Energy Less Than 50 Ft-lb

1.163 Performance-Based Containment Leak-Test Program

Division 2—Research and Test Reactor Guides

None

Division 3—Fuels and Materials Facilities Guides

None

Division 4—Environmental and Siting Guides

None

Division 5—Materials and Plant Protection Guides

5.52 Standard Format and Content of a Licensee Physical Protection Plan for Strategic Special Nuclear Material at Fixed Sites (Other than Nuclear Power Plants) (Revision 3)

Division 6—Product Guides

6.9 Establishing QA Programs for the Manufacture and Distribution of Sealed Sources and Devices Containing Byproduct Material

Division 7—Transportation Guides

None

Division 8—Occupational Health Guides

None

Division 9—Antitrust and Financial Review Guides

None

Division 10—General Guides

None

DRAFT REGULATORY GUIDES

Division 1

DG–1027	Format and Content of Application for Approval of Thermal Annealing of Reactor Pressure Vessels
DG–1032	Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion
DG–1033	Second Proposed Revision 2 to Regulatory Guide 1.12, Nuclear Power Plant Instrumentation for Earthquakes
DG–1034	Pre-Earthquake Planning and Immediate Nuclear Power Plant Operator Postearthquake Actions
DG–1035	Restart of a Nuclear Power Plant Shut Down by a Seismic Event
DG–1037	Performance-Based Containment Leak Test Program
DG–1038	Proposed Revision 2 to Regulatory Guide 1.82, Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident
DG–1039	Proposed Revision 1 to Regulatory Guide 1.152, Criteria for Digital Computers in Safety Systems of Nuclear Power Plants
DG–1040	Time Response Design Criteria for Safety-Related Operator Actions
DG–1043	Proposed Revision 2 to Regulatory Guide 1.149, Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations

Division 4

DG–4004	Second Proposed Revision 2 to Regulatory Guide 4.7, General Site Suitability Criteria for Nuclear Power Stations

Division 8

DG–8012	Proposed Revision 1 to Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure
DG–8014	Proposed Revision 3 to Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure

Division 10

DG–0005	Second Proposed Revision 2 to Regulatory Guide 10.5, Applications for Licenses of Broad Scope
DG–0008	Applications for the Use of Sealed Sources in Portable Gauging Devices

Appendix 7

Civil Penalties and Orders—Fiscal Year 1995

CIVIL PENALTIES PROPOSED, IMPOSED, AND/OR PAID IN FY95
(in EA Number Order)

Licensee, Facility, and EA Number	*Civil Penalties Proposed, Imposed, and/or Paid in FY 1995*	*Facts*
Honeywell, Inc. Hopkins, NM EA 92-112	$20,000 proposed and paid in FY95	Transfer of an NRC license and licensed material without prior approval.
Cameo Diagnostic Center, Inc. Springfield, MA EA 93-005	$1,750 proposed in FY 93, imposed in FY94, and paid in FY95	Willful use of licensed material at unauthorized location.
Houston Lighting & Power Co. South Texas EA 93-056	$100,000 proposed in FY95, withdrawn in FY95	Harassment and intimidation of contract Instrumentation & Control technician.
Radiation Oncology Ctr at Marlton Marlton, NJ EA 93-072	$80,000 proposed in FY94, imposed in FY95, pending	Corporate breakdown in control of licensed activities.
Amoco Oil Co. Whiting, IN EA 93-128	$25,000 proposed and paid in FY95	Failure to conduct audits, fabricated audits, false statement by Radiation Safety Officer to NRC.
Georgia Power Co. Vogtle EA 93-304	$200,000 proposed in FY94, reproposed and paid in FY95	Inaccurate/incomplete information re: emergency diesel generator reliability.
Oncology Services, Inc. State College, PA EA 94-006	$280,000 proposed in FY94, imposed in FY95, pending	Misadministration, exposure to members of the public, corporate breakdown in control of licensed activities.
Logan General Hospital Logan, WV EA 94-008	$8,000 proposed and paid in FY95	Failure to secure licensed material and failure to maintain complete and accurate records.
Milwaukee County Medical Complex Milwaukee, WI EA 94-074	$3,750 proposed and imposed in FY94, paid in FY95	An individual received a radiation exposure in excess of quarterly limits.
Advacare Management Services, Inc. Bala Cynwyd, PA EA 94-089	$2,500 proposed in FY95, pending	Multiple violations reflecting lack of management control of licensed activities.
Nuclear Pharmacy of Idaho Boise, ID EA 94-096	$7,500 proposed in FY94 and withdrawn in FY95	Release of radioactive material to area in excess of Part 20 limits.

Licensee, Facility, and EA Number	Civil Penalties Proposed, Imposed, and/or Paid in FY 1995	Facts
Public Service Electric & Gas Co. Salem EA 94–112	$500,000 proposed and paid in FY95	Failure to follow procedures, failure to identify or correct spurious high steam flow signal that occurred following three trips prior to April 7, 1994.
Radiation Management Consultants Philadelphia, PA EA 94–114	$1,500 proposed in FY94, imposed and paid FY95	Change of location without authorization, transportation violations, failure to post high radiation area, and missing records.
Atlas Corporation Moab, UT EA 94–117	$5,000 proposed and paid in FY95	Release of scrap for unrestricted use with contamination levels above release limits.
William W. Backus Hospital Norwick, CT EA 94–150	$15,000 proposed and paid in FY95	Therapeutic misadministration and violation of the medical quality management program.
St. Joseph Mercy Hospital Pontiac, MI EA 95–156	$8,000 proposed and paid in FY95	Physician ordered thyroid scan and a whole body was performed instead. The violation resulted from a lack of training and failure to follow quality management plan.
Nebraska Public Power District Cooper EA 94–164	$100,000 proposed and paid in FY95	Violations resulting in an inoperable control room emergency filtration system.
Nebraska Public Power District Cooper EA 94–165	$100,000 proposed and paid in FY95	Violations resulting in an inoperable primary containment.
Nebraska Public Power District Cooper EA 94–166	$100,000 proposed and paid in FY95	Violations resulting in the inoperability of both emergency diesel generators.
Drexel University Philadelphia, PA EA 94–167	$6,250 proposed, imposed, and paid in FY95	Lack of oversight by radiation safety officer and a management breakdown.
Babcock & Wilcox Co. Lynchburg, VA EA 94–169	$37,500 proposed, imposed, and paid in FY95	Licensee exceeded nuclear criticality safety limits in low level dissolver hood and in field storage area.
Old Forge Testing Company Old Forge, PA EA 94–180	$3,000 proposed in FY95, pending	Possession of material with an expired license.
Commonwealth Edison Co. Quad Cities 1 EA 94–186	$100,000 proposed and paid in FY95	Deliberate placement of strontium-90 source in radiation workers' clothing.
Commonwealth Edison Co. Quad Cities 1 EA 94–188	$80,000 proposed and paid in FY95	Failure to test an individual who reported for work apparently under the influence of alcohol.

Licensee, Facility, and EA Number	*Civil Penalties Proposed, Imposed, and/or Paid in FY 1995*	*Facts*
Memorial Hospital, Inc. Towanda, PA EA 94–191	$3,750 proposed and paid in FY95	Management breakdown.
Philadelphia Electric Co. Peach Bottom EA 94–197	$87,500 proposed and paid in FY95	Emergency diesel generators inoperable due to emergency service water systems alignment.
Hunt Concrete Co. Warrenton, MO EA 94–198	$3,000 proposed and withdrawn in FY95	Possession of material without a valid license and the failure to pay fees over a period of several years.
Mallinckrodt Medical, Inc. Warren, MI EA 94–202	$6,250 proposed and paid in FY95	A breakdown in the control of licensed activities.
Carolina Power & Light Co. Robinson EA 94–205	$100,000 proposed and paid in FY95	The failure to control pressurizer cooldown on a number of occasions resulting in violations of technical specification requirements.
Nuclear Scanning Services, Inc. Houston, TX EA 94–208	$2,800 proposed and paid in FY95	Deliberate failure to file Form 241 and for the failure to pay fees.
Memorial Hospital South Bend, IN EA 94–217	$2,500 proposed in FY95, pending	Programmatic weakness in the implementation of the quality management program that resulted in a misadministration.
Johnson Yokogawa Corporation Newman, GA EA 94–219	$10,000 proposed and paid in FY95	Failure to file for reciprocity application and installing and servicing gauges without an NRC license.
Commonwealth Edison Co. Quad Cities EA 94–220	$100,000 proposed and paid in FY95	Maintenance and testing problems associated with control rods, in addition to corrective action weaknesses concerning the scram solenoid pilot valve diaphragm degradation.
Consumers Power Co. Palisades EA 94–222	$25,000 proposed and paid in FY95	Failure to properly maintain the emergency diesel generators.
Environmental Testing Labs., Inc. Forked River, NJ EA 94–226	$3,000 proposed, imposed, and withdrawn in FY95	Possession of material after license expiration.
Harman Mining Corporation Harman, VA EA 94–227	$250 proposed and paid in FY95	Transfer of gauge to an unauthorized recipient.
Public Service Electric & Gas Co. Salem 1 EA 94–239	$80,000 proposed and paid in FY95	Harassment and intimidation of two staff engineers by licensee management.

Licensee, Facility, and EA Number	Civil Penalties Proposed, Imposed, and/or Paid in FY 1995	Facts
Material Testing Laboratories, Inc. Norfolk, VA EA 94-244	$7,500 proposed and paid in FY95	A Radiographer allowed an untrained helper to operate radiographic exposure device.
Joseph Paolino & Sons, Inc. Philadelphia, PA EA 94-248	$3,000 proposed and withdrawn in FY95	Possession of material after license had been revoked.
Wolf Creek Nuclear Operating Corp. Wolf Creek EA 94-251	$25,000 proposed and paid in FY95	Inadvertent partial drain of the Reactor Coolant System.
McCormick, Taylor, & Associates, Inc. Philadelphia, PA EA 94-253	$3,000 proposed, imposed, and paid in FY95	Improper security of gauge resulting in the loss of a gauge and for violations involving leak tests and inventory.
Geo-Tech Associates Fanwood, NJ EA 94-257	$3,000 proposed in FY95, pending	Failure to pay annual fees and possession of material without a license.
IHS Geotech & CMT San Antonio, TX EA 95-007	$500 proposed, imposed, and $499 paid in FY95	Working in federal jurisdiction without NRC license or filing NRC Form 241.
Florida Power Corporation Crystal River 3 EA 95-016	$25,000 proposed and paid in FY95	Failure to consider instrument error when setting instruments to meet technical specifications allowable instrument settings.
Carlisle Hospital Carlisle, PA EA 95-021	$5,000 proposed, imposed, and paid in FY95	Violations involving teletherapy performed by unauthorized physicians.
Hawaiian Rock Products Agana, Guam EA 95-026	$150 proposed and paid in FY95	Repetitive violation involving use of nonportable density gauge by personnel not authorized on license.
Commonwealth Edison Company Dresden 2 EA 95-030	$100,000 proposed and paid in FY95	Valve testing violations that resulted in a breach of containment.
Northeast Nuclear Energy Co. Millstone 2 EA 95-031	$50,000 proposed and paid in FY95	Potential loss of emergency core cooling system during recirculation phase of a loss-of-coolant accident.
Joseph Paolino & Sons, Inc. Mt. Laurel, NJ EA 95-034	$15,000 proposed and withdrawn in FY95	Continued possession of licensed material after license had been revoked.
Mattingly Testing Services, Inc. Great Falls, MT EA 95-035	$15,500 proposed and paid in FY95	Multiple violations of radiography requirements.
Washington Public Power Supply System Washington Nuclear 2 EA 95-036	$50,000 proposed and paid in FY95	Control room ventilation system being inoperable.

Licensee, Facility, and EA Number	*Civil Penalties Proposed, Imposed, and/or Paid in FY 1995*	*Facts*
Individual Boston, MA EA 95-038	$750 proposed, imposed, and paid in FY95	Licensee allowed patients to take I-131 capsules home.
Commonwealth Edison Co. Braidwood 2 EA 95-041	$100,000 proposed and paid in FY95	Both trains of hydrogen monitors being inoperable.
Quality Inspection Services, Inc. Buffalo, NY EA 95-046	$13,000 proposed in FY95, being paid overtime	Performing work in Pennsylvania without having filed a Form 241.
Dyna Jct, Inc. Gilette, WY EA 95-047	$500 proposed and withdrawn in FY95	Breakdown in control of licensed activities, as indicated by 16 violations.
Consumers Power Co. Big Rock Point EA 95-057	$50,000 proposed and paid in FY95	Strainer blockage made an emergency core cooling system inoperable, and for violations involving the failure to maintain calibration of the neutron wide range monitors.
Vermont Yankee Nuclear Power Corp. Vermont Yankee EA 95-070	$50,000 proposed and paid in FY95	Potential inoperability of Core Spray Injection valves.
Cabot Corporation Boyertown, PA EA 95-086	$5,000 proposed and paid in FY95	Failure to survey radiation dose to employees and public.
Soil Testing Ft. Wayne, IN EA 95-092	$250 proposed and paid in FY95	Two moisture density gauges were unsecured.
Washington Public Power Supply System Washington Nuclear 2 EA 95-096	$50,000 proposed and paid in FY95	The control room supervisor willfully violated plant procedures and a number of operational violations.
Washington Public Power Supply System Washington Nuclear 2 EA 95-109	$50,000 proposed and paid in FY95	High radiation area violations.
Hospital Center at Orange Orange, NJ EA 95-130	$2,500 proposed in FY95, pending	Discrimination against a technologist.
Canspec Group, Inc. Middlesex, NJ EA 95-163	$5,000 proposed in FY95, pending	Program breakdown.

ORDERS ISSUED IN FY 1995
(in EA Number Order)

Licensee, Facility, and EA Number	*Orders Issued in FY 1995*	*Facts*
Environmental Testing Labs., Inc. Forked River, NJ EA 94-179	Order to Cease and Desist issued November 10, 1994	Possession of material with an expired license.
Ohio State University Columbus, OH EA 94-215	Confirmatory Order issued November 8, 1994	Confirmatory Order to incorporate the licensee's Radiation Safety Improvement Plan into its licenses.
Old Forge Testing Company Old Forge, PA EA 94-223	Order to Cease & Desist issued November 1, 1994	Possession of material with an expired license.
Midwest Testing, Inc. Indianapolis, IN EA 94-240	Confirmatory Order issued June 12, 1994	Failed to provide personnel dosimetry to licensee employees while using moisture density gauges.
Jones Inspection Services Alderson, OK EA 94-241	Order Suspending License issued April 11, 1995	Licensee failed to file Form 241 to work in NRC jurisdiction.
Material Testing Laboratories, Inc. Norfolk, VA EA 95-003	Order Modifying License issued February 9, 1995	Radiographer allowed untrained helper to operate radiographic exposure device.
Blackhawk Engineering, Inc. Tulsa, OK EA 95-018	Order Modifying Licensee issued February 14, 1995	Deliberate use of material after license expired and a false statement to an NRC inspector.
High-Way Engineering & Surveying Co. Bonners Ferry, ID EA 95-024	Order to Cease & Desist issued March 24, 1995	Possession of material with an expired license.
Mattingly Testing Services, Inc. Great Falls, MT EA 95-063	Order Modifying License issued May 5, 1995	Numerous violations of radiography requirements, some involving wrongdoing.
Joseph Paolino & Sons, Inc. Mt. Laurel, NJ EA 95-090	Confirmatory Order issued May 9, 1995	Confirmatory Order issued, withdrawing proposed civil penalties and to confirm the licensee's agreement not to be involved in NRC-licensed activities for 5 years.
J&L Engineering, Inc. Cannonsburg, PA EA 95-183	Order Suspending License issued September 27, 1995	Violation of 10 CFR 30.9 and 10 CFR 30.3.

ORDERS ISSUED IN FY 1995
(in IA Number Order)

Individual and IA Number	*Orders Issued In FY 1995*	*Facts*
Individual Western Industrial X-Ray IA 94-031	Order Prohibiting Involvement in NRC-Licensed Activities issued October 31, 1994	Failure to supervise radiographer's assistant, and false information to licensee about incident.
Individual Amoco Oil Co. IA 94-032	Order Prohibiting Involvement in NRC-Licensed Activities issued November 15, 1994	Failure to conduct audits, fabrication of audits, and false statements.
Individual Amoco Oil Co. IA 94-033	Order Prohibiting Involvement in NRC-Licensed Activities issued November 15, 1994	Failure to conduct audits, and false statements.
Individual Brunswick IA 94-035	Order Prohibiting Involvement in NRC-Licensed Activities issued December 12, 1994	Falsification of application for access authorization.
Individual Piping Specialists, Inc. IA 95-003	Order Prohibiting Involvement in NRC-Licensed Activities issued March 3, 1994	Provided false information to NRC inspectors, falsified required radiation safety records, and provided false testimony during NRC hearing.
Individual Midwest Testing, Inc. IA 95-015	Confirmatory Order issued June 12, 1995	Failed to provide personal dosimetry to employees while using moisture density gauges.
Individual Midwest Testing, Inc. IA 95-016	Confirmatory Order issued June 12, 1995	Failed to provide personal dosimetry to employees while using moisture density gauges.
Individual Cammenga Associates, Inc. IA 95-022	Order Prohibiting Involvement in NRC-Licensed Activities issued June 27, 1995	Deliberate unauthorized possession of licensed material.
Individual Blackhawk Engineering, Inc. IA 95-028	Order Prohibiting Involvement in NRC-Licensed Activities issued August 3, 1995	Deliberate continued use of license material after license expired and false statement to NRC inspector.
Individual Mid-American Inspection Services IA 95-029	Order Prohibiting Involvement in NRC-Licensed Activities issued August 7, 1995	Deliberate failure of radiographer to supervise assistant.
Department of the Army Madigan Army Medical Center IA 95-037	Order Prohibiting Involvement in NRC-Licensed Activities issued September 18, 1995	Individual provided inaccurate information to licensee concerning possible misadministration.

NOTICE OF VIOLATIONS NOT ASSESSED A CIVIL PENALTY ISSUED FY 1995
(in EA Number Order)

Licensee, Facility, and EA Number	*Date Issued in FY 1995*	*Facts*
Missouri, University of Columbia, MO EA 93-058	Issued November 23, 1994	Transportation violations
Energy Steel & Supply Co. Auburn Hills, MI EA 93-074	Issued July 7, 1995	Possible falsification of fastener certificate of conformance
V.A. Department of N. Chicago, IL EA 93-264	Issued October 5, 1994	Violation of 10 CFR 30.7, employee protection
Rockingham Memorial Hospital Harrisonburg, VA EA 94-047	Issued March 21, 1995	Use of licensed material without authorization
Entergy Operations, Inc. Arkansas Nuclear One EA 94-161	Issued December 7, 1994	Two violations of failure to withdraw access authorization when derogatory information is found; failure to make one-hour report
East Jordan Iron Works, Inc. East Jordan, MI EA 94-200	Issued October 24, 1994	Significant lack of attention toward licensed activities
Carolina Power & Light Co. Harris EA 94-204	Issued November 17, 1994	Failure to analyze system of ESW header "A" return valve of all three high head SI pumps, potential inaccurate info issue in that letters to NRC indicated ESW study complete but safety evaluation was not completed
Pennsylvania Power & Light Co. Susquehanna EA 94-212	Issued May 9, 1995	Security supervisor gave test answers to guards on required test
Penn Inspection Co. Chickasha, OK EA 94-213	Issued November 7, 1994	Annual exposure to radiographer exceeding 5 rem
Northern Indiana Public Hammond, IN EA 94-218	Issued November 17, 1994	Significant failure to control licensed material
ATEC Association, Inc. Cincinnati, OH EA 94-229	Issued November 23, 1994	Licensed material in an unrestricted area, and not in storage. Was not under the immediate control of the licensee
Florida Power & Light Co. Turkey Point EA 94-236	Issued January 10, 1995	Design failure in vital bus load sequencer

Licensee, Facility, and EA Number	Date Issued in FY 1995	Facts
South Bend Medical Foundation South Bend, IN EA 94-238	Issued November 29, 1994	Breakdown in the management of the licensee's use of chromium-51
Adams Construction Company Roanoke, VA EA 94-241	Issued December 28, 1994	Moisture density gauge left unattended, run over by a truck
V.A., Department of Memphis, TN EA 94-245	Issued February 27, 1995	Technologist admitted that he falsified in a daily dose calibrator constancy check record. Unauthorized use of check source
Cumberland Village Mining Nashville, TN EA 94-246	Issued January 9, 1995	General licensed gauge sold with other scrap metal when company was sold
Rochester Gas & Electric Co. Ginna EA 94-254	Issued January 13, 1995	Licensee was not conducting the random testing program in an adequately random manner so as to fairly include the weekend and night shifts
Mid American Inspection Gaylord, MI EA 94-256	Issued August 7, 1995	Violations including deliberately allowing assistants to use sources, failure to secure sources
GPU Nuclear Corporation Oyster Creek EA 94-260	Issued February 14, 1995	EDG modifications and combustion turbine problems
Commonwealth Edison Company Braidwood EA 94-261	Issued January 25, 1995	Operations program breakdown
Individual EA 94-262	Issued January 10, 1995	Deliberate failure to file NRC Form-241
IRT Corporation San Diego, CA EA 94-264	Issued January 6, 1995	Failure to transport source as "exclusive use" shipment
Commonwealth Edison Co. Byron EA 94-265	Issued January 25, 1995	SRO left the control room for 22 minutes
Omaha Public Power District Fort Calhoun EA 94-267	Issued February 15, 1995	Design problems rendered control room air conditioners inoperable under certain circumstances
Navy, Department of the Portsmouth, VA EA 94-269	Issued February 10, 1995	Failed to include policies and procedures resulting in a misadministration
Union Carbide Chemicals Sistersville, WV EA 94-270	Issued February 7, 1995	Removed shutters from two fixed nuclear gauges containing 250 millicuries of cesium-137 due to miscommunications

Licensee, Facility, and EA Number	Date Issued in FY 1995	Facts
Indiana & Michigan Electric Co. D.C. Cook EA 95-002	Issued February 28, 1995	Individual falsifying application. Had been denied access at Turkey Point
Boston Edison Co. Pilgrim EA 95-010	Issued March 3, 1995	Failure to maintain primary containment integrity with the reactor critical for 30 days
Nebraska Public Power District Cooper EA 95-012	Issued February 21, 1995	Violation of TS—movement of fuel loads that could change irradiated fuel
Pittsburgh, University of Pittsburgh, PA EA 95-013	Issued February 23, 1995	Door interlock taped during irradiation
Army, Department of the EA 95-017	Issued March 1, 1995	Failure to meet requirements for shipment of material
Individual Susquehanna EA 95-020	Issued May 9, 1995	Improperly assisted people who were taking exams
Brucker Earth Engineering St. Louis, MO EA 95-022	Issued February 13, 1995	Soil gauge ran over by an earth scraper
Calumet Testing Service, Inc. Griffith, IN EA 95-039	Issued March 28, 1995	Loss of control
Public Service Company of Colorado Ft. St. Vrain EA 95-045	Issued August 14, 1995	Four contractor employees were allegedly terminated (through RIF) for raising safety concerns
Individual Salem EA 95-052	Issued April 11, 1995	Alleged H&I of engineers
Soil & Materials Engineering Plymouth, MI EA 95-055	Issued April 18, 1995	Loss of control of material
Amersham Corporation Burlington, MA EA 95-058	Issued July 5, 1995	Hot particle overexposure
Maine Yankee Atomic Power Co. Maine Yankee EA 95-061	Issued June 2, 1995	Two HP events that may have involved a substantial potential for overexposures
Individual Mattingly Testing Services EA 95-066	Issued May 5, 1995	Numerous violations of radiography requirements, some involving wrongdoing
Individual Mattingly Testing Services EA 95-067	Issued May 5, 1995	Numerous violations of radiography requirements, some involving wrongdoing

Licensee, Facility, and EA Number	Date Issued in FY 1995	Facts
Individual Mattingly Testing Services EA 95-068	Issued May 5, 1995	Numerous violations of radiography requirements, some involving wrongdoing
Entergy Operations, Inc. Arkansas Nuclear One EA 95-076	Issued July 6, 1995	Individual who had been terminated under unfavorable conditions still had an active security badge
Morrison Knudsen Corporation Ft. St. Vrain EA 95-079	Issued August 14, 1995	Four former contractor employees were terminated (through RIF) for expressing concerns about safety
Hydro Nuclear Services Moorestown, NJ EA 95-080	Issued June 28, 1995	Discrimination of technician by contractor of DC Cook
Individual EA 95-082	Issued August 7, 1995	Deliberate use of radiography camera by assistant without supervision
Entergy Operations, Inc. Arkansas Nuclear One EA 95-085	Issued July 17, 1995	Failure to control contractor employee in refueling, 10x greater dose
Public Service Electric Co. Hope Creek EA 95-087	Issued July 20, 1995	Violations related to a contamination event
Individual Carlisle Hospital EA 95-099	Issued June 6, 1995	Individual deliberately allowed physicians not named on license to perform teletherapy
Braun Itertec Engineering Minneapolis, MN EA 95-104	Issued June 23, 1995	Unattended moisture density gauge
Operator Washington Nuclear Project EA 95-105	Issued August 17, 1995	Control room supervisor deliberately violated procedural caution statement
Individual Quality Inspection Service EA 95-111	Issued June 28, 1995	Individual provided inaccurate information to the NRC
Geo-Test, LTD. Saginaw, WI EA 95-112	Issued June 27, 1995	Lost/Stolen troxler soil moisture gauge containing licensed material
HNU Systems, Inc. Boston, MA EA 95-116	Issued July 27, 1995	Violation of NRC requirements
Commonwealth Edison Company Zion EA 95-118	Issued September 22, 1995	Seven potential violations of failure to meet TS surveillance requirements
Consolidated Edison Company Indian Point 2 EA 95-119	Issued June 23, 1995	Shipment of waste to Oak Ridge with excessive radiation levels when received

Licensee, Facility, and EA Number	Date Issued in FY 1995	Facts
Professional Inspection & Testing Chambersburg, PA EA 95-127	Issued July 6, 1995	Failure to maintain control of radioactive material and failure to have required information on a Yellow II label
Operator Hope Creek EA 95-128	Issued June 29, 1995	Violation requirements of license
Operator Watts Bar EA 95-129	Issued June 23, 1995	Tested positive for marijuana use
Philadelphia Electric Company Peach Bottom EA 95-132	Issued August 17, 1995	Inoperable EDGs; Design Modification
V.A., Department of Long Beach, CA EA 95-149	Issued August 21, 1995	Control; Inadequate Testing
CTI & Associates, Inc. Brighton, MI EA 95-150	Issued September 28, 1995	Unauthorized disposal of radioactive material
EBASCO Services, Inc. New York, NY EA 95-151	Issued July 21, 1995	Unattended soil moisture/density gauge
Consolidated Edison Company Indian Point 2 EA 95-155	Issued September 18, 1995	Black listing individual from employment
Duke Power Company McGuire EA 95-156	Issued August 22, 1995	Procedure violations of locked high radiation area controls
Operator Hatch EA 95-157	Issued August 11, 1995	Both EDGs for both units inoperable due to bad turbo changer part commercially dedicated (common mode)
Carolina Power & Light Company Brunswick EA 95-156	Issued September 8, 1995	Licensed operator tested positive for marijuana use
Consumers Power Company Palisades EA 95-169	Issued September 29, 1995	HPCI & RCIC
Individual Hope Creek EA 95-188	Issued September 19, 1995	Containment high pressure was inoperable for two cycles
Individual Hospital Center at Orange EA 95-195	Issued September 28, 1995	Individual violation TS when the control room was left unmanned Alleged discrimination of an Oncology Technologist

DISCRETION CASES

Licensee, Facility, and EA Number	*Date Issued in FY 1995*	*Facts*
Missouri, University of Columbia, MO EA 93-058	NOV Issued November 23, 1994	Transportation violations
Florida Power Corporation Crystal River EA 94-106	Letter issued October 11, 1994	Willful violation of 10 CFR 50.7. Discrimination against security guard for reporting another guard sleeping
Syncor Corporation Flint, MI EA 94-109	NOV issued November 9, 1994	Inaccurate information provided to NRC. Careless disregard of 10 CFR 20.207.
Public Service Electric & Gas Co. Salem EA 94-112	$500,000 proposed and paid in FY95	Failure to follow procedures. Did not identify nor correct spurious high steam flow signal that occurred following three trips prior to April 7, 1994.
William W. Backus Hospital Norwick, CT EA 94-150	$15,000 proposed and paid in FY95	Therapeutic misadministration. Violation of medical quality management program.
Nebraska Public Power District Cooper EA 94-164	$100,000 proposed and paid in FY95	Violations resulting in an inoperable control room emergency filtration system.
Nebraska Public Power District Cooper EA 94-165	$100,000 proposed and paid in FY95	Violations resulting in an inoperable primary containment.
Nebraska Public Power District Cooper EA 94-166	$100,000 proposed and paid in FY95	Violations resulting in the inoperability of both emergency diesel generators.
Illinois Power Company Clinton EA 94-178	NOV issued October 4, 1994	Falsification of a surveillance record.
Environmental Testing Labs., Inc. Forked River, NJ EA 94-179	Order to Cease and Desist issued November 10, 1994	Possession of material with expired license
Old Forge Testing Company Old Forge, PA EA 94-180	$3,000 proposed in FY95, pending	Possession of material with expired license.
Hunt Concrete Co. Warrenton, MO EA 94-198	$3,000 proposed and withdrawn in FY95	Possession of material without valid license. Failed to pay fees over several years
Nuclear Scanning Services, Inc. Houston, TX EA 94-208	$2,800 proposed and paid in FY95	Deliberate failure to file Form 241s, pay fees
Old Forge Testing Company Old Forge, PA EA 94-223	Order to Cease & Desist issued November 1, 1994	Possession of material with expired license

Licensee, Facility, and EA Number	Date Issued in FY 1995	Facts
Joseph Paolino & Sons, Inc. Philadelphia, PA EA 94-248	$3,000 proposed and withdrawn in FY95	Possession of material after license had been revoked
McCormick, Taylor, & Associates, Inc. Philadelphia, PA EA 94-253	$3,000 proposed, imposed, and paid in FY95	Improper security of gauge resulted in loss of gauge
Pacific Gas & Electric Company Diablo Canyon EA 94-255	Letter issued December 27, 1994	Violation of high radiation boundary involving two low level individuals
Mid American Inspection Gaylord, MI EA 94-256	NOV Issued August 7, 1995	Violations including deliberately allowing assistants to use sources, failure to secure sources
Geo-Tech Associates Fanwood, NJ EA 94-257	$3,000 proposed in FY95, pending	Failure to pay annual fee. Possession of material without license
Connecticut Yankee Atomic Power Co. Haddam Neck EA 94-258	Letter issued January 31, 1995	Inoperability of both trains of RHR during TS surveillance
IRT Corporation San Diego, CA EA 94-264	NOV issued January 6, 1995	Failure to transport source as "exclusive use" shipment
LRA Engineering Rancho Cordova, CA EA 94-266	Letter issued February 8, 1995	Conducted licensed activities in federal jurisdiction, no NRC license
Omaha Public Power District Fort Calhoun EA 94-267	NOV Issued February 15, 1995	Design problems rendered control room air conditioners inoperable under certain circumstances
Northeast Nuclear Energy Co. Millstone EA 95-004	Letter issued February 16, 1995	Excessive flow from the hydrogen analyzer ventilation system
Special Testing Laboratories of North Carolina, Inc. Garner, NC EA 95-011	NOV issued January 26, 1995	Failure to file NRC Form-241
Nebraska Public Power District Cooper EA 95-012	NOV Issued February 21, 1995	Violation of TS – movement of fuel loads that could change irradiated fuel
Niagara Mohawk Power Corporation Nine Mile Point EA 95-051	Letter issued June 12, 1995	Inoperable diesel generators and failure to identify despite opportunities in 1992
Commonwealth Edison Co. Dresden EA 95-074	Letter issued June 2, 1995	Loss of control of licensed material

Licensee, Facility, and EA Number	*Date Issued in FY 1995*	*Facts*
Washington Public Power Supply System Washington Nuclear Project EA 95-088	Letter issued June 21, 1995	Firewatch deliberately bypassed portal monitor. NCV issued
Washington Public Power Supply System Washington Nuclear 2 EA 95-096	$50,000 proposed and paid in FY95	The control room supervisor willful violated plant procedures; a number of similar operational violations.
Entergy Operations, Inc. Arkansas Nuclear One EA 95-139	NOV issued August 7, 1995	Reactor containment fan bearings installed improperly
Asher, Inc. Louisville, KY EA 95-186	Letter issued September 19, 1995	Failed to file reciprocity prior to using byproduct material within federal jurisdiction

DISCRIMINATION CASES

Licensee, Facility, and EA Number	*Date Issued in FY 1995*	*Facts*
Houston Lighting & Power Co. South Texas EA 93-056	$100,000 proposed in FY95, withdrawn in FY95	Harassment and intimidation of contract IC technician
V.A., Department of N. Chicago, IL EA 93-264	NOV Issued October 5, 1994	Violation of 10 CFR 30.7, employee protection
Florida Power Corporation Crystal River EA 94-106	Letter issued October 11, 1994	Willful violation of 10 CFR 50.7. Discrimination against security guard for reporting another guard sleeping
Burns International Security Services Florida Power Corporation EA 94-135	NOV issued October 11, 1994	Burns discriminated against Security Guard by firing the guard when he reported concerns related to an alleged incident involving a sleeping guard.
Michigan State University East Lansing, MI EA 94-201	Letter issued October 21, 1994	Alleged employment discrimination; not substantiated
Deborah Research Institute Browns, NJ EA 94-228	Chilling Effect Letter issued November 10, 1994	Alleged discrimination for raising safety concerns
Public Service Electric & Gas Co. Salem EA 94-239	$80,000 proposed and paid in FY95	H&I of two staff engineers by licensee management
Babcock & Wilcox Company Lynchburg, VA EA 95-008	Chilling Effect Letter issued January 13, 1995	Chilling Effect Letter regarding discrimination
Entergy Operations, Inc. River Bend Station EA 95-023	Letter issued March 22, 1995	Alleged harassment and intimidation of QA inspectors
Union Electric Company Callaway EA 95-028	Letter issued March 31, 1995	Discrimination against employee in Emergency Preparedness Department for raising safety concerns regarding the EP Department
Tennessee Valley Authority Watts Bar EA 95-032	Chilling Effect Letter issued February 27, 1995	Discrimination against contract engineer
United Energy Services Corp. Maritetta, GA EA 95-033	Chilling Effect Letter issued February 27, 1995	Discrimination against contract engineer
Public Service Co. of Colorado Ft. St. Vrain EA 95-045	NOV issued August 14, 1995	Four contractor employees were allegedly terminated (through RIF) for raising safety concerns
Individual Salem EA 95-052	NOV issued April 11, 1995	Alleged H&I of engineers

Licensee, Facility, and EA Number	*Date Issued in FY 1995*	*Facts*
Individual Salem EA 95-054	Letter issued April 11, 1995	Alleged H&I of engineers
Honolulu Medical Group Honolulu, HI EA 95-056	Demand For Information issued April 12, 1995	DFI regarding inaccurate information
V.A., Department of Loma Linda, CA EA 95-059	Chilling Effect Letter issued April 14, 1995	Discrimination against Medical Center RSO
Deborah Research Institute Browns Mill, NJ EA 95-064	Letter issued June 6, 1995	Former employee of DRI alleged he was terminated because he raised safety concerns
EBASCO Services, Inc. New York, NY EA 95-071	Chilling Effect Letter issued June 12, 1995	SOL found discrimination and blacklisting of individual
Texas Utilities Electric Co. Comanche Peak EA 95-072	Chilling Effect Letter issued June 12, 1995	SOL found discrimination and blacklisting of individual
Washington Public Power Supply System WNP-2 EA 95-075	Chilling Effect Letter issued June 2, 1995	Discrimination against licensee employee for having raised safety concerns
Morrison Knudsen Corporation Ft. St. Vrain EA 95-079	NOV issued August 14, 1995	Four former contractor employees were terminated (through RIF) for expressing concerns about safety
Northeast Nuclear Energy Co. Millstone EA 95-093	Letter issued June 7, 1995	SOL finding that employee was discriminated against with respect to settlement agreement
GPU Nuclear Corp. Oyster Creek EA 95-106	Chilling Effect Letter issued June 6, 1995	Potential Harassment and Intimidation
W. J. Barney Corporation Millstone EA 95-107	Letter issued June 7, 1995	Discrimination for engaging in protected activities
Hospital Center at Orange Orange, NJ EA 95-130	$2,500 proposed in FY95, pending	Alleged discrimination
Arizona Public Service Co. Palo Verde EA 95-140	Chilling Effect Letter issued July 11, 1995	Chilling Effect Letter regarding discrimination
Missouri, University of Columbia, MO EA 95-145	Chilling Effect Letter issued August 1, 1995	Employment discrimination

Licensee, Facility, and EA Number	*Date Issued in FY 1995*	*Facts*
EBASCO Services, Inc. New York, NY EA 95-151	NOV issued July 21, 1995	Blacklisting individual from employment
Individual Hospital Center at Orange EA 95-195	NOV issued September 28, 1995	Alleged discrimination of an Oncology Technologist

Appendix 8

Nuclear Electric Generating Units in Operation or Under Construction

(As of December 31, 1995)

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, 1995, representing a total capacity of 99,116 MWe (megawatts-electric; one megawatt is 1,000 kilowatts), of which 1,125 MWe was not yet licensed for full power operation [Note: Watts Bar 1 subsequently received a full power license on February 7, 1996.]. Two reactor types are represented, abbreviated 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, 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, 1995. In 1995, there were 110 commercial nuclear reactors in the United States with operating licenses and operating; these units had been operating for a cumulative 1,759 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, with information on power ratings and dates of licensing.

Site	*Plant*	*Capacity (Net MWe)*	*Type*	*Status*	*Utility*	*Commercial Operation*
ALABAMA						
Decatur	Browns Ferry Unit 1 nuclear power plant	1,065	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

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
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	1,127	PWR	OL 1982	Southern California Edison Co.	1983
San Clemente	San Onofre Unit 3 nuclear generating station	1,127	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	873	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	666	PWR	OL 1972	Florida Power & Light Co.	1972
Florida City	Turkey Point Unit 4 nuclear power plant	666	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

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
GEORGIA						
Baxley	Hatch Unit 1 nuclear power plant	741	BWR	OL 1974	Georgia Power Co.	1975
Baxley	Hatch Unit 2 nuclear power plant	809	BWR	OL 1978	Georgia Power Co.	1979
Waynesboro	Vogtle Unit 1 nuclear power plant	1,162	PWR	OL 1987	Georgia Power Co.	1987
Waynesboro	Vogtle Unit 2 nuclear power plant	1,162	PWR	OL 1989	Georgia Power 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
Bryon	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	1,105	PWR	OL 1987	Commonwealth Edison Co.	1988
Braidwood	Braidwood Unit 2 nuclear power plant	1,105	PWR	OL 1987	Commonwealth Edison Co.	1988
Clinton	Clinton Unit 1 nuclear power plant	930	BWR	OL 1986	Illinois Power Co.	1987

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
IOWA						
Palo	Duane Arnold energy center	541	BWR	OL 1974	IES Utilities, Inc.	1975
KANSAS						
Burlington	Wolf Creek generating station	1,170	PWR	OL 1985	Wolf Creek Nuclear Operating Corp.	1985
LOUISIANA						
Taft	Waterford 3 steam electric station	1,075	PWR	OL 1985	Louisiana Power & Light Co.	1985
St. Francisville	River Bend Unit 1 station	934	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	1,085	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

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
MINNESOTA						
Monticello	Monticello nuclear power plant	536	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.	1974
Red Wing	Prairie Island Unit 2 nuclear power plant	513	PWR	OL 1974	Northern States Power Co.	1974
MISSISSIPPI						
Port Gibson	Grand Gulf Unit 1 nuclear power plant	1,173	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

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
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	1,108	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	780	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	790	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	871	PWR	OL 1977	Toledo Edison Co.	1978
Perry	Perry Unit 1 nuclear power plant	1,166	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

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
Delta	Peach Bottom Unit 3 nuclear power plant	1,093	BWR	OL 1974	PECO Energy Co.	1974
Limerick	Limerick Unit 1 nuclear power plant	1,055	BWR	OL 1985	Philadelphia Electric Co.	1986
Limerick	Limerick Unit 2 nuclear power plant	1,155	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	885	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	1,111	PWR	OL 1980	Tennessee Valley Authority	1981

Site	Plant	Capacity (Net MWe)	Type	Status	Utility	Commercial Operation
Soddy Daisy	Sequoyah Unit 2 nuclear power plant	1,106	PWR	OL 1981	Tennessee Valley Authority	1982
Spring City	Watts Bar Unit 1 nuclear power plant	1,125	PWR	CP 1973	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	1,149	BWR	OL 1984	Wash. Public Power Supply System	1984
WISCONSIN						
Two Creeks	Point Beach Unit 1 nuclear power plant	497	PWR	OL 1970	Wisconsin Electric Power Co.	1970
Two Creeks	Point Beach Unit 2 nuclear power plant	497	PWR	OL 1973	Wisconsin Electric Power Co.	1972
Kewaunee	Kewaunee nuclear power plant	525	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.
Arkansas 2 = pwr, 858, 12/72, 12/78.
Beaver Valley 1 (Pa.) = pwr, 810, 6/70, 7/76.
Beaver Valley 2 = pwr, 820, 5/74, 8/87.
Big Rock Point (Mich.) = bwr, 67, 5/60, 5/64.
Braidwood 1 (Ill.) = pwr, 1105, 12/75, 7/87.
Braidwood 2 = pwr, 1105, 12/75, 5/87.
Browns Ferry 1 (Ala.) = bwr, 1065, 5/67, 12/73.
Browns Ferry 2 = bwr, 1065, 5/67, 8/74.
Browns Ferry 3 = bwr, 1065, 5/67, 8/76.
Brunswick 1 (N.C.) = bwr, 790, 2/70, 11/76.
Brunswick 2 = bwr, 754, 2/70, 12/74.
Byron 1 (Ill.) = pwr, 1105, 12/75, 2/84.
Byron 2 = pwr, 1105, 12/75, 1/86.
Callaway (Mo.) = pwr, 1125, 4/76, 10/84.
Calvert Cliffs 1 (Md.) = pwr, 835, 7/69, 7/74.
Calvert Cliffs 2 = pwr, 840, 7/69, 11/76.
Catawba 1 (S.C.) = pwr, 1129, 8/75, 1/85.
Catawba 2 = pwr, 1129, 8/75, 5/86.
Clinton (Ill.) = bwr, 930, 2/76, 4/86.
Comanche Peak 1 (Tex.) = pwr, 1150, 12/74, 4/90.
Comanche Peak 2 (Tex.) = pwr, 1150, 12/93.
Cook 1 (Mich.) = pwr, 1000, 3/69, 10/74.
Cook 2 = pwr, 1060, 3/69, 12/77.
Cooper (Neb.) = bwr, 764, 6/68, 1/74.
Crystal River 3 (Fla.) = pwr, 818, 9/68, 1/77.
Davis–Besse ((Ohio) = pwr, 871, 3/71, 4/77.
Diablo Canyon 1 (Cal.) = pwr, 1073, 4/68, 11/84.
Diablo Canyon 2 = pwr, 1087, 12/70, 8/85.
Dresden 2 (Ill.) = bwr, 772, 1/66, 12/69
Dresden 3 = bwr, 773, 10/66, 3/71.
Duane Arnold (Iowa) = bwr, 541, 6/70, 2/74.
Farley 1 (Ala.) = pwr, 812, 8/72, 6/77.
Farley 2 = pwr, 822, 8/72, 3/81.
Fermi 2 (Mich.) = bwr, 1085, 9/72, 7/85.
Fitzpatrick (N.Y.) = bwr 780, 5/70, 10/74.
Fort Calhoun 1 (Neb.) = pwr, 478, 6/68, 8/73.
Ginna (N.Y.) = pwr, 470, 4/66, 12/69.
Grand Gulf 1 (Miss.) = bwr, 1173, 9/74, 11/73.
Haddam Neck (Conn.) = pwr, 560, 5/64, 12/67.
Harris 1 (N.C.) = pwr, 860, 1/78, 1/87.
Hatch 1 (Ga.) = bwr, 744, 9/69,10/74.
Hatch 2 = bwr, 809, 12/72, 6/78.
Hope Creek 1 (N.J.) = bwr, 1031, 11/74, 7/86.
Indian Point 2 (N.Y.) = pwr, 951, 10/66, 9/73.
Indian Point 3 = pwr, 965, 8/69, 4/76.
Kewaunee (Wis.) = pwr, 525, 8/68, 12/73.
LaSalle 1 (Ill.) = bwr, 1036, 9/73, 8/82.
LaSalle 2 = bwr, 1036, 9/73, 3/83.
Limerick 1 (Pa.) = bwr, 1055, 6/74, 8/85.
Limerick 2 = bwr, 1155, 6/74, 7/89.
Maine Yankee = pwr, 860, 10/68, 6/73.
McGuire 1 (N.C.) = pwr, 1129, 2/73, 7/81.
McGuire 2 = pwr, 1129, 2/73, 5/83.
Millstone 1 (Conn.) = bwr, 641, 5/66, 10/70.
Millstone 2 = pwr, 873, 12/70, 9/75.
Millstone 3 = pwr, 1137, 8/74, 1/85.
Monticello (Minn.) = bwr, 536, 6/67, 1/70.
Nine Mile Point 1 (N.Y.) = bwr, 565, 4/65, 12/69.
Nine Mile Point 2 = bwr, 1180, 6/74, 7/87.
North Anna 1 (Va.) = pwr, 893, 2/71, 4/78.
North Anna 2 = pwr, 897, 2/71, 8/80.
Oconee 1 (S.C.) = pwr, 846, 11/67, 2/73.
Oconee 2 = pwr, 846, 11/67, 10/73.
Oconee 3 = pwr, 846, 11/67, 6/74.
Oyster Creek (N.J.) = bwr, 619, 12/64, 8/69.
Palisades (Mich.) = pwr, 730, 3/67, 10/71.
Palo Verde 1 (Ariz.) = pwr, 1227, 5/76, 6/85.
Palo Verde 2 = pwr, 1227, 5/76, 4/86.
Palo Verde 3 = pwr, 1230, 5/76, 11/87.
Peach Bottom 2 (Pa.) = bwr, 1093, 1/68, 12/73.
Peach Bottom 3 = bwr, 1093, 1/68, 7/74.
Perry 1 (Ohio) = bwr, 1166, 5/77, 11/86.
Pilgrim 1 (Mass.) = bwr, 670, 8/68, 9/72.
Point Beach 1 (Wis.) = pwr, 497, 7/67, 10/70.
Point Beach 2 = pwr, 497, 7/68, 3/73.
Prairie Island 1 (Minn.) = pwr, 513, 6/68, 4/74.
Prairie Island 2 = pwr, 513, 6/68, 10/74.

Quad Cities 1 (Ill.) = bwr, 769, 2/67, 12/72.
Quad Cities 2 = bwr, 769, 2/67, 12/72.
River Bend 1 (La.) = bwr, 934, 3/77, 11/85.
Robinson 2 (S.C.) = pwr, 683, 4/67, 9/70.
Salem 1 (N.J.) = pwr, 1106, 9/68, 12/76.
Salem 2 = pwr, 1106, 9/68, 5/81.
San Onofre 2 = pwr, 1127, 10/73, 9/82.
San Onofre 3 = pwr, 1127, 10/73, 9/83.
Seabrook 1 (N.H.) = pwr, 1158, 7/76, 5/90.
Sequoyah 1 (Tenn.) = pwr, 1111, 5/70, 9/80.
Sequoyah 2 = pwr, 1106, 5/70, 9/81.
South Texas 1 = pwr, 1251, 12/75, 3/88.
South Texas 2 = pwr 1251, 12/75, 12/89.
St. Lucie 1 (Fla.) = pwr, 839, 7/70, 3/76.
St. Lucie 2 = pwr, 839, 5/77, 6/83.
Summer 1 (S.C.) = pwr, 885, 3/73, 11/82.
Surry 1 (Va.) = pwr, 801, 6/68, 5/72.
Surry 2 = pwr, 801, 6/68, 1/73.
Susquehanna 1 (Pa.) = bwr, 1090, 11/73, 11/82.
Susquehanna 2 = bwr, 1094, 11/73, 6/84.
Three Mile Island 1 (Pa.) = pwr, 786, 5/68, 4/74.
Turkey Point 3 (Fla.) = pwr, 666, 4/67, 7/72.
Turkey Point 4 = pwr, 666, 4/67, 4/73.
Vermont Yankee = bwr, 5010, 12/67, 2/72.
Vogtle 1 (Ga.) = pwr, 1162, 6/74, 3/87.
Vogtle 2 = pwr, 1162, 6/74, 2/89.
Washington Nuclear 2 = bwr, 1149, 3/73, 4/84.
Waterford 3 (La.) = pwr, 1075, 11/74, 3/85.
Wolf Creek 1 (Kans.) = pwr, 1170, 5/77, 6/85.
Zion 1 (Ill.) = pwr, 1040, 12/68, 10/73.
Zion 2 = pwr, 1040, 12/68, 11/73.
Total as of 12/31/93 = 109.

Reactor projects for which construction permits were in effect** as of 12/31/93 (cp date shown):

Bellefonte 1 (Ala.) = pwr, 1235, 12/74.
Bellefonte 2 = pwr, 1235, 12/74.
Perry 2 (Ohio) = bwr, 1205, 5/77.
Washington Nuclear 1 = pwr, 1266, 12/75.
Washington Nuclear 3 = pwr, 1242, 4/78.
Watts Bar 1 (Tenn.) = pwr, 1125, 1/73.
Watts Bar 2 = pwr, 1165, 1/73.
Total as of 12/31/93 = 7.

*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.

**Construction has been halted on a number of these projects.

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